CANCER

THE PROBLEM OF ITS GENESIS AND TREATMENT

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BY

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TO

ISABEL

THE TREATMENT OF WHOSE CASE ABSOLUTELY

CONFIRMED MY BELIEF IN THE

POSSIBILITIES OF POTASSIUM

AND OTHER ALKALIES

PREFACE.

THE materials set forth in this small book have been mostly gleaned from my own work, practical experiences, and observations during the past twenty years.

During the last ten years I have most particularly concerned myself with cell physiology in special relation to the pathology of cells in cancer.

My researches, published from time to time in the *Lancet* and *British Medical Journal*, will afford sufficient evidence thereof.

The results set forth were not arrived at without constant and prolonged microscopic and histological research, supported by practical experience at the bedside of the patient and in the operating theatre.

For purposes of connected and closely reasoned theses I have adopted the hypothetical method of demonstration; nevertheless, it must not be supposed that the main theme which constitutes the subject-matter of this book was the result of a sudden "happy thought" or chance inspiration.

During many years and many experiences, I have been steadily forced to the conclusions which I have drawn by a steady process of exclusion and building up. Not the least important of the researches bearing on cancer were those I conducted on dietary and other matters in connection with tuberculosis, numerous papers on which I have from

time to time published in the medical journals of the United Kingdom, the Continent, and America.

My researches and book, entitled "Intestinal Intoxication in Infants," published in 1897 (Rebman and Co.), were not the least important items in directing my attention to metabolism bearing on cancer.

The foregoing was followed by researches in blood corpuscles and blood generally, which, however, afforded no evidence of any blood disease in cancer as cause and effect other than those changes which are found in any other exhausting disease.

I have purposely refrained from attempting to illustrate by photographs, diagrams, or plates any of the well-known and over-hackneyed points in cancer tissue, inasmuch as anyone desirous of pictorial illustration will be able to corroborate my statements from any single microscopic section cut from the growing line of a cancer and stained by any of the commoner methods well known to trained laboratory workers.

It seems to me a mere platitude to state that almost everything of value, learnable from a microscopic section regarding cancer, can be learnt from one single section derived as above.

I do not pretend to provide the reader with a masterly exposition of well-turned phrases and classical literature, not having the time or inclination for the attempt of such a feat.

I regret that I cannot furnish an extensive bibliography in support of my contentions, for the reason that they are the result of my own personal

observations and practical experiences, and which compel me therefore to be my own authority.

My thanks are due for any support which my thesis may appear to have derived from the efforts of others; and I have endeavoured to give recognition of this in the text of the book.

I have advanced a number of arguments in support of my thesis, and have put the matter in the form of a hypothesis, in order to help and facilitate the work of possible hostile critics, as it is by this method only that the truth of any definite statement may be arrived at.

I have withheld nothing that has occurred to my mind, and have endeavoured to place at the disposal of everyone such knowledge as I may possess in order to be used by them without reference to myself in the cause of suffering humanity.

F. W. FORBES ROSS.

21, New Cavendish Street, Harley Street,

London, W.

June 20, 1912.

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CHAPTER I.

CANCER.

To both the medical profession and the public the term "cancer" has a peculiarly terrible significance. To one it spells failure hitherto, and often to both it spells death personally. Even medical "cancer experts" die of cancer.

Talking one day with a former Pathologist of a large general hospital in London he used to me the following true but significant words:—

"You surgeons may say what you like about the thoroughness with which you claim to excise with your knife a cancerous growth, and no doubt in many cases you are successful, especially when you deal with an early case of cancer, in that in a very few cases the disease after operation does not recur. On the other hand, the cases in which recurrence supervenes after operation are quite sufficiently numerous to give pause to any insistent claim as to the curability of cancer by what we

know, and by what can be done at the present moment. Epithelioma is a fatal disease.

"Take, for instance, cancer of the tongue: it is a fatal disease, for sooner or later, whatever you may do, it will either recur locally or in the glands of the neck. This form of cancer kills; it is, as most cancers are, terribly fatal."

The above is a quotation from memory of words spoken by one who has been an honest, sincere, and painstaking worker in the pathology of cancer for many many years; and a great debt is owed by the profession to him as a pioneer in a direction of research which, if it did not result in anything immediately tangible, served to elucidate many points of evidence in the consideration of the cancer problem.

Popularly understood, "cancer" for the lay public means "something growing of a bad nature, which if not operated upon soon, that is, if it can be operated upon, will cause death, and even though the sufferer submits to be 'cut up,' it might return, and all the suffering will only have resulted in a short gain of time—well! one has got to go any way."

The above is a tolerably correct though colloquially lay method of putting the matter; but nevertheless fraught with terrible significance and much terrifying horror for the victim of a disease who needs to utter such a sentence.

For the member of the Medical Profession who sees a case which he is tolerably certain is a case of cancer or malignant new growth exactly the same

problem is put by him to himself, but in somewhat different words as follows:—

"This lump, or thickening, or obstruction, appears to me to be a cancer. My experience and the experiences of others force me now to consider the following points: Is this cancer; if a cancer, and I am quite certain it is, one of long standing? Is it extensive in its ramifications? Is the size of the cancer and its surroundings, and the surroundings of the organ or parts affected by it such that if I were to propose operation can I reasonably hope to cut wide of the disease and so rid my patient of it with a tolerable chance that it may not recur and kill him afterwards?"

If the above soliloquy can be answered favourably a surgeon is justified in urging the sufferer to submit to operation for the removal of the new growth on account of its malignancy.

If the answer on the other hand is not quite favourable, the surgeon puts to himself the further problem: "Will the removal of this diseased part, in spite of the extensive disease and the liability of distant infection, give my patient any advantage? Will he or she have a reasonable length of period between my operation and recurrence (which I will earnestly try to prevent), or will the removal of the primary seat of disease benefit my patient by affording him or her an easier death than if I did nothing at all?"

The above, alas! is too often all that a surgeon can honestly think and hope for when he sees

certain cases of cancer for the first time. The end, as we too often know, to the sorrow of the profession and public alike, is death.

I have heard it said by a member of the medical profession: "Why worry about cancer and the finding of a cure, or bothering whether you can remove or can't remove the disease? After all, cancer is only one of the ways of dying, and we have got to die by some method or other, and why not cancer as a method of dying as well as any other?" The latter is the frankly hopeless view, but none the less held by many amongst the profession and public.

The above describes the attitude of a great many well-meaning and well-thinking persons, and I am bound to confess that when a member of the profession is brought face to face with an advanced, hopeless, and inoperable case of cancer some such sentiment as the above would be the only possible consolation for the hopeless inability to do anything to ward off the hitherto inevitable but sure ending —Death.

To be an expert in cancer in the popular sense is to have gained a reputation for dexterity with the knife which all of us possess in more or less degree.

A surgeon may spend his life carving his neighbour with astonishing facility and despatch, may even write a book in order to convey to the profession and public his superlative success as a cutter out of cancers that can be cut out; yet, at the end of that man's life, although he has enjoyed a reputation as a good performer, he will have left nothing

behind which will bring humanity, medical and lay, one iota nearer the true solution of the problem, the cause, therefore the cure, of cancer. The medical profession is too painfully conscious of its own limitations, and is therefore very tolerant of those who lay down the law, which is accepted of the medical Medes and Persians, "the law of the knife," yet they are for want of a better resource than the knife compelled to accept circumstances as they are. Habit and constant realization of the uselessness of the knife in many cases compels to a discreet though saddened and chastened silence between its intolerant and over-enthusiastic exponents and those who are of a more open mind, but are nevertheless willing to avail themselves of every resource in order to save life.

Most books on cancer have attempted nothing more or less than to give expositions of operations undertaken for cancer of some part or organ of the body, and although they serve to advertise, *urbi et orbi*, the fact that the authors of them are able, by the aid of the knife, to remove a piece of the human body successfully or not as may be the case, by no possible twist of imagination can they be regarded as throwing any light whatsoever on cancer from the point of view of attempting to elucidate and explain its true cause and origin, and so give hope of methods and means to prevent or terminate the disease when acquired.

An elaborate long-winded description for the removal of the sac of a man's stomach or half of the internal organs of a woman, although it might enhance the reputation of the performer, does not

benefit anyone but the particular subject of that operation, inasmuch as the discovery of the cause and cure of cancer is in no way furthered, and the recurrence of the disease and death of the patient, which often follows within a very short space of time, shows after all that a great deal yet remains to be done.

From what has been said it is quite clear that many cases of cancer come to a surgeon altogether beyond the aid of his knife, and medical and surgical science had hitherto nothing further to offer the sufferer than death, sooner or later, soothed and alleviated by more or less anodyne medication, principally morphine. There are those of us surgeons who, in conscientious recognition of the limitations of the knife, endeavour to do something more for an inoperable case of cancer than merely to stand by, administer morphine, and watch the patient sink surely down into the grave at whatever age he or she may happen to be when cancer puts an end to the scene.

If cancer were essentially a disease of far-advanced old age it would not be nearly so terrible to humanity; unfortunately, cancer may attack anyone at any age, and herein lies the cause of its peculiarly terrifying nature.

For inoperable cases of cancer, by some process unknown to anyone, the medical and surgical profession by general tacit consent will seize upon a certain line or method of treatment, and having adopted that treatment for no earthly reason whatever than that they happen to have done so, will regard anyone who attempts to treat hopeless

inoperable cases of cancer, by any other method than the one they have selected, as an irregular and unorthodox practitioner.

For example: when Röntgen discovered the X-ray whilst experimenting with a Crooke's tube, the whole mental world was stirred to its profoundest depths, and the medical profession did not escape.

A few enterprising medical souls decided that X-rays might be useful in the treatment of cancer. It was immediately adopted, and became the law of the medical Medes and Persians for inoperable cases of cancer, simply because the so-called "cancer experts"—who as operative curers had failed and were at their wits end to find some feasible excuse and method with which to cover their paralyzed resources—had decided to adopt X-rays. The first trial of X-rays as a treatment of cancer was the blindest of blind leaps in the dark by even the most orthodox.

Purely and simply therefore, because the shining lights amongst the cancer experts, who were singularly inexpert in advanced cancer, had smiled on X-rays they became the fashionable cure for cancer. Perhaps because they had proved useful in what is known as rodent ulcer, an allied form of epithelial disease of the skin, therefore it was argued they might be useful in cancerous disease of the epithelial cells of the same structure. X-rays proved only a very, very uncertain remedy, if considered in even the most generous and enthusiastic light.

But, *mirabile dictu*, X-rays as far as the cancer

problem was concerned had the mule-like property of *kicking* backwards, and the medical and surgical profession found itself face to face with the fact that repeated exposure of the skin to X-rays would actually produce, in an apparently healthy person, the very disease which it was supposed to cure.

So much for the prescience of the powers that be, the orthodox cancer experts.

The world was equally moved by the discovery of Radium and its properties by M. and Mme. Curie, and immediately Radium was installed with the greatest enthusiasm as a treatment for cancer with the cordial approval of the powers that be among the operating cancer experts, whose only resource, X-rays, had apparently left them in the lurch.

Why X-rays or Radium was supposed to act beneficially in the cure of cancer was supposed to be some "subtle influence" of their ultra-violet (alpha, beta, and gamma) rays. What particular process or action these rays were supposed to exert nobody knew. How they acted or why they acted nobody knew. Why X-rays or Radium should influence some cancerous growths, and cause cancerous growths in other healthy people, was equally a mystery.

The hypothesis,which I shall put forward in this book and endeavour to support by deductive and inductive reasoning and by actual experimentation and practice, will I hope be able to answer all the foregoing.

Briefly stated, the hypothesis advanced is as follows : Cancer I believe is due to a want of balance in particular mineral salts in the body, and that the

disturbance of this balance leads to the disorderly and malignant growth of epithelial cells (epiblastic and hypoblastic) which is professionally known as cancer or carcinoma.

If, as I believe, this disturbance of the balance of mineral salts in the body is not the key to the problem of cancer, then I am morally certain that at any rate it is one of the chief wards of the key which will yet help to unlock the sanctum of secrets.

It may be that the other form of cancer, known professionally as sarcoma or malignant disease of the mesoblastic tissues, is also referable to the disturbance of balance of other mineral salts in the body, or a combination of such salts.

So far as my researches on epithelial cancer have taken me, I have reason to believe that the disturbance of the potassium balance in the body is the cause, or one of the main causes, of epithelial cancer.

Ten years of constant microscopic, clinical, and surgical research has tended more and more to convince me that this is the case. The true test of the hypothesis will be whether the artificial or intentional administration or regulation of the potassium balance in an apparently hopeless case of cancer will affect any profound change for the better in the disease. This, after all, is the one and only true test, as we shall see.

A hypothesis holds good whilst it is able to supply the answer or explanation of most puzzles or phenomena presenting themselves for solution in any problem, and until some other hypothesis can be

advanced which will do more than the existing one, the first hypothesis must remain paramount.

I claim that the hypothesis of the disturbance of the balance of mineral salts in the body as the possible cause of cancer generally, is one, especially in regard to potassium in its relation to epithelial cancer, which will answer and explain more of the puzzles and intricacies of the cancer problem, as we know it to-day, than any other hypothesis yet put forward. It most easily answers the reason for the cause of the apparent spontaneous cures of cancer in the body by some natural influence or power of the body. It will explain the various phenomena in cancer causation. It will explain the length of the interval between an operation and recurrence.

In order that the reader may follow carefully the line of research and reasoning that has been followed by the author, it is requested that a paper on cancer cells and leucocytes, made public in 1905 by the author, after two years' constant microscopic research, will be carefully read.

This Paper forms the subject-matter of Chapter II.

Chapter II.

OBSERVATIONS ON CERTAIN FEATURES EXHIBITED BY CELLS IN THEIR RELATION TO CANCER.

Being a Paper contributed to the Annual Meeting of the British Medical Association at Leicester in 1905, and published in the "British Medical Journal," October 28th, 1905, p. 1,101.

During an investigation into the pathological histology of cancer, accompanied by parallel observations on normal tissues, certain points strongly impressed themselves, and appear to be worthy of consideration, and briefly are as follows:

The genesis of cancer, and indeed of malignant new growths generally, appears to be probably a question of alteration of cell polarity, and therefore work on cancer research should consider cell polarity in all its bearings.

Cell polarity has been defined as morphological or organic, and physiological. The *morphological* or *organic* polarity is based on an axis drawn through the cell, having the nucleus and centrosome on the axis line, with the nucleus nearest the basal or attached end of the cell, and the centrosome on the distal side of the nucleus towards the free end of the cell. The *physiological* polarity is based on an axis line drawn through the epithelial cell from

its basal end, or source of nervous and food supply, to its free end, or end for discharge of its functions —for example, cuticular structures, cilia, pigment, and zymogen granules. The *two* foregoing expressions of polarity correspond, as both are at right angles to the surface on which the cell grows. Heidenhain developed the above conceptions, and endeavoured to explain the position and the movements of the nucleus, the succession of divisional planes, and other properties and functions manifested by cells.

The polarity of cells is *various*, however. In some cells it is fixed permanently when the adult cell is specially differentiated—for example, ciliated and goblet epithelial cells, cells of the taste-buds, and of the Schneiderian membrane in the nose, and nerve cells. Cancer arising from taste-bud cells and Schultz's cells in the olfactory membrane has not been recorded, nor has any malignant tumour formed of neuron cells been described, as far as I know.

The consideration of the rôle of ciliated cells and goblet cells in cancer appears to throw valuable light on some of the life-phenomena of cancer cells.

Gaylord and Aschoff describe the total disappearance of goblet cells in an intestinal follicle about to become cancerous, and described also the mutation of columnar cells to the cubical type. Mr. Pearce Gould* has called my attention to the fact that the cells from a duct cancer in the mamma, which are cubical, become ovoid when found in secondarily-infected glands. Bland-Sutton*

* Since knighted.

mentions the mutability of the ciliated cells in parovarian cysts, the lining cells varying from the ciliated and cubical types to the total absence of epithelial cells. He also draws attention to the mutability of columnar epithelium to the squamous type, as in the trachea of the cat.

Normal histology of the above cells teaches us that these cells (ciliated, goblet, taste-bud cells, Schultz's cells, and neuron cells) possess a peculiar nervous connection indissolubly bound up with their function, and that for the most part the nervous control passes through the centre of the cell to its functional organs, for example, cilia. Henneguy and Lenhossek give reason to believe that the cilia are closely connected with the centrosomes of the cells.

The only cells of this class occurring in cancer, ciliated cells, are comparatively rare, as indeed is the occurrence of primary cancer in tracts lined by ciliated cells, when we take into consideration the fact that there are present in ciliated cell tracts, other cells, which are not ciliated, and which probably in the first place give rise to the cancer, and which enclosed some ciliated cells in process of extension. In cancer containing ciliated cells, a peculiar, benign modification appears to recur invariably, in the form of cyst-like cavities described by Stroebe and Zeigler. These cyst-like cavities are lined by adult ciliated cells; which strongly tends to show that as the adult cell must have its cilia on a free surface, that when the polarity of the cell becomes fixed the cell must cease to grow as a cell having non-fixity of polarity, that it ceases to grow as a cancer cell and invade surrounding

tissues. In other words, if a cell becomes cancer-genetic, it must become so during its early divisional stages, or must mutate to a form of cell not having fixed polarity as an obligation, and that as in the case of the ciliated cell, *cancer cells generally can cease to grow continuously as cancer cells*, and that the process of cell growth which we know as cancer appears to be here shown to be *terminable*, resulting in the reversion to a cell *whose growth is non-cancergenetic.*

If this change could be brought about in all the cells of a cancer simultaneously, then the arrest of the cancer would be inevitable and certain, and its malignancy would be lost. From the foregoing it can be gathered that cubical, columnar, and other epithelial cells whose nerve supply is in the form of end bulbs at the side of the cells in the intercellular spaces (Ranvier and Beale) are those cells peculiarly liable to cancerous growth, and such is the case, as a review of the known pathology will support, and shows that the method of nervous supply in the first place determines partially the *liability* of a cell to take on cancerous growth if suitably influenced. The polar axis of non-epithelial mesoblastic cells appear to be either permanently fixed—for example, striped and non-striped muscle cells—and in some, lost or various—for example, as in leucocytes, plasma cells, or connective tissue corpuscles, the centrosomes occupying situations in the cell on any side of the nucleus.

The mesoblastic tissue shows an example of high developmental differentiation and fixity of

cell polarity—for example, striped muscles, whose nervous supply and control is intimate with the cell in the form of a fibre entering the capsule, and ending in a special structure or "end plate" within the cell.

If striped muscle be injured and reparative attempts take place, striped muscle is not the result, but fibroid tissue, through all the embryonic phases up from the simple round cell to the spindle cell, and finally the fibroid tissue, which is the finality in repaired mesoblastic tissue, always stopping short of the original highest specialization, striped-muscle.

The hypoblastic and epiblastic tissues, on the other hand, are for the most part capable of complete reproduction of the original cell, which would tend to show that any hypoblastic or epiblastic epithelial cell, however highly specialized, as the ciliated and goblet cell, is only on the same developmental plane as the mesoblastic spindle cell, and never attains normally the quiescence and permanence of fibroid tissue.

In the epiblastic nerve cell we have an exception analogous to striped muscle in all respects.

There is therefore a feature in *mesoblastic* tissue, which the *hypoblastic* and *epiblastic* epithelial tissues *seldom* attain to; hence the benign and orderly mesoblastic tumour.

The less differentiated mesoblastic tissues with variable cell polarity, on the other hand, show the same features as the hypoblastic and epiblastic tissues under certain conditions, and hence we get

the sarcomata, from the rapidly growing and more deadly small round cell sarcoma up to the less rapidly growing and less deadly long spindle-cell sarcoma and the myeloma. The next stage above these is the benign slow growing myoma which occasionaly retrogrades to the spindle-cell sarcoma in the same tumour; which tends to place non-striped muscle on the same polar plane as the ciliated and goblet cell.

The foregoing tends to support the contention of Mr. Jonathan Hutchinson* (senior) that *sarcomata* and *carcinomata* are *identical manifestations in different tissues.*

It will be noticed that through the foregoing series we have variability of polar axis and nervous control till the myoma is reached, where fixity for the time being of axis and nerve control can be deduced from study of striped and non-striped muscle normally.

If a cell with a temporarily fixed nervous polar axis is going to invade, it must first structurally alter; if not, then it is highly likely that it cannot give rise to invasion. It appears that it is necessary for the cell to acquire non-fixity of its polar axis in order to allow its centrosome to swing or veer round, and so changing its plane of nuclear division variously, after the manner of a leucocyte or connective tissue corpuscle, or an ovoid cell, to be then able to invade surrounding and subjacent tissue. The applicability of this factor to the origin of the sarcomata is as feasible as it is to carcinomata.

* Since knighted.

The variation of polarity shown by some mesoblastic cells is apparently the case with cancer cells which have left their normal position or are about to leave their normal position to become invaders of tissues whose cell polarity is variable, as in the case of mesoblastic tissue cells, leucocytes, etc., and less highly organized cells generally; and these epithelial cells do not invade until non-fixity of polar axis has been conferred upon them by an agency whose influence is common to epiblastic, mesoblastic, and hypoblastic cells throughout the biological kingdom wherever malignant growth occurs—for example, one or other of the forms of leucocyte—possibly a mononuclear leucocyte. I briefly outlined the idea that cancer was due to leucocytes at Oxford last year, in the Gynaecological Section, when discussing Messrs. Smallwood Savage's and Wilson's papers on chorion-epithelioma.

It will now be profitable to consider histological evidence of disturbance of polar axis in cells about to become cancergenetic. In epitheliomata specimens I have observed that in the palisade cells, at a spot where invasion was about to commence, the polar axes of the cells were altered, and, as a result, the palisade line was irregular, and the centrosomes were seen to be at the side of the nuclei and not towards their free surface as normally. In other words, the polar axis was at right angles to the normal axis. Cell nests were present in the apparently normal layers of the prickle cells in the immediate vicinity of the original cancer focus, clearly showing a preliminary

alteration of polar axes, and therefore of the centrosomal relations and their functions.

Examination of many specimens of mastitic and cancerous mammæ showed that the polar axes of the cells were at various angles, and the relations of the centrosomes and the nuclei were heterogeneous. There was a more than significant invasion of leucocytes preceding these changes, which was well shown in the neighbourhood of the original cancerous focus and growing margin.

It is probably the case in epithelia and other cells, whose nervous control is not closely and intimately bound up with the cell, that a stimulus could thus more easily give rise to cancer, preceded or followed by influences conferring the property of heterogeneous polarity such as is possessed, for instance, by leucocytes who may have the power to transmit this peculiarity. The ciliated cell and others of fixed polarity when fully developed, may have their polarity upset, probably during the *early* stages of cell division and multiplication before their nervous control has been definitely established.

It would appear that where function was constant and kinetic, as in the case of ciliated cells, muscle cells, and nerve cells, etc., there was less tendency for the conversion of stimuli of function to stimuli of proliferation; on the other hand, where function was merely metabolic or passive, there is reason to suspect that such nervous control and energy could be more easily perverted to proliferative exuberance.

It would appear that the nature of the stimulus leading to alteration of polar axis and breaking of

alignment of cells in precancerous stages, was certainly not a negative one, nor was it a loss of nerve control alone; otherwise the planting of a skin graft, or the subcutaneous injection of epithelial cells, would give rise to cancer, which is certainly not the case, as attempts to produce true cancer in this way have failed.

In this connection Bland-Sutton mentions the spontaneous disappearance of epithelial bodies grafted on to the peritoneum in cases of non-cancerous papillomatous cysts of the ovary.

The stimulus must, then, be a positive or exciting one, determining the wild ungoverned growth with invasion, which follows on the precancerous change of polar axis and irregular division with break in alignment. The answer is that more than likely the cause is a leucocyte or leucocytes. If normal tissues be injured, repair does not take place till the débris are removed; this débris is removed by the biological action of leucocytes, and it is quite probable that cell proliferation is stimulated by the action of one or other kind of leucocyte, possibly a mononuclear, and is controlled by another kind, a polymorphonuclear leucocyte. The clinical evidence of this is only presumptive, but chronologically appears likely, as it is certain that no repair is attempted till the advent of leucocytes to the area requiring reparation.

Finally, reparation goes on while the leucocytes remain in that area, and it is only on its completion that they are entirely removed. In practice do we have any example of this? In some recurrent

fibroids (sarcomata) we do know that Coley's fluid, which leads to intense chemiotaxis, often produces fibrosis and arrest of growth. In so-called atrophic cancers of the mamma, I believe that the fibroid reaction and comparative quiescence is due to one kind of leucocyte; and I have seen in a cancer specimen a line of leucocytes passing across the cancer and leaving dense fibrosis in their wake, with what appeared to be for the most part stable quiescent mononuclear epithelial cells.

For these reasons it would appear that cancers and sarcomata have a close causative connection with leucocytes, chemical or symbiotic, just as leucocytes have with young reparative tissue cells.

I am aware that many attribute to leucocytes the rôle of attempting cure; some leucocytes may and probably do this, whilst at the same time other forms of leucocytes are busy in setting up the exact opposite condition. Research in this direction in the future may prove interesting and profitable.

NOTE.—Since depositing my paper with the Selection Committee of the Pathological Section of the Annual Meeting at Leicester early in July this year, and of which the foregoing is a short summary of the paper read, a paper by Messrs. Farmer, Walker and Moore has appeared, from which it is evident that we have been working upon similar but independent lines. I would like to remark, however, that the scheme of my paper was originally outlined in the discussion of the Gynaecological Section of the British Medical Association meeting at Oxford in 1904 and sub-

sequently shortly referred to again this year at Leicester in the same Section, up to which time I was totally unaware of the results obtained by Messrs. Farmer, Walker, and Moore, which had not yet been published. It is, therefore, worthy of notice that these very similar conclusions have been arrived at by workers whose efforts were entirely unknown to each other.

NOTE.—The foregoing Paper and Note are to be found in the *British Medical Journal* of October 28th, 1905.

Chapter III.

LEUCOCYTES AND PROLIFERATION.

It is presumed that the reader will have carefully perused Chapter II. and has grasped the significance of cell polarity as set forth therein. Cells generally, as derived from the blastodermic vesicle, are divisible into epliblast and hypoblast, the two derivatives of the original gametoid germ cell, the outcome of the union of the male and female pronucleus.

The qualities of the original germ cell are therefore divided between the epiblast and the hypoblast, to each of which, as we have seen in the previous chapter, is attributable certain conditions of polarity. For example: among the epiblastic cells we have fixed polarity in neuron cells, Max Schultz's cells of the nose and taste-bud cells of the tongue, from all of which malignant new growth has never been recorded, because these cells have their polarity permanently and immutably fixed.

Among hypoblastic cells we have ciliated and goblet cells, whose polarity appears to be fixed only in the adult stage, and the supposition that in their stage of early growth and division their polarity is not fixed is shown by examination of the renal tubules of the frog, where nodes of cell proliferation

can be seen from which the adult ciliated cell is eventually elaborated. The cell is then swung into alignment and fixed polarity, by its basal attachment to its nerve fibril, which is the actuating factor of its cilia.

It can now be postulated that the epiblast, in contradistinction to the hypoblast and *vice versa*, contains certain qualities of developmental attributes not possessed by the other.

So that, neither of them is capable of reverting to the condition pertaining to the original germinal cell from which they sprung; unless the peculiar quality lacking in itself but possessed by the other is restored to it. The mesoblast, so far as we know, is derived from a combination of cells in the original epiblast and hypoblast, and as such possess attributes common to both the epiblast and the hypoblast.

If then the mesoblast possesses qualities common to the other two primitive layers (epiblast and hypoblast) it can be understood that should any cell of the mesoblast at any time become capable of or able to amalgamate or conjugate with either an epiblastic or an hypoblastic cell, then the resulting cell of such a union will immediately possess the original primitive function of growth possessed by the original germinal cell aforementioned.

The mesoblast possesses cells of immutably fixed polarity, *e.g.*, striated muscle cells, whose nervous connections are part and parcel of their structure and are unchangeable. Other cells of the mesoblast, from the non-striated muscle fibre

to the small lymphocyte, possess variability of polarity, and when we consider the leucocyte we see an absolute unfixity of polarity—in other words, the centrosome of a leucocyte is in no particular position in relation to the nucleus of its cell.

Inasmuch as a leucocyte, whether polymorphonuclear or mononuclear, is a mesoblastic cell possessing unfixity of polarity and qualities common to both the epiblast and hypoblast, if now a leucocyte should become conjugated, or be absorbed as to its biological principles as living protoplasm, and its nucleus become amalgamated with the nucleus of a young epiblastic or hypoblastic cell, it can be understood that the original germinal qualities will be restored to the epiblastic or hypoblastic cell in question, together with unfixity of polarity, and so we have the power of free growth in any direction restored to a cell whese polarity in the adult stage is otherwise normally fixed.

It may be, and probably is, that certain leucocytes possess the power of conveying to an epiblastic or hypoblastic cell the quality of growth, and that other leucocytes may also possess the quality of arresting that growth, either by partial amalgamation or by the conveyance of some chemical body not yet understood.

The study of the healing of normal tissue after injury is interesting from the point of view of the function of leucocytes with regard to proliferation and the ultimate results of such proliferation. I am inclined to believe that the kind of leucocyte has a great deal of influence on results. After

carefully examining numbers of sections of healthy healing ulcers and wounds in all stages of healing, I feel safe in asserting that nowhere in the field under an immersion lens, when looking at a healing ulcer, will any other leucocyte than a polymorphonuclear or so-called multinuclear leucocyte be found. Examination of a cancer, on the other hand, will reveal the fact that a large number of large and small mononuclear leucocytes and lymphocytes are present in every direction, and the number (or rather the scarcity) of polymorphonuclear leucocytes in the specimen appears to have a strange significance as regards conditions seen, of which more anon.

For the proper healing of a wound or ulcer, and the formation of fibroid scar tissue then, we must look to the influence of the polymorphonuclear leucocyte.

It has long been asserted by physiologists and biologists that leucocytes amalgamate with connective tissue corpuscles of all kinds to produce either a new cell capable of multiplication; or act as food for those cells in the form of living protoplasm. It may be that a leucocyte of a certain character can only amalgamate with a certain cell, and that after amalgamation that cell is only capable of producing one "division" or "generation," and it may be that under pathological conditions certain other leucocytes (or the same one if amalgamating with the wrong cell) may then produce a cell whose pathological quality is indefinite subdivision with any number of generations, until some quality lacking in the cells in the surrounding tissues or in the

blood circulating in those tissues is restored, and enables the steadying influence of the right kind of leucocyte to be exerted. It might be that, until this occurs, the phagocytosis or destruction of invading cells foreign to the tissues invaded cannot take place.

If this were not the case, malignant disease would almost certainly follow on every wound inflicted, whether the result of intention, accident, or disease.

If the hypothesis of leucocytic amalgamation with tissue cells is tenable, which I confidently assert to be the case, why does a wound heal and remain quiescent without malignant new growth in the majority of cases? And why, in other rare cases, in a chronic ulcer, whether the result of traumatism or disease, and in old scars, does the cancerous process suddenly commence? Briefly, why do not all wounds take on malignant processes? In the reply to this question lies the answer, "What is the nature of cancer?" The answer will of course be:—*on account of conditions the reverse of those normally existing.*

Let us now review tumours in relation to their structure and malignancy, and at the same time take note of the peculiar leucocyte or nucleated cell associated with them. Among benign tumours we have the fibrous and the fibromyomatous tumour, and certain tumours of mixed connective tissue, all of which may on occasion become malignant; for instance, some myxo-chondromatous tumours. The answer, I feel sure, could be provided by a certain leucocyte if they were all capable of

speech. There is a tumour which combines the qualities of a fibroid tumour and a multinuclear cell tumour which shows a very low malignancy, the myeloma or the myeloid sarcoma. This tumour, composed as it is of fibroid cells and multinucleated myeloplaques, is proof of the close connection of multinucleated cells and fibroid tissue of low malignancy; also the connection between multinucleated white corpuscles and fibroid scar tissue.

Examination of many sections of myeloid sarcoma leads me to the conclusion that the elements chiefly present here are young and old myeloid cells and long spindle cells. The nuclei of the young myeloid cells stain very deeply, and are strangely different as regards the grouping of their chromatic nuclear substance from the older myeloid nuclei; further, I believe that the spindle cells are derived from peripheral splitting off of nuclei and their surrounding protoplasm severally from the older myeloid cells, and therefore the spindle cell of a myeloid sarcoma is the complete adult developmental stage of the nuclei of the multinucleated myeloid cell.

This myeloid tumour starts, as we know, in relation to bone, one of whose constituent chemicals are chiefly the phosphates of calcium and magnesium, and this fact, I think, has some significance when viewed in relation to certain experiments conducted by myself, and from observation in certain other diseases than cancer.

We have already considered the multinuclear leucocyte in the healing wound and the fact of the

absence of every other form of leucocyte, and we know that a completely healed scar is composed mainly of fibroid cells which have passed through every stage from the round cell through the spindle stage up to the complete fibroid cell of fixed polarity.

It would not be then extraordinary to assert that the production, fibrosis, and fixation of polarity may be one of the functions or attributes of a multinuclear leucocyte.

The most intensely virulent malignant tumour which arises in the mesoblastic tissue is the small mononuclear round cell sarcoma, followed next by the large mononuclear round sarcoma, then by the small spindle cell sarcoma, then by the long spindle cell sarcoma, next the myeloma before described, and finally the fibroma of comparatively benign growth, but capable on occasion of reversion to malignancy.

Examination of thousands of sections of cancer, cut and stained by myself, have led me to assert the following: "A cancer of the epiblast or hypoblast shows development as to quantity or absence of fibrous stroma in direct relation to the presence or absence of polymorphonuclear leucocytes in the field of the microscope." Sections of adeno-carcinoma of the large intestine will show a fibropolypoid development more when polymorphonuclear leucocytes are present in greater number than when they are very few in the field or are nearly absent.

Examination of cancers of the breast in women reveals the same phenomenon. In cases of

atrophic scirrhus of the breast, where there is a very thick and coarse fibrous stroma and the cancer is very slow growing, the number of polymorphonuclear leucocytes in the field is found to be preponderant over any other; in other words, the great deposition of fibrous tissue which characterize these cancers is the work of the multinuclear leucocyte whose action has led to the fixation of polarity of the connective tissue corpuscles and their conversion into fibrous tissue.

If then connective tissue corpuscles, after having produced fibroid tissue, can be fixed as we see, it is quite feasible to expect; that the mononuclear epitheloid cancer cell lying in the older portions of the tumour are also epithelial cells who have had their polarity refixed, perhaps by the agency of the same white blood corpuscle.

On the other hand, examination of the columnar celled and encephaloid cancer of the breast of comparatively young women, which is strangely frequent during and immediately after the child-bearing period, is characterized by a strange absence of polymorphonuclear leucocytes, a very poor and scanty stroma of fibrous tissue, and an enormous ponderance of large and small mononuclear leucocytes.

These two latter classes of cancer of the breast are well known to experienced surgeons as exceedingly virulent and infective.

Let us now consider epithelioma of epiblastic surfaces. The first sign of the precancerous stage which can be observed is a loss of polarity of the palisade line of the rete malphigi. Careful exami-

nation will show the rete to be invaded by a strangely large number of large mononuclear leucocytes, and deeper down in the section, where fibrosis is being attempted, a very few polymorphonuclear leucocytes. Inasmuch as the spaces between the cells of the rete malphigi of the skin freely communicate with one another, and the cells are bound together by narrow threads of protoplasm crossing these spaces, the entire rete is open to the flow of serum or lymph in any and every direction, and therefore to the invasion of leucocytes in the same manner. The foregoing explains the rapidity of œdema of the skin and the free infection of the rete in all directions by cancer.

This has led many cancer workers to formulate theories of the propagation of skin-cancer against the lymph current, but which, being free in every direction, possesses no definite set of current, and so the idea of the propagation of skin-cancer, more particularly in any one direction, either with or against the supposed lymph current, is a matter of quite trivial importance, and is for the most part entirely fallacious.

"Cancer cells take the line of least resistance," and it matters not whether their path lies along lymph channels, into blood vessels, or in every direction through the rete malphigi.

The presence of epithelioma of the skin was once upon a time judged from the fact that so-called "cell nests" were present, and "cell nests" were regarded as invariably the "sign" of cancer. My own opinion is that although "cell nests" are present in cancer, they are not part of the cancerous pro-

cess, and are no evidence of malignancy, as they can be found in situations which have been subject to prolonged irritation; but which are not the subject of malignant diseases.

Strange as it may seem, "cell nests" are a strong evidence of the terminability of the cancerous process as it effects epithelial cells, because the cells which go to form "cell nests" are cells which have reached the fixed polarity stage of adult life, and their whorl-like arrangement is due to the fact that they have been compressed by surrounding cells into their nest-like formation, and are identical manifestations, among epiblastic cells, to that assumed by ciliated hypoblastic cells in the cyst-like cavities occasionally present in an epithelioma of the hypoblast, containing ciliated cells. Cancer cells, therefore, as pointed out in Chapter II., are capable of abandoning their profligate method of growth and settling down to what may be described as adult respectability: in other words, *cancer cells can cease to be cancer cells.*

To summarize briefly all the foregoing:—Polymorphonuclear leucocytes and multinuclear leucocytes all appear to confer stability of polarity, if their presence in scar tissue and in malignant tumours which show low malignancy is to count for anything. On the other hand, the mononuclear leucocyte, large or small, seem to concern themselves with proliferation pure and simple, and do not show any quality which would lead one to regard them as having any other effect than excitation to ungoverned growth.

The wildest and the most exuberant malignant

tumours are composed of large and small lymph corpuscles. It is quite significant that large and small round cell sarcomata and small spindle cell sarcomata possess practically no stroma and show practically no polymorphonuclear leucocyte endeavouring to assert any action in the tumour.

It is true that polymorphonuclear corpuscles circulate through these tumours, but they do not appear to take any active part either in causation or reparation. If, on the other hand, the bio-chemical balance should be upset by such an inflaming agent as "Coley's Fluid" in a mesoblastic tumour, such as the long spindle cell sarcoma, then white polymorphonuclear white blood corpuscles crowd the field and give rise to safe fibrosis of fixed polarity, which, however, does not prevent the tumour from subsequently resuming malignancy at some part, as has occurred. I believe that the access of blood and the increased supply of potassium to the parts, brought thither by the blood stream, enables the polymorphonuclear white corpuscles to effect the corrective influence needed, and which before that event was lacking in the tumour generally, and comparatively in proportion in any part of the body of the sufferer, under normal circulation of amount of blood.

Chapter IV.

THE GENERALLY ACCEPTED RÔLE OF LEUCOCYTES AND THE CONTRARY.

The liver was originally thought to have but one function, and that was to produce bile. Claude Bernard, after much professional opposition, established its bile functions in relation to the blood. Subsequently, it was discovered that the liver had other functions besides the production of bile and the utilization of hæmoglobin set free by the destruction of red blood corpuscles, which also occurs in the spleen in certain diseases.

To the foregoing, in time, was added the discovery of the glycogenic function of the liver, and it began to be seriously considered as one if not the main arbiter of the sugar economy of the body. There is no organ or tissue of the human body which does not possess a main function, and also whose by-products of that main function are not useful and necessary for other organs.

The domain of bacteriology and the study of phagocytosis, in which the functions of the white blood corpuscles were by direct experiment discovered to be the ingestion and destruction of micro-organisms attempting to invade the body, opened up a field in which the popular medical

opinion was that the one and only rôle of the white blood corpuscles was to kill and eat bacilli and generally rush to the frontier of invasion and sacrifice himself in the noble defence of his country.

It is the function of a soldier to fight, but that soldier must also live, and if owing to deficiency of commissariat or indiscipline from any cause, it is not unknown that the soldiers composing the army of a country may turn on those they are supposed to protect, and do as much harm as could be possible at the hands of the most merciless enemy.

The functions of a fireman, if he cannot extinguish a conflagration, is to blow up and remove buildings and other material which tend to feed the fire and lead to its extension further afield. One of the functions of the white blood corpuscle, aided by the blood serum, is to cause solution and liquefaction of tissues which are invaded by organisms, and so we have the formation of what is popularly known as an abscess or slough of tissue. The separation of a diseased or dead part of the human body is therefore one of the functions of a white blood corpuscle. There may be other yet undiscovered properties possessed by these organisms. Time and again have I heard lecturers and teachers, who were admittedly learned experts in the pathology of cancer, assert generally and broadly that the grouping of leucocytes round and in a cancer was wholly and solely a provision of nature for the protection of the individual from the results of his own disease. It never occurred to some of them that perhaps these leucocytes may

be doing something else than that which they fondly imagined.

So strongly is this generalization of function held and believed, that one can well understand the revulsion of feeling manifested towards anyone who would dare to modify or deny such a universal dogma.

More especially is this the case if the person endeavouring to establish the modified view of the rôle of leucocytes in cancer did not happen to be specially appointed by the older accepted authorities, whose previous attitude was helpless inefficiency in the face of advanced and advancing disease.

Examination of microscopic specimens of a cancer reveals different conditions at different parts of the same tumour. As mentioned before, one observes fibrosis, mononucleated cancer cells, and polymorphonuclear leucocytes in the older portions of the cancer, and also every sign of quiescence and abandonment of the cancerous growth by the cells. On the other hand, examination of the "growing point" of the cancer reveals a multitude of large mononuclear lymphocytes in and about the parts of the body which the cancer was commencing to invade. The naked eye appearance of the tumour shows no marked differentiation as between healthy and inflamed tissues. There was no naked eye appearance which would lead one to expect true inflammatory curative reaction in the growing line of a cancer, such as appears round an abscess or tubercular nodule. Examination under the microscope, however, constantly revealed in every case

the following phenomenon: If the strict line of invading cancer cells and tissue about to be invaded be carefully examined, the following will always be noticed : the tissues in the immediate track of the invading column of cancer cells will be found to be cut up and segmented in all directions and to be invaded by mononuclear corpuscles ; the connective tissue fibrils are broken and fragmentary, and the connective tissue corpuscles are swollen and fragmented, and some of their nuclei show included lymphocytic cells.

If now white blood corpuscles were so diligently employed in protecting the body, why do we not see a broad band of polymorphonuclear leucocytes manufacturing a dense limiting fibrous capsule such as we are accustomed to observe in a healing ulcer or scar? Sir Almroth Wright has shown that the liquefaction of tissue by white blood corpuscles goes on in the presence of blood serum most easily.

It is more than likely that the solution of continuity of the connective tissue round the cancer is slowly produced by the same process, and thus the cancer cells are free to advance and complete the picture.

Examination of the advancing column of cancer cells reveals another extraordinary phenomenon :— after the first few rows of cancer cells (which are as a rule multi-nucleated and show signs of exceeding great developmental energy and proliferation) no leucocytes are discoverable. First we notice in the column, a line of cancer cells with appearances in their nuclei of what looks suspiciously like conjugation with the nucleus of a large mononuclear

lymphocyte and then, further back, changes quite compatible with all the lymphocytes having been used up in this pernicious process, until at about ten rows back in the column no lymphocyte can be seen at all.

If now these leucocytes were engaged in defending the body from invasion they are singularly inept in their function.

The next question which arises from observation of many similar specimens :—Is the growth of the cancer cells due to the fact that they use up the leucocytes and so clear the way for unmolested invasion? Do the cancer cells secrete some digestive material, which liquefies the tissues and paralyses the white blood corpuscles and so lead to their easy defeat and consumption as food for the cancer cells, as some think? I think that the answer is very doubtful, and for the following reason : If the growth of a cancer were due purely to the failure in resistance of the white blood corpuscles to invasion of the tissues, and also to the fact that the cancer cells are able to secrete a digestive or disintegrating fluid analogous in its action to that of pepsin or trypsin, then all cancers should necessarily have a much more swift and rapid growing line than is the case in many instances.

Cancer is very swift to invade the body through the lymph channels, and will jump a long distance through lymphatic channels to glands without invading the intervening tissues. Nevertheless, any surgeon who is in the habit of operating on cancers must be compelled to admit that the rate

of growth of a primary nodule of cancer is not so swift as might be expected from a tumour having the power of paralysis and digestion of corpuscles and tissues alike.

Rather does the pace of growth correspond with the number and rate, which is compatible with the theory that the cancer grows in direct ratio and with that speed which is possible from the number of mononuclear corpuscles which are available for conjugation with the invading epithelial cells. If one bears in mind that primarily a cancer cell must be either an epiblastic or a hypoblastic cell, in the majority of cases with only a definite function of secretion and not one of phagocytosis, where then comes this wonderful power of suddenly assuming mesoblastic attributes and all the properties usually attributable to the mesoblastic cells except from the white blood corpuscle of that unfixed polarity which we see in the cancer cell and the leucocyte alike?

If epithelial cells naturally possessed the power which has hitherto been attributable to cancer cells, without obtaining some alteration in their functions by conjugation with some other cell, how is it that normal epithelial cells if injected subcutaneously do not give rise to cancer? If loss of nervous control were the only factor, then skin grafts, injected epithelial cells, and any part of the body cut off from nervous control by accident or design would give rise in every case, without exception, to cancerous growth.

In tuberculosis we are accustomed to observe around the tubercular nodule, composed as they

are of "giant-cell systems," several rows of round cells commonly known as "epithelioid" cells. These epithelioid cells are the undoubted result of the reaction of the surrounding tissue with lymphoid cells; they have a strange resemblance to certain cells seen in cancer, and show many of the phenomena attributed solely to cancer cells.

No one has ever yet attributed to the epithelioid cell of a tubercular nodule the power of digesting the tissues in which they lie; rather, indeed, is the reverse the case, as they are the first attempt at the fibrous isolation of the nodule of tubercle, and themselves undergo destruction and liquefaction during the course of the disease.

It is outside these epithelioid cells of the tubercle nodule that the polymorphonuclear leucocyte lays down the dense fibroid capsule which serves to restrict and isolate the caseating material composed of dead giant and epithelioid cells of the tubercular focus.

If the epithelioid cells of a tubercular nodule are derived from mesoblastic tissue whose power of growth is not nearly comparable to that of normal epithelial cells on surfaces of the body, it need not appear extraordinary if the cancer cells which result from the action of certain leucocytes on epithelial cells have powers and rate of growth peculiar to both their progenitors.

Normal epithelial cells do not exhibit phagocytic properties, at any rate towards their fellows cells in the same organs, whatever may be their conduct towards bacilli which may gain entrance to them by accident or ingestion.

On the other hand, phagocytic properties are essentially those of the leucocyte or white blood corpuscle. The question can now be pertinently asked : If, as some experts in cancer hold, that the cancer cell exhibits properties whereby it is able to destroy, by digestion or ingestion, mesoblastic cells among which it is growing—where, and by what means, did it obtain this property of cell destruction? Is the answer not that it has derived its malignant property of tissue destruction, or rather tissue substitution, from one of its ancestors which is one of the forms of leucocyte? We know, however, that in many cases the natural hypoblastic cell possesses the power of secreting a digestive fluid, as, for instance, the cells of the stomach, intestine, pancreas, and salivary glands.

Epiblastic epithelial cells do not as a rule possess the quality of secreting digestive fluids.

If now, as some cancer experts assert, that all cancer cells have the power of digesting and disintegrating the tissues which they invade, where did the epiblastic epithelial cell obtain this property, because, if consistency is a desideratum, the digestive theory of all cancer cells must obtain confirmation from the fact that every kind of normal epithelial cell from which a cancer cell is derived must originally have the property of secreting a digestive fluid under natural conditions?

A child of a black woman and a white man shows peculiarities common to both parents as regards colour and features. If a cancer cell has a hypoblastic parent, we can understand that it may have digestive properties. On the other hand, if a

cancer cell has an epiblastic parent, how is it that it is also asserted to possess digestive properties, when, as we know, no epiblastic cell has been endowed by the Creator with the property of secreting digestive fluid, that is, so far as we know?

The theory, then, that a cancer cell necessarily possesses the power of breaking down and disintegrating the tissues amongst which it grows, is apparently not altogether supported by logical examination, though such logical examination tends to confirm and establish the contention that the white blood corpuscle is one of the progenitors of a cancer cell, whether epiblastic or hypoblastic.

We know that the cancer cell, whether of epiblastic or hypoblastic origin, possesses the power of free growth in any direction (heterogenous polarity) and the ability to exist and multiply in the midst of mesoblastic tissue.

We know that all cancer cells can do this. We also know that the white blood corpuscle possesses this power, and is also a cell of mesoblastic origin. We also know that the white blood corpuscle, in the presence of blood serum, has the power of liquefying and disintegrating tissues, among which under certain conditions it habitually and naturally exists without damaging them. It is, as we know, also phagocytic as regards every form of organism and cell, including its own fellows. If now all cancer cells possess a disintegrating power, then the weight of evidence points distinctly towards a white blood corpuscle as a likely progenitor by conjugation, and so, for some reason at present not clearly understood, gives rise to what we know as a freely growing

cancer cell, showing many of the traits of a white blood corpuscle from which it more than likely sprung by conjugation with a normal epithelial cell.

If, as many authorities assert, the white blood corpuscle discoverable in, about, and around a cancerous tumour, is wholly and entirely engaged in the suppression of the cancer cell and the defence of the body in a manner analogous to their action in bacillary infections and inflammations, then we should expect that in every single case of cancer the number of white blood corpuscles in the blood should show a regular, increased, and increasing ratio in all forms of cancer.

This, however, is certainly not the case, because although in cancers of some of the internal organs, liver and kidneys, we may find an increase of white blood corpuscles from thirty thousand to forty thousand per c.mm. On the other hand, we find that in some cases of skin cancer there is absolutely no increase whatsoever in the number of white blood corpuscles in comparison with those present per c.mm. in the blood of a healthy person.

We now see that if the rôle of the corpuscle is to defend against cancer invasion alone, the resources of defence are singularly lacking in the case of some cancers, which are strangely enough the least rapid in growth. On the other hand, when a cancer becomes ulcerated or infected by micro-organisms (in just the same manner as any other tissue), we at once observe a rise in the total number of white blood corpuscles, showing that probably in the case of cancer of the liver and kidneys a natural liability to bacilliary infection

from the alimentary canal in the early stages may account for the increase of white blood corpuscles when they are the seat of cancer. Hyper-leucocytosis is therefore more the result of actually protecting the cancer itself, when ulcerated and infected, from the action of micro-organisms than actually a protection of the mesoblastic tissues from cancerous invasion.

It is therefore feasible to suspect that some of the qualities possessed by cancer cells are derived from a progenitor, and that that progenitor is a white blood corpuscle, and, although at one time observation inclined me to fasten the paternity on the polymorphonuclear leucocyte, further careful research disposed me to lean heavily towards the accusation of the mononuclear white blood corpuscle.

To summarize. Taking into consideration the qualities which we know to be possessed by cancer cells to travel in and invade tissues habitually inhabited by the white blood corpuscle, and also the exhibition of qualities possessed by the white blood corpuscle, the evidence in favour of a cancer being the possible outcome of some hitherto unrecognized deficiency in local nutrition, which the white blood corpuscle is either endeavouring to remedy, or is taking a mean advantage of, or possibly whilst endeavouring to remedy, inherently and unwittingly at the same time imparts to epithelial cells qualities which we recognize as constituting malignancy, appears to be quite justifiable if the weight of evidence counts for anything.

Microscopically—as we have seen in the beginning

of this chapter—the existing conditions observed, point more strongly in support of the above contentions that white blood corpuscles are as much engaged in the purely cancerous process as in the prevention of it.

As regards the action of white blood corpuscles when a cancer becomes ulcerated or infected by micro-organisms from outside, nothing more can be said for the rôle of the white blood corpuscle than that it is endeavouring to deal with infection purely and simply, but is probably at the same time, by reason of their enormous increase in the locality, also engaged in unwittingly expediting the cancerous increase, and so hastening death.

When we speak of an entire cancerous tumour being cast out by necrosis and sloughing, we are compelled to attribute that happy event to the disintegration and breaking down of the natural tissues around and beyond the tumour. This last result never occurs, however, unless a cancer is ulcerated or has become infected by micro-organism.

If we admit that this sloughing away of a cancer, which occasionally occurs, is the work of white blood corpuscles aided by the blood serum, and that the rôle of white blood corpuscles is entirely to defend the body during cancerous invasion, why then do they not invariably proceed to dislodge the cancer *en masse* in every case without waiting for the occurrence of outside infection at any stage of the disease, and thus rid the sufferer of his trouble and need of the surgeon's knife, which, as we know, is only a reliable and successful aid in very special and suitable cases ?

Alas, the very reverse is the case, as the most enthusiastic advocate of operative surgery applied to cancer will admit, for the more advanced becomes the disease the more swiftly does it progress, and the more completely are the resources of nature exhausted which have hitherto been supposed to be the means of protection, if they ever have been so, which I now make bold to assert is more than doubtful.

Chapter V.

THE POSSIBLE RÔLE OF THE RED BLOOD CORPUSCLE.

No study of the cancerous process should omit to consider the red blood corpuscle, because no cancer is ever outside tissues in which the red blood corpuscle is not always found.

Malignant disease of epiblast, hypoblast, and mesoblast, comprising as it does new growths of every form of cell in the body which is capable of heterogenous polarity, is always intimately concerned, from a nutritional standpoint with the blood, and therefore it is necessary to consider red blood corpuscles as well as leucocytes.

At the annual meeting of the British Medical Association, held at Portsmouth in the year 1899, I contributed a short paper on the histology of red blood corpuscles to the Anatomical Section.

After experiments with red blood corpuscles by means of formalin in varying strengths of solution, and comparing them with the results of others, I claimed to show that red blood corpuscles were indisputably possessed of an envelope, and that their contents were divisible into *two* parts, a central and a peripheral, and that under formalin experi-

mentation the central part, although not solid, was somewhat more fluid and did not set as firmly as the peripheral portion.

I claimed to show also that, owing to the fluidity of the peripheral portion under normal conditions, that gravity played a great part in the appearance of a corpuscle under the microscope when it was seen as a so-called dumb-bell.

I showed also that red blood corpuscles habitually opened along their free edge, and that their contents were there extruded, and that possibly normal and abnormal contents gained access by the same route. I have reason to believe that every red blood corpuscle has a minute opening or micropyle somewhere along its free edge, this micropyle apparently coming into view under favourable circumstances if methylene blue and formalin were carefully manipulated.

A brief description of this paper will be found in the *Lancet*, page 530, August 19, 1899.

My object in mentioning the above is to draw attention to the possibility that if a red blood corpuscle possesses the power, as I know it to do, of extruding part of its contents at a certain point along its free margin, it also possesses the power of taking up a continual supply of nutriment from the blood stream by the same route.

Careful examination of the blood in advanced cases of cancer, and indeed in comparatively early cases, show us that although red blood corpuscles in conditions of health are not commonly supposed to possess nuclei, yet in cases of malignant disease, and especially in advanced cases showing profound

anæmia and exhaustion, many red corpuscles circulating in the blood are found to possess nuclei.

The form of nucleated red blood corpuscle that can then be found in the blood is that which is described as a normoblast.

This fact is very important, and, as I hope to show, proves the importance of a contention which I will advance at a later part of this treatise, namely, that some therapeutic agent for the cure of cancer is quite feasible.

Da Costa, in his work on Clinical Hæmatology, page 387, says : "It may be stated as an accepted fact that nucleated red blood corpuscles (erythrocytes) occurred in cancer more frequently than in any other variety of secondary anæmia, except that accompanying sarcoma" (which after all is only a cancerous form of mesoblastic tumour).

As for the assertion of some, that by microscopic examination of the blood they can observe a granular change or segmentation of a red blood corpuscle in cancer; and which is indicative of, and peculiar to cancer; no such property has been observed by me after most careful search of many specimens from many cases.

Any such change I regard as artificially produced by the methods of the observers who make the assertion. Nucleation of the red blood corpuscles, however, I have repeatedly noticed in nearly every advanced case, and no one will now attempt to deny its existence.

What are we to gather from the fact that in cancer are to be found some red blood corpuscles with nuclei? It is that there is an urgent need

for a large influx of corpuscles which are being destroyed and used up at an enormous rate; and I hope to show that certain of the contents present in preponderating proportion in a red blood corpuscle have an interesting connection with the problem of cancer—*e.g.*, compounds of phosphorus such as lecithin, and salts of potassium.

Red blood corpuscles as the carriers of hæmoglobin, the colouring matter of the blood, are composed of proteids, water, fat (lecithin), and salts, *but contain no nucleo-albumins*, which property differentiates them from other cells of the body. This latter peculiarity of red blood corpuscles seems to be compensated for by the presence of lecithin, which breaks up into glycerin-phosphoric acid and cholin on the addition of water. Nuclein and nucleo-albumin possess a considerable proportion of phosphorus, just as does lecithin.

In red blood corpuscles, which normally possess no nuclei, it is possible that the presence of lecithin is nature's method of providing the necessary phosphorus compound which nature requires every living cell to possess.

The nucleated red blood corpuscle of advanced cancer, on the other hand, will be found to contain nucleins and nucleo-albumins, clearly indicating the exhaustion of lecithin, and the general deficiency of potassium salts.

Here, then, in cancer we have a decided morphological and probably profound chemical change in red blood corpuscles.

Red blood corpuscles, as we know, are derived in the embryo from certain mesoblastic cells of the

vascular area of the ovum, and for the most part in the adult from large nucleated cells in red bone marrow and possibly from other sources: for example, the thymus gland of infants and adolescents. Schäfer has also asserted that in the rat and mouse, red blood corpuscles arise from cells of the connective tissues.

If now, as I have shown, the red blood corpuscle can discharge its contents through an aperture on the free edge of its envelope, it is quite possible that this is the reason why normal red blood corpuscles are said not to contain a nucleus. In other words, the nucleus has been extruded, and its nucleins and nucleo-albumins have become replaced by lecithin, which it is alleged also gives the corpuscle its power to carry carbonic acid gas in the blood.

In conditions of anæmia consequent on cancer, certain red blood corpuscles have failed to lose their evidences of a nucleus, and we are therefore compelled to associate with the presence of a nucleus the properties of cells which commonly contain nuclei—some more easily produced phosphorus compound, such as nuclien.

Observation of cancer cells in the growing line of a cancer leads me to suspect that many so-called "micro-nuclei" of cancer cells are the extruded nuclei of normoblasts, two, three, and four of which (staining very badly) can often be seen in some cancer cells. It would not be extraordinary if some symbiological connection existed between the nuclei of cancer cells and the nuclei of the nucleated red blood corpuscles.

To summarize. In many cases of cancer, particularly in advanced cases, we find a structural and chemical change in red blood corpuscles, if suitably stained. I deduce from the foregoing, not that cancer owes its origin as is thought by some to a diseased condition of the blood, but to a deficiency of some influence or material arising in the body which calls for a tremendous effort and strain on the natural functions of the blood corpuscles both white and red. This deficiency may be an increasing lack of phosphorus compounds such as lecithin or its constituent elements, or the exhaustion of other phosphorus compounds such as nucleins and potassium salts of phosphorus.

Because one form of leucocyte, whilst endeavouring to correct some influence or deficiency in an epithelial cell, should at the same time confer on that epithelial cell properties of irregular growth and devastating conduct, it may follow that, owing to a lack of the same influence (to be hereinafter discussed), other forms of white blood corpuscles are unequal at the same time to the strain of remedying conditions which they are normally able to do, and the weight of evidence points to a destructive demand on the red blood corpuscles and their elements to supply that element or influence.

For instance, in every case of cancer the destruction or absorption of red blood corpuscles is greater than their production. Normally, in conditions of health, the average of red blood corpuscles in the blood are about five million per cubic millimetre. Examination of many cases of cancer shows the average to be about three million five

hundred thousand per c.mm., and cases have been known in which the number per c.mm. has fallen below one million five hundred thousand, if all circumstances governing their ratio to the fluids of the blood be carefully considered.

Further, not only do the red blood corpuscles suffer in number, but they also suffer in quality, for the average percentage of the natural pigment is as a rule forty per cent. below the normal, and may be as low as half the normal. So that we see that not only the numbers of the red blood corpuscles are decreased by as much as twenty-five per cent., but that the hæmoglobin has also decreased by forty per cent., and also that some of the red blood corpuscles show marked and striking structural change:—nucleation, with presence of nucleo-albumins. According to the foregoing, we can now also deduce that the red blood corpuscle is equally deficient in its other elements such as lecithin and nuclein, and more particularly its vital inorganic salt potassium, which normally comprises six parts of the eight parts assigned as the mineral constituents of the ash of coloured corpuscles.

How vitally important potassium salts is to the red blood corpuscle is shown by the following: One thousand parts of red blood corpuscles are found to contain six hundred and eighty-eight parts of water, three hundred and three parts of organic solids, and minerals eight parts. Of these eight parts three and one half are potassium chloride, two and a half are potassium phosphate, and decimal one potassium sulphate, the remaining 1·9 parts is divided between the iron, sodium, calcium, and

magnesium comprising the rest of the ash of the red blood corpuscles. More than three quarters then of the total mineral ash of the red blood corpuscle is composed of potassium. This fact is an important one, and the reader is earnestly requested to bear it in mind.

How important potassium is to the red blood corpuscle, and indeed to all the tissues of the body, and especially the organs of nutrition and secretion, has only to be realized in order to appreciate its vital significance: this in spite of so-called experts and therapeutic authorities notwithstanding.

Years of experience of anæmia in girls, particularly that form of anæmia characterized by deficiency in hæmoglobin and known as chlorosis, have shown me that the administration of a potassium salt is as vital in rapidly curing the condition as the time-honoured and popular iron. Red blood corpuscles take up iron more readily and far more rapidly if the patients be given potassium and phosphorus at the same time. Not only is this the case, but the quantity of iron required to be administered is a mere tithe of that which must be used if no potassium is exhibited at the same time.

The value in cancer research then of observations on all the blood corpuscles, red and white, and the significance of their nature and changes, particularly such chemical changes as can be shown to have connection with other factors likely to affect the cancer problem, is one which cannot be lightly put aside.

Chapter VI.

POINTS OF INTEREST WHICH MAY BEAR ON CANCER CAUSATION.

In Chapter II. I discussed what is known as cell polarity. There, and in Chapter III. I showed that a cancer cell has an absolutely unfixed polarity while it remains a malignant cancer cell, but that there are conditions which tend to prove that a cell may cease to be malignant, even though it may be one of the cells which is seen in a cancer.

A cancer cell need not always retain its cancer qualities, that is, its power to grow and invade tissues not usually occupied by it; to grow without reference to the welfare and needs of the body, to maintain that growth at the expense of the body, even when and particularly after the condition of the body is such that its continued growth and spread by continuity and conduction will be certainly fatal.

Briefly put, cancer can be defined as follows: "A cancer is a tumour occurring in the body, which grows and is propagated without reference to the needs of the body, and at its expense; and continues to grow in spite of the fact that its growth has weakened, is weakening, and will cause the ultimate dissolution of the organism."

Cancer may be composed to all intents and
C poses of mixed epiblastic and hypoblastic
purp ments, together with certain mesoblastic
elem lateral growth. This form of tumour comes
colla er the heading of epithelial new growth or
unde cinoma. An allied form, composed of various
carci difications of mesoblastic tissue, is known as a
modi lignant connective tissue tumour or sarcoma.
mali pularly, these two headings are comprised under
Pope term "cancer," and, as quoted in Chapter II., Sir
the nathan Hutchinson regards carcinoma and
Jona coma "as identical manifestations in different
sarc sues."
tissu It may however, turn out on further investiga-
In that, although the processes in either form
tion cancer are identical, and are started and
of ntained by identical or allied agents, still the
mai disposing cause might be different though allied
pred function; for instance, carcinoma may arise as
in fe result of a deficiency of one influence in the
the dy belonging to a certain group of influences, and
body which the deficiency of another member of that
of oup may give rise to the conditions which would
grou tiate the commencement of the sarcoma.
initi If, as I believe, malignant new growths are due
] a disturbance of the balance of inorganic
to bstances, to wit, salts of various metals normally
subs the body, then it would be quite within the
in unds of possibility that the disturbance of
bou lance of one metal or any of its salts may
balave rise to one form of malignant new growth; and
give at of another metal or one of its salts to another
thatm of malignant new growth.
form

Possibly, combinations and variations of the foregoing may explain malignancy; and its opposite, benign formation. Certain malignant tumours confine themselves with a few exceptions to certain age periods; for instance, the epithelial cancers are malignant new growths for the most part confined to the aged period occurring after reaching adult life right up till old age.

The late Sir Henry Trentham Butlin, in his Bradshaw Lecture of 1905, stated that "the longer a man lived the more and more his liability to epithelial cancer increased." With this I am in total agreement, as I do not agree with those who, on very slender grounds, and mostly on account of ignorance, state that a person can live beyond what they are pleased to call "the cancer period." This error, popular among certain of the medical profession, arises from the fact that fewer and fewer people survive as the decennial age periods advance, and therefore any medical man is far less likely to come across a cancer in a centenarian than he is in a young woman between thirty and forty; centenarians having no comparative numerical reference at the present day as regards numbers, to shingle on the seashore.

The other form of malignant growth, sarcoma or cancer of the mesoblastic tissue, also with exceptions, for the most part confines itself to infancy, childhood, and young adult life, and strangely corresponds with the period when disturbances of nutrition arise as the result of a deficiency in one or other of the earthy salts, calcium or magnesium.

Very interesting problems crop up as the result

of watching the research of others. Apollant, working on the Continent with a form of cancer peculiar to mice, has asserted that if this cancer, known as Jensen's cancer of mice, be transplanted from mouse to mouse for a large number of transplantations or generations, that eventually this cancer, which is supposed to be an epithelioma of the mammary glands of the mouse, loses its epithelial nature, and the cells assume the appearance and properties of sarcoma cells. In other words, the epiblastic tumour cells have slowly and steadily absorbed so many of the properties of mesoblastic tissues that they have now become to all intents and purposes sarcoma cells or cells of a tumour having preponderant mesoblastic qualities.

The question now arises: What were the agents which steadily conferred the genetic mesoblastic qualities on a tumour which originally arose from epiblastic elements? The reply seems to be, that the mesoblastic qualities have been derived from the repeated and continuous action of some mesoblastic cell frequently conjugating with the original epiblastic cell.

This work of Apollant, completed long after my exposition that carcinoma genetically was connected with leucocytes, seems to support my whole contention; if Apollant's conclusions are correct and can be corroborated, which I believe has been since done by other workers. It would appear that the more we examine into the causation of cancer the more sure it looks that leucocytes play an important rôle in its initiation, if not its maintenance.

That leucocytes are unable to cure cancer under the existing conditions in which it arose there can be no doubt. Under altered conditions of the locality affected, such as inflammation naturally or artificially induced, or the access of influences previously lacking, then perhaps the rôle of the leucocytes becomes beneficial. It was in order to discover by reasoning and direct experimentation and research the possible cause, which being known then the possible line of treatment, that my work has been carried on during the last ten years, both in the laboratory and at the bedside.

Cancer research by experimentation on animals has lead to some strange results. It has been found that if the blood of one mouse be injected into another mouse, that it is not possible to implant cells of Jensen's cancer on the mouse already inoculated with the first mouse's blood. This points to one of two things, either that Jensen's cancer, so-called, is not a true cancer, but is the tissue manifestation of a fungus which has not yet been isolated, or that the blood of one mouse conveys to another mouse properties whereby the natural forces resistant to cancer are reinforced. If this latter is the case, then it would appear that arguing from serumtherapeutics or organotherpy that *cannibalism was a natural safeguard against malignant disease ordained by nature and practised by primitive man as a compelling instinct.*

We know that raw food partaken of by the mouth conveys certain qualities to the blood of the consumer, for instance, the raw thyroid gland of a sheep taken by the mouth will favourably

the disease known as *myxœdema* in a hose own thyroid gland is out of gear.

st sight it would appear that a juicy and e steak cut from a robust and healthy an might prove not only a cannibalistic uche, but, like other things in this world, other organs of the body, fulfil more than ction: not only provide a meal but ze against the occurrence of malignant in the cannibalistic gourmet.

ssor Flinders Petrie has stated that among es of primitive man recovered in Egypt he stinct evidence of their previous owners een consumed by their fellow men, in that the bones show evidence of having been cooked, and possess on their softer parts, f human teeth. Professor Petrie explains an ancient Egyptian custom of honouring sed beloved relation or famous person by ng his defunct mortal remains within the l entities of his or her living relations and s.

next parallel of mouse blood injection seems hat the habit which existed at the time of t Crusade, of warriors opening a vein and ingling the blood in their wine cups and y partaking of the vino-sanguineous "cock-"pick-me-up" (as happened at an historical at Constantinople in those days); possessed ustification as a possible protection from nt disease even if it did not afterwards r harmony in the camp of the Crusaders.

writer wishes to point out from his own

observation, and from statements made to him by the late Sir David Palmer Ross, C.M.G., his father, who served the British Government as a hospital surgeon for the space of fifteen years in Jamaica, ten years in Sierra Leone, and ten years in British Guiana, that malignant disease was not formerly prevalent among the negro population of those countries, although the white population and more affluent of the half-coloured population were prone to every form of cancer.

The author was informed that during ten years in Sierra Leone, from 1884 to 1894, that his informant never saw a single case of epithelioma in an African native, and only one case of sarcoma in an Arab of the better class who had migrated from Upper Egypt.

From 1865 to 1884 the statements from the same source were, that the negro in Jamaica at the beginning of this period was very much more free from malignant manifestation than at the end of it. It is known that the American negro is very much the victim at the present time of malignant disease.

Malignant disease in the negro formerly confined itself mostly to manifestations of the sarcomata, latterly they have been developing epithelioma.

The foregoing, taken in conjunction with the possible deductions to be drawn from the instance of the immunity of blood-injected mice, seems to point again to the bearings of cannibalism on immunity to malignant new growth.

The American and West Indian Negro during the times of slavery were drawn from the native population of the West Coast of Africa, particularly

tribes, mostly Fantees, who only in the ...iate past, in the interior, showed cannibalistic ...sities.

...ne were to reason from the above, it would ..., if the further the negro generatively travels ...is cannibalistic ancestors the more he becomes ...to malignant new growth. The American ...being longest away, in point of time, from ...nibalistic ancestors, shows more liability to ...ant disease. The West Indian negro in ...ca and British Guiana shows almost the ...increasing propensity to cancer as the ...can negro; but the native of Sierra Leone, ...e other hand, whose fathers and mothers, ...indeed, even himself, may have partaken ...man flesh, shows in the period, 1884 ...94, a singular absence of malignant disease, ...he exception of the Arab before mentioned. ...e face of it, the case looks quite clear that ...balism and post-prandial blood-brotherhood ... to cancer immunity if the injection of the ... of one mouse into another mouse actually ...ys, *per se*, immunity to implantation of ...n's cancer, if it be a true cancer.

...nfortunately, mice are particularly fond of ... the dead bodies of their friends and relations ...driven to it by hunger; and it is not unknown ...a female mouse has dined sumptuously off ...f her own offspring. Therefore as mice, in ... of their natural propensity to cannibalism, ...ble to spontaneous cancer, we are compelled ...ek for immunity from cancer from other ...es than cannibalism.

Here then appears a serious practical flaw in the train of reasoning, which might have led to the beneficial adoption, as a measure for preventing cancer, of injecting the blood of one person into another. For instance, the blood of a wife might be injected into her husband, who would duly return the compliment, and the fact of a woman having borne children for a particular man might also, *per membranam serotinam*, confer upon her "cancer immunity" *via* the fœtus; but, alas for reasoning by analogy, such is not the case, as the "mother of a quiverfull" is as liable to cancer as the childless female celibate or the unproductive male creature.

We must then search elsewhere for an explanation of the graduated liability of the American and West Indian negro to malignant disease, and the relative freedom, until latterly, of the African negro from the same disease. Of this more anon.

The injection of blood from one mouse to another may convey immunity by the destruction of the injected blood, by what we understand as hæmolytic power existing in one individual against the corpuscles of the blood of another individual even of the same genus and species. The destroyed blood might convey just those qualities needed, which for a time will confer increased resistance to implantation of Jensen's cancer—*e.g.*, potassium and phosphorus compounds such as lecithin or nucleins.

This latter is important, as it tends to prove that some influence governing liability to malignant new growth (supposing Jensen's cancer to be a true

cancer) exists in the blood and can be conveyed from one individual to another in blood, or causes the blood of the mouse injected to take up and reinforce itself naturally with some already existing and available influence governing cancer formation and cancer resistance and reparation.

When experiments with Jensen's cancer were first undertaken it was asserted that only *thirty* or *forty per cent.* of the mice inoculated acquired the disease, but latterly it has been shown that quite *ninety* per cent. of inoculations are successful. When it is borne in mind that mice are being particularly bred for the purpose of experimental inoculation, all of them under the same conditions of vital surroundings, it will not be surprising if their food was consistently deficient in important constituents, hence the increasing percentages of success in implantation inoculation.

It must be borne in mind that these mice are bred and fed and housed under artificial conditions

Chapter VII.

POTASSIUM SALTS IN RELATION TO CERTAIN FUNCTIONS OF THE BODY.

We now begin here to deal with the hypothesis that cancer is the result of the disturbance of the potassium balance in the human body, and the reader is referred to Chapter V. in order to emphasize the importance of potassium salts to the welfare of the red blood corpuscle.

In Chapter IV. the rôle of the white blood corpuscle was gone into, and it only now remains to say that the white blood corpuscle as a nucleated cell will also be concerned in the position occupied by potassium salts in relation to its nucleins and nucleo-albumins, and lecithin.

Every cell of the body is more or less a possessor of potassium as the salt of its existence, and every cell of the body, though under a central government and a common source of nutriment, is nevertheless a comparatively independent entity.

If a dried, corneated, and cast-off cell of the skin be examined it will be found that such a cell shows a deposition of potassium salts immediately round about and in the shrunken nucleus, and has also a small quantity of potassium inside the cell-wall at its periphery.

The old physiological adage, "Potassium is the salt of the tissues and sodium the salt of the fluids of the body," still holds good as an absolute physiological truth.

The above thesis does not interfere with the fact that some potassium is found in transit in the fluids of the body, and some sodium also present in transit in the tissues, but nevertheless the main axiom holds good.

Blood corpuscles are cells, and as such rank as tissue-cells, just as much as bone or muscle, or brain or liver cells, and any other cell of the body.

All the foregoing must be borne in mind as being important for the comprehension of what is to follow.

Animal physiology teaches us that the whole range of the animal creation, from an amœba to man, follows the same law, "Potassium is the salt of the tissue cell."

Examination of the botanical world brings us face to face with the same identical statement: "Potassium is the salt of the chemical physiology of the vegetable cell."

Here then we see that throughout the whole living universe potassium, as a mineral constituent of animal or vegetable protoplasm and nuclear life, is universal.

The term "potash" is an abbreviation of "pot-ashes," given originally to the result of incinerating twigs and leaves of trees, grass, and other vegetation in a vessel or pot, and the ashes extracted by water, which was then known as "potash lye." Evaporation and purification then

furnished carbonate of potassium, hence the name potash or potassium.

Potassium can be made in the same manner from the incineration of any animal tissue, including blood corpuscles.

Throughout the whole of the life of a tree or an animal, a constant supply of potassium is necessary, and any interference with the quantity or quality of that supply has certain definite results.

Let us review briefly the question of potassium and vegetation.

Trees and vegetation, growing in the wild state in the forests as nature intended them, spring up from the ground, throw out their branches and leaves; in time these fall to the ground, decay, and return their salts to Mother Earth, which are then taken up by the roots of the trees and are once more passed into circulation as before.

Various causes, such as wind removing leaves and rain percolating through the soil, lead to loss of potassium in the locality of the earth on which a tree stands and grows.

Let us now examine the domesticated tree: for instance, the apple and pear trees in an orchard. Careful observation of fruit trees, subject to the use of man, growing in an orchard will reveal the following:—

Fruit trees in a cultivated condition are peculiarly liable to the formation of tuberous and tumourous irregular growths of their trunk, branches, and fruit, in a manner very analogous to tumours, benign and malignant, as observed in the human body.

It will be observed that most trees in an orchard will show signs of tumourous growth after a certain number of years.

Their function as fruit trees is to supply mankind with food. Every pear and every apple gathered and carried away from an orchard means impoverishment of the soil of that orchard in potassium salts.

If the leaves of the trees are annually swept up and removed the result is more striking, if grass is allowed to grow in that orchard, and sheep or cattle permitted to consume that grass, or the grass be cut, gathered, and removed for hay, one fact that strikes forcibly is that such an orchard bears the startling evidence of diseased trees, old, tuberous, and gnarled, producing few leaves and little or no fruit, and the fruit produced will show disease and irregular cell growth very analogous to cancer in animals.

If we consider the rain percolating through the soil, and especially if a well for the procuring of water has been sunk in the same orchard, then we can understand that a tree, because it cannot move from the spot in which it was originally planted, will, as the result of the constant removal and washing away of the only available potassium in the earth where it was planted, suffer purely because of potassium exhaustion.

Many researchers in cancer have endeavoured to show that certain insects produce irregular growth in vegetation, and so create confusion by endeavouring to explain human cancer on the same lines.

Long and painstaking examination, by myself, of trees and fruit subjected to the attack of larval insects, convinces me that there is absolutely no connection between malignant disturbance of cell growth and the mechanical disturbance produced in a leaf bud by the deposition of the eggs of an insect or the growth of such a fungus as that on the birch tree or the *plasmodophoria brassicæ* of turnips.

Examination of an apple, the subject of the larva of the codlin moth, does not show any evidence of other vegetable cell disorganization than is usually present if the same apple had been previously injured by a knife or blunt instrument.

In other words, the apple simply shows scar tissue endeavouring to close the aperture from which the larva has emerged.

Examination of the currant gall, of the hard and soft oak gall, merely shows an orderly modification of a naturally existing section of their vegetation system.

Take for instance the large soft apple-gall of the oak tree.

If this spongy, thin-cuticled, apple-like growth be examined it will be found to be attached to the oak tree by the base or stalk of a leaf bud; and if the apple-gall be cut open it will be at once observed to consist of ribs radiating from a common point, the attachment point of the gall.

Each radiating rib will be found to end in a little cup, in which will be found a larval maggot.

Between each rib carrying its maggot-containing cup the soft spongy tissue of the gall is noticed.

Botanical training at once shows this apparent irregularity of growth to be an orderly modification of the natural leaf bud system of an oak twig.

The ribs, by their orderly arrangement, show that they are the petioles of the aborted leaves, and the little cups at their extremities are the modified midrib of the leaf; the soft spongy tissue is now seen to be the coalesced leaf parenchyma (collenchyma) of the leaves, which had undergone a more or less orderly modification as the mechanical results of the deposition of the eggs of an insect in the growing point of a leaf bud.

It is very necessary to understand such arguments, which may be advanced by others in explanation of problems, but which they only tend rather to confuse than elucidate.

If the results of the action of the larva of certain insects on vegetation were comparable to or analogous to cancer in animals, then cancer as we know it microscopically should arise forthwith whenever any animal parasite gains access to the human body.

Trichina spiralis, the itch insect, guinea worm, toomboo fly of West Africa, and the Chigoe of the West Indies should, on gaining access to the human body, immediately give rise to cancerous growth. This, as we know, is not the case. Therefore the changes in vegetation which are alleged to be analogous to human cancer have their exact counterpart in well-known non-cancerous conditions in the human body, and the existence of living parasites and their larvæ in the human body we know from clinical and microscopic experience

has no resemblance whatsoever in their results to cancer.

There are many in the profession who regard cancer as an infectious and infective disease, who base their arguments on the fact that cancer when once begun is difficult to check, that it spreads by continuity, by lymphatics and by blood vessels, that it affects (in the majority of cases) only one point of the human body simultaneously.

The last reason, the fact that cancer affects only one point of the human body and spreads over the body from that point, is explained by those who hold the theory of cancer being the result of a germ, or plasmodium, or spore, or fungus, that the rest of the body becomes immune to a certain extent, just as a tuberculous infection confines itself during the early period of tuberculosis to an initial focus of primary infection, as a gland or an apex of a lung.

Unfortunately, cancer has been known to attack more than one organ of the body of the same person simultaneously. I have seen a case where the breast and the womb were both the seat of primary cancer in the same person, also a case in which both the tongue and the lower bowel were the seat of simultaneous primary cancer. It would appear that, granted a general deficiency of potassium-nuclein compounds as a predisposing factor, it only needed some local irritation or other stimulus to act as the determining factor of cancer.

There are those indeed who claim that there is a distinct connection between the liability to cancer and the liability to tuberculosis in members

of the same family, basing their argument on the fact that some members develop tuberculosis and other members develop cancer, but that both diseases do not attack the same individual simultaneously, and there are many who believe that cancer is the result of a sporular manifestation of the tubercle bacillus irritating the cells and driving them to their irregular growth and destructive conduct.

Careful research does not appear to support the above thesis. The members of the same family who develop cancer are those who differ from their tubercular relations in being somewhat full-blooded, plethoric, and gouty. It is just these latter people who suffer from cancer and who are most benefited by the exhibition of potassium salts generally.

Possibly the same process which tends to produce gout also tends to predispose to cancer.

Any process which tends to upset the nuclear chemistry by disturbing the potassium-nucleo-phosphorus compounds may lead to loss of potassium, and so predispose to cancer. It can be shown that from the nucleins of tissue cells, by reduction and oxidation, uric acid can be derived. If nucleins be treated "adenin" can be obtained; and from "adenin" it is possible to obtain hypoxanthin, which by oxidation can become xanthin, and by still further oxidation give rise to uric acid. The potassium may then make its way out of its albuminoid combination as a phosphate, and so appear in the urine and be lost. The above shows the connection between the production of gout and the loss of potassium.

Potassium possesses peculiar importance as a constituent salt of the cells of the liver. It is known that primary cancer of the liver is exceedingly rare, so much so that doubt is always possible that the cancer has arisen from the cells lining the bile ducts, which are mucoid epithelial cells.

The liver derives a somewhat rich supply of potassium from the food, and from the blood coming from the spleen, where red blood corpuscles have become disintegrated and given up their heavy load of potassium. Some authorities also assert that potassium salts are derived directly from red blood cells by their destruction in the liver, which they regard as the "grave of the red blood corpuscle."

The liver possesses a particular function in the storage and regulation of the sugar economy of the body. It has been shown that the administration of potassium salts, in cases of disturbance of the sugar balance in the body, has been markedly beneficial in favourably regulating the sugar economy.

Oatmeal and roast potatoes are recommended in the treatment of diabetes, particularly because of the potash salts contained in them, and no doubt potassium was the reason for their favourable action.

Anyone suffering from diabetes, if he or she lives long enough, in my experience, is more liable to develop cancer than anyone else.

So often have I seen diabetes accompanying cancer that I am inclined to regard the presence of sugar in the blood and cancer as having a linked

relation, and we have seen that potassium aids the liver in controlling the sugar balance.

It is not therefore extraordinary to expect that the administration of sufficiently large doses of the same salts to cancer cases will have some beneficial effect, and so far as actual experience will justify this seems to be the case up to the present.

Hardly any case of advanced cancer exists without an excess of sugar in the blood and also some evidence of glycosuria, and if, as is known, glycosuria and diabetes are benefited by the administration of potassium, it would appear that the same factor might be beneficial in cancer, which is often accompanied by glycosuria.

The experiment of implanting a piece of cancer into the liver has been done, and it has been found that the implanted piece of cancer in a healthy liver has been destroyed and absorbed.

It was thought that this was due to the presence of a cell-dissolving or cytolytic ferment normally present in the liver.

I do not believe this to be the case, for if so, it would never be possible that the liver could ever become secondarily infected by a cancer existing somewhere else in the human body.

We know that the liver does become secondarily infected, after a cancer has existed for a very long time in the body and has probably exhausted nearly all the available potassium in the body; but this only occurs when the red blood corpuscles, and indeed the liver cells themselves, possess the lowest possible index of available potassium for physiological purposes.

Every cell in the body which is cast off carries away potassium with it, as does every secretion and excretion.

Potassium is the most soluble alkali naturally present in the body, and as such rapidly passes through the tissues and the circulation. It is a constituent of every secretion and fluid discharged from the body; particularly is this the case in the mucus, and in urine where it makes its appearance in combination with the various acid bodies contained therein.

It is therefore necessary that the supply of potassium to living animals must be constant; and that if for any reason this supply of potassium be curtailed or stopped, then disturbances in the physiology of cell nuclei are prone to occur.

In Chapter II. I have shown the connection between the centrosome and the nucleus, and in the first part of this present chapter we have considered the relationship between potassium and the nuclei of cells.

We can now begin to understand why microscopists in cancer research describe changes in nuclear division and multiplication whereby the number of chromatic bodies or chromosomes are fewer in cancer cells than in normal epithelial cells.

These changes are described as "reducing division," or "reducing mitosis," or "heterotype mitosis."

I have myself carefully noted and considered this latter factor, and believe that as potassium is closely allied to the nucleins and nucleo-albumins

and their analogue mucin, that a deficiency of potassium salts in the blood giving rise to a disturbance in nuclear physiology will explain the changes above described.

Potassium, or rather the exhaustion and lack of potassium in the cells of a particular locality, will prevent those cells, when stimulated to growth by white blood corpuscles, from gaining stable maturity.

I believe the quiescent and orderly old age of a normal epithelial cell is due to the presence of potassium salts in proper proportion within that cell.

I believe that if cancer cells could be supplied with a proper quantity of potassium that they would lose their malignancy. In other words, they would cease to be "cellular Peter Pans who won't grow old," and in an orderly and respectable old age cease to be malignant in their conduct and become absorbed by phagocytic leucocytes, because their potassium index would be such that their nature would be altered for the better and they would settle down to a mature death and biological removal.

Potassium, or rather the lack of it locally, will explain why certain localities of the body are more liable to cancer than others; and the continual and repeated presence of potassium salts will also explain the immunity of certain tracks and cells of the body from cancer.

The parts of the body most liable to cancer are as follows:—The lips, the tongue, the tonsils, the larynx, the gullet, the stomach, the pylorus, the

duodenum, the cæcum, the colon, the rectum, the anus, and the female breast and womb. The above list to all intents and purposes exhaust the common localities of carcinoma.

If these parts be reviewed and considered in relation to potassium deficiency, a very little thought will be necessary to prove that they are localities particularly liable to local removal and loss of potassium by their secretion, by their functions, by friction, and by chemical, mechanical, and bacillary irritation.

The whole expanse of the human skin, on the other hand, shows singular immunity from cancer, except it be subjected at any part to prolonged local disturbance, whereby it may be subject to repeated and continued loss of potassium salts by the cells and secretions cast off.

The theory that some original "germinal cells" existed as such in the body, but remain quiescent until disturbed, is too ridiculous to be considered for a moment, because in these days of universal operations and injuries, cancer, as the result of a wound, whereby a quiescent germ cell was goaded to activity, would be very common, and cancer, immediately following a wound, would be a peculiar and ever-present terror for patient and surgeon.

The above is fortunately not the case, and so disposes of the germinal cell inclusion theory as untenable in the face of experience.

Cancer occasionally, however, attacks long-standing ulcers and diseases involving exhaustion of a locality, either by over-growth, or over-secretion, or exfoliation.

Tuberculosis of the skin, when long standing, may develop an epitheliomatous change on the growing line of the epithelial cells.

An old scar, if irritated, may begin cancerous change. The continual loss of potassium can be shown to be a likely result at any of these situations, more especially is this the case in the female breast and womb. Cancer of the breast in a young woman who has been nursing an infant is always more virulent than in a woman who is older and who has never suckled or has not done so for many years, for the reason that the young nursing mother sufiers a heavy and severe loss of potassium with the secretion of milk.

My experience of chronic inflammation of the breast is that sooner or later it will become cancerous: the reason for this being that it leads to local potassium exhaustion. Chronic irritation of the neck of the womb or any other part of the body will lead as we know to cancer, which manifests itself at first by over-growth of epithelial cells, alteration of their polarity, and then we have what is known as malignant disease. The periodical monthly loss of potassium from the womb in women is a factor in the possible local predisposition to cancer which must be seriously considered.

Let us now consider immunity or comparative immunity of certain parts of the body from cancer.

We have seen in Chapter II. that cells of fixed polarity with complicated nervous, nuclear, and centrosomal apparatus are not liable to give rise to malignant new growth, and the reason for

this is that the complexity of their internal structure forces them to maintain a high potassium index, and it is only those cells on the border line between permanent fixity of polarity and absolute unfixity which appear to have the power of some resistance to the cancerous process, which however often overtakes them.

The nervous system, nerves and nerve cells, do not become malignant; and, as we have seen in Chapter II., neither do certain other cells, but there is a very long tract in the body furnished with exactly the cells which are peculiarly liable to malignant change, but which are seldom or never the seat of cancer, and this strange immunity of these cells can at last be explained by the fact that all the cells lining this long tract are subject to and are perhaps the only cells in the body in constant, repeated, and copious contact with potassium salts. The locality referred to is that part of the small intestine from the commencement of the jejunum to the lower end of the ilium. The potassium salts here present are derived from the nuclei of the animal and vegetable cells used as food, and are potassium compounds with nucleins or nucleo-albumins, which pass into the portal system and are carried in bulk direct to the liver cells. This latter perhaps explains why liver cells also are not usually the seat of primary cancer.

It is highly probable that potassium exists in the body, in living chemical relation within the cell, in an allotropic form as an "albuminoid potassium," and that the peculiar relation of

phosphorus and potassium within the cell is maintained by an albuminoid or colloidal link such as with nuclein, nucleo-albumin, or even with lecithin, as in the red blood corpuscle and other cells. Lecithin is decomposible into stearic acid, glycerin-phosphoric acid, and cholin. It is possible that potassium exists as a potassium stearyl-glycero-phosphate with cholin.

It may be that if from any cause potassium should become a crystalline phosphate, it is at once excreted as a foreign body, in much the same manner as any other crystalline compound found in the urine. For the above reasons then the "albuminoid potassium" of vegetation bears a significant importance for animals generally.

The artificial administration to cancer cases of lecithin and its compounds with potassium or of nucleins and their compounds with potassium, appears then to be a rational and proper precaution in treatment.

Chapter VIII.

THE ALKALINE MINERALS OF THE BODY.

Roughly enumerated, the alkaline minerals of the body of importance are—*potassium*, *sodium*, *magnesium*, and *calcium*.

These four alkalies with unimportant additions to their number are also found throughout the vegetable kingdom.

The above group, as far as concerns animal life, and particularly that of man, may be divided as follows :—

Potassium and sodium, whose carbonates and phosphates are freely soluble in water ; and calcium and magnesium, known as earthy salts, whose carbonates and phosphates are nearly insoluble in water. The sulphate of magnesium is soluble in water, but the sulphate of calcium scarcely so.

Hitherto physiologists and experts in therapeutics and materia medica appear to regard the two first alkaline salts of the body more or less as purely chemical agents, and look upon their main function as being solvents, and as neutralizing acids in the body ; and of the earthy salts, as serving by deposition in fibrous tissue to form the main stiffening of bone.

Physicians speak of potassium and sodium as solvents and neutralizers of acids ; and as agents whose only function seems to be, that the Creator intended them to play a certain fixed part in a condition of the body popularly known as "gout" ; and that there their functions ended.

The medical profession have hitherto, to all intents and purposes, overlooked the bio-chemical action of minerals in the body, especially in relation to cell physiology.

As I have stated before in this work it would appear that the Creator placed nothing in the body that had not many complex and allied functions, too often indeed may an organ or substance or mineral in the body possess an unthought of and undiscovered vital relation to life, which mankind in their superlative wisdom had omitted to assign, but which, nevertheless, existed and perhaps does exist.

It is a very strange thing that nature should have assigned to the animal body two alkalies whose carbonates and phosphates were freely soluble in water, and two other alkalies whose carbonates and phosphates were not so soluble in water.

Not only does this chemical contrast exist, but there seems to be a decided biological antagonism which can best be illustrated and readily understood by quotation of the following well-known clinical fact.

If the bicarbonates, or indeed any salt of sodium or potassium such as the citrate, tartrate, or acetate of sodium or potassium, be administered to a human being in fair quantity for any brief but

appreciable period, the following extraordinary phenomenon sooner or later commences to be manifest.

Large quantities of calcium and magnesium salts immediately make their appearance in the urine, thus showing that sodium or potassium when administered to an animal in excess, at once exhibit so strong a contrast in the economy of that animal that immediately a large output of calcium and magnesium is set up.

So strange are the methods and thoughts of the devotees of medicine, that what is universally noted, is not the fact that calcium and magnesium are excreted on the exhibition of sodium and potassium, but the fact that phosphoric acid is excreted, without taking proper note of the metals with which the phosphoric acid is combined.

It is common to hear the following remark:—

"Of course you know the prolonged administration of alkalies such as soda or potassium soon leads to a large excretion of phosphates."

Just as if the fact of the salt of calcium and magnesium being a "phosphate" was all that mattered, and that the fact of the excretion in increased quantity of the minerals calcium and magnesium wasn't really a matter of quite equal interest!

The bio-chemical antagonism between the soluble alkalies and the alkaline earths calcium and magnesium is interesting, as being the possible explanation of the liability of the free potassium-feeding cow to tuberculosis of the breast, due to the cow excreting most of the lime salts taken in

food, and also in the milk which she secretes. The woman, on the other hand, having a tendency to unduly accumulate calcium, does not suffer from tuberculosis of the breast, but gets cancer as the result of potassium deficiency.

It is noteworthy that tuberculosis tends to become less and less acute and virulent the more and more advanced into the "calcium accumulation period" of the latter end of life we progress.

The young of all animals are more liable, and suffer more from tuberculosis than the more mature and more "calcium saturated."

It is well that the reader should bear in mind all of the foregoing subject-matter, as it would appear that a great deal of the problems of malignant growth will turn on the existence of these four minerals in the human body, perhaps the proportions of any of them, or the proportions of any combination, or comparative surplus, or deficiency of any one or any combination *inter omnes*.

It may be that the relationship of sodium and potassium to calcium and magnesium is one of the wards of the key to the secret chamber of the causation of epithelial cancer, and perhaps the relationship of sodium and potassium to either magnesium or calcium, or magnesium and calcium, or of magnesium itself alone in contrast to calcium, and the aggregate proportion of the above minerals present in the body in relation to one another, may turn out to be another ward of the key to the secret chamber of the problem of malignant tumours of the calcifiable tissues, which we know as mesoblastic cancer or sarcoma.

An orderly balance of all four alkalies may be the cause of the regulated and comparatively harmless tumour which we know as a benign new growth, whose only disadvantage is a mechanical or cosmetic one.

Granted any cells out of control, which may be stimulated to growth in the body, by what I believe to be one of the biological functions of a leucocyte under certain conditions, then if the natural balance of the four mineral alkalies present in a healthy body exist we will get a non-cancerous and safe mechanical new growth which does not recur after surgical removal.

It does not require a great stretch of imagination to see that if the hypothesis advanced has any justification, then the subsequent occurrence of an abnormal balance of the aforesaid minerals in the body may lead to some malignant determination in a hitherto benign mesoblastic new growth.

Mankind is compelled to drink water and to partake of various kinds of food for his existence.

Water in its natural condition contains large quantities of calcium and magnesium, according to the strata of the earth over which and through which that water flows.

These two earthy salts are necessary to preserve the viscosity of the blood; because it is well-known that if a population is in the habit of drinking rain water totally free of the earthy salts, various catarrhal affections of the alimentary canal will be prevalent, and much defective bone formation in the young.

Sodium to a somewhat less extent is always

present in water, and potassium also in very small quantities, with the exception that in some water potassium is very much less evident than the other three.

Water which is subject to the presence of leaves and other decaying vegetable matter contains rather more potassium than the same water not so influenced, but passing over or through strata of the earth having no potassium salts in their composition.

From the foregoing it will be seen that consumers of water from birth to death will always obtain calcium, magnesium, and sodium in fair proportion; indeed, as regards magnesium and calcium, a harmful excess is far more probable than a deficiency.

When we consider potassium, however, the possibility of this mineral becoming deficient in quantity in the body during life, or becoming deficient as to relative proportion to the other alkalies and so giving rise to biological disturbances, is not altogether a matter which we can afford to overlook.

In the last chapter we have seen a great many of the relationships of potassium in the body; it will now be interesting to observe certain of the actions of the various alkaline minerals in the body.

Life is started by the male and female pronuclei in utero; and presumably the relative portion of nuclear constituents to the gross quantity and weight of the commencing organism is such that the potassium and other alkaline mineral balance makes for orderly growth.

From the exact time of the initiation of healthy creative developmental energy during intra-uterine life, and right up till the age of twenty-five years, when the junction of the sternal end of the collar-bone with its shaft occurs, and ossification is completed, the period is that of comparative calcium and magnesium balance.

During the aforementioned period, the bones and other tissues connected with calcium and magnesium are undergoing development, so that as we know neither calcium or magnesium tends to accumulate in harmful excess in the body.

After the period of ossification is completed at the age of twenty-five the era of the liability of harmful and excessive deposition in the body of calcium and magnesium salts commences and continues with greater and greater severity (unless checked) until death puts an end to the scene.

During this latter period of life the bones become more and more earthy and brittle and liable to fracture, and the tissues become more and more infiltrated and damaged by calcareous and earthy deposition, and the infiltration leads to many well-known diseases which it will not be necessary to enumerate here.

As regards calcium and magnesium therefore, we can divide the life of a human being into two distinct periods: that below the age of twenty-five and that from twenty-five years until death.

Does consideration and observation offer any explanation by the finding of the existence of some subtle influence existent in the body during the first period and absent during the second?

The answer is "Yes."

We know that the growth of the bones are subject in some subtle manner to the influence of the pituitary gland at the base of the brain, and we know that disease of this body gives rise to "giantism."

We also know that the suprarenal bodies attached to the kidneys, the pituitary gland, and the parathyroid glands, are somewhat similar in structure to one another and have allied functions.

It may be that the functions of these glands are corrective and mutually regulative and complementary of one another, and the weight of evidence is in favour of that view.

There is, however, another gland of the body, the thymus gland, present at the lower part of the neck and the upper part of the chest in infants, children, and adolescents, which disappears completely as a rule by the twenty-fifth year.

The thymus gland is reputed to control the production of red blood corpuscles as its chief function; my opinion, based on direct observation, inclines me to connect the thymus gland very closely with the behaviour of calcium in the body, if not with both calcium and magnesium.

My reasons for the above are as follows:—

The thymus gland flourishes most particularly during the period of ossification in the body, that is during the first period of life, including intra-uterine life.

Calcium and magnesium during this first period of life do not tend to accumulate in the body in any harmful excess.

The next reasons are mainly experimental.

Some years ago I formed the opinion, that the reason why cancer of the epithelial structures was more prevalent after twenty years of age than before that period was because during the first twenty years the infant, child, or adolescent was possessed of a thymus gland in a flourishing condition. It therefore seemed feasible that the prevalence of cancer after twenty years of age was due to the absence of this gland in the body, which by then was usually absorbed and withered away.

On this reasoning I obtained some thymus gland tablets and administered them to some inoperable and hopeless cancer cases, with the fond hope that I might benefit the sufferers. I was appalled at the colossal increase of growth of the cancers which immediately supervened. In from two to three weeks the tumours had quadrupled in size and the condition of the patients was very much worse.

It is needless to state that I have never repeated this treatment, although I regard the experience as very valuable to my present work.

On another occasion I had reason to administer calcium salts in the form of chloride of calcium and lacto-phosphate of calcium to cases of cancer which were deficient in alkaline minerals, such deficiency having been previously brought about by the prolonged and free administration of mineral and other acids.

I was appalled again at the rate of growth of the cancers, which grew in exactly the same way,

and whose constituent elements increased in the same proportion as did those cases to whom I had administered thymus gland.

If reasoning by analogy is ever safe, it cannot be very dangerous here to connect the exuberant growth of cancers under thymus and calcium treatment with the fact that during ossification of the bones of the body the thymus gland is in full and active existence, and that the gland diminishes in size gradually as the period of ossification draws to a close.

During that period we find no harmful or excessive deposition of lime salts occurring in the body.

Both thymus gland and calcium then caused over-growth of cancerous tissue; therefore there appears to be some reason for biologically connecting calcium with the thymus gland.

Have we any other evidence in the body which tends to connect the thymus gland directly or indirectly with the calcium economy of the body?

The reply is "Yes."

In the condition known as "status lymphaticus," characterized by unnatural enlargement of the thymus gland, the tonsils, and all the lymphatic glands of the body of a child, we find disorders of bone formation and ossification existent in certain of these children, and, what is more important, we find that the free administration of calcium salts in combination with potassium, magnesium, and iron, at once tends to remedy the pathological conditions.

Here then we have evidence, pathologically,

clinically, and therapeutically that the thymus gland and the calcium salts of the body during a certain period of life are possibly closely related.

It is necessary to mention with appreciative gratitude the work of Sir Almroth Wright on calcium in its action on lymph, blood serum, blood coagulability, and in serous hæmorrhage generally.

We will now consider *magnesium*; and the question at once arises, Has magnesium any function in the body other than a bone stiffener and antacid?

Reasoning again that nothing in the body placed there by the Creator possesses but one function, we are driven to acknowledge that perhaps magnesium, by the fact that its carbonate and sulphate are more soluble than those of calcium, is after all but the connecting link between potassium and sodium on the one hand and calcium on the other.

Possibly magnesium possesses some subtle control or counteracting influence on the disordered growth of the mesoblastic tissues, as is perhaps the reason for the following:—

During early childhood and young adult life some persons are very subject to a warty or papillomatous growth of the skin, particularly the hands and face.

It is well known that the administration of magnesium salts tends to remove and prevent a continued recurrence of these overgrowths of connective tissue.

Malignant tumours of the mesoblastic tissues, known as the sarcomata, attack mainly during the

first or thymus period of life, that is under twenty-five years of age, and as a person grows older the liability to malignant mesoblastic new growth gives way to an increased liability to epiblastic and hypoblastic cancer.

We know that after twenty-five years of age both magnesium and calcium salts tend to accumulate in the body.

We also know that before twenty-five years of age they are being usefully utilized to stiffen bone.

We see now that the sarcomata are particularly the malignant cancers liable to attack below twenty-five years of age.

We find also that for the most part the sarcomata affect just those tissues which are liable to calcification and ossification in after life; indeed, we often find that sarcomata themselves show a distinct liability to calcareous change.

We know that most sarcomata spring either from bone or structures connected with or attached to bone or liable to bony change. The supposition therefore that malignant growth of the mesoblastic tissues may be due to a want of balance among the four alkaline minerals of the body is not so impossible as would on the face of it appear.

We see that calcium and the thymus gland tends to cause an increase of the mesoblastic or sarcomatous element of the epithelial cancers.

We see that over-growth of the mesoblast of the skin in the form of warts is checked and removed by the administration of magnesium.

Further investigation and research may probably reveal an important biological balance

between calcium and magnesium, and probably account for the disorderly and malignant growth without bone formation in tissues subject to normal bony change under certain conditions.

Sodium, as has before been stated, is essentially the salt of the fluids of the body, and, like calcium and magnesium, is always present in the body, and is obtainable like them from every source of food and drink. It is adjuvant to potassium.

Experts in materia medica, besides attributing properties such as being antacid and solvent of various substances in the body, particularly laud sodium as the alkaline medicine par excellence for medicinal administration in stomach diseases to the wholesale exclusion of potassium.

As no condition or habit of life will lead to the accumulation, excess, or deficiency of so soluble and so universally distributed a mineral as sodium, and as all persons, whether in conditions of health or the subjects of cancerous new growths or other diseases are ever likely to vary as regards their sodium balance owing to its wide prevalence within their body, there is no further necessity to discuss sodium in relation to new growths.

Potassium, on the other hand, calls for serious consideration medicinally, and especially since, latterly, potassium has fallen very much into disfavour with the medical authorities that be, chiefly, I believe, on account of the prevalent view of the mineral alkalies given at the commencement of this chapter. Further, potassium and its compounds has fallen into some disrepute on account of a much belaboured, exaggerated, and over-hackneyed accusation as to

its depressant effects on the heart, and also on account of the peculiar action for the destruction of red blood corpuscles which a certain salt (chlorate of potassium) is stated to possess, so that, with the exception of the iodide of potassium, very little potassium salt indeed is now used except by certain of us who regard potassium, as I have always done, as vitally necessary to the regulation and proper maintenance of the vital functions of the nuclei of the cells of the human body.

The foregoing is important, as it would tend to show that humanity generally is not peculiarly liable to obtain many neutral and assimilable potassium salts at the hands of their medical attendants. The power of potassium in assisting the blood to accumulate iron is undoubted, and one I am prepared to maintain in the face of any expert in the world who may be pleased to assert the contrary.

In the next chapter I will consider the habits of mankind in relation to obtaining and maintaining its supply of potassium from food sources.

Chapter IX.

CERTAIN FUNCTIONS AND HABITS OF LIFE IN RELATION TO CANCER.

During the last fifty years cancer has shown an extraordinary increase per head of population.

The increase amongst males has ranged from about 200 per million fifty years ago to about 800 per million per annum at the present time.

As regards females, cancer seems to have been very much more prevalent amongst women during all periods of recorded time than amongst males. Fifty years ago we find a rough estimate of 500 cases of cancer per million, until at the present time the death-rate is somewhere round 1,000 per million per annum.

The males appear to be rapidly overtaking the females as regards prevalence however, inasmuch as the cancer rate has quadrupled amongst males in the same time that it took to double in females. This is explainable as an increasing deficiency of potassium in the food and drink of men (refined flour, no natural wines, beer made from artificial malt devoid of potassium, prevalence of the consumption of spirits totally devoid of potassium, and de-potashed food generally).

In the aggregate there are between thirty and thirty-five thousand deaths per annum in England

and Wales from cancer, including men and women.

The British people are reputed to be heavy eaters of meat; and many persons have sought to explain the prevalence of cancer by accusing the meat diet of being the prime cause. We should then expect that if a community could be discovered who were mostly addicted to a vegetarian diet that cancer would be practically non-existent amongst them.

Search throughout the disease records of the peoples in the world brings us to the Japanese, whose diet is for the most part a vegetable diet, consisting mostly of rice with a little fish.

Examination of the total recorded deaths from cancer in Japan shows that almost exactly the same number of Japanese die of cancer during the year as die of the same disease in England.

I have the very best authority obtainable for stating that the Japanese Government are taking steps to popularize a meat diet, particularly in their army, as they have found that the Japanese soldier is capable of greater endurance with a meat than with a rice and fish diet. I am, however, under a bond not to give the sources of my information publicity.

The East Indian people, the Chinese, and other Indo-Chinese races suffer as much from cancer in comparison as do the Japanese and British.

The proportions in civilized European countries, such as France, Germany, Austria, Italy, Russia, and other minor countries, are almost the same

comparatively per head per population as has been previously stated for England and Japan.

Superficial examination of the death-rate from cancer between men and women would lead one to surmise that the prevalence of cancer was a sex disease as regards its preponderance in women.

This is only partly true, but it is somewhat more true to assert, in both men and women, that cancer is a matter of the facilities for loss of certain alkaline salts from the body, and is not a disease appertaining purely to sex, because, as we see, both men and women suffer from cancer. Women, unfortunately, possess bodily and physiological reasons for a greater loss of potassium salts than is the case with men.

The more extensive mucous tracts in women and their bodily economy, as arranged to meet the demands of their sex, predisposes them somewhat more to the unbalance of their alkaline mineral index than does the sex demand on man.

Food :—Food is composed of the following substances or elements :—

Proteids, such as meat albumin, milk albumin, egg albumin, albumin from peas and beans, and any other source, animal or vegetable, from which albuminous matter can be obtained for purposes of food.

Nuts contain a peculiar substance known as *aleurone*, which is somewhat akin to an albumin, but does not furnish chemically some of the reactions of the other proteids.

Sugars are the next important dietary elements.

These exist in food as starch, which we chiefly consume in bread, flour, and meals from all cereals, potatoes, peas, and beans, fruits, and particularly in the form of sugar, such as cane and beet sugar, and the sugar present in malt liquors, and also a modified form of sugar generally coming under the head of alcohol, which is used by mankind for various reasons, and is produced by the destructive fermentation of starches and sugars.

Fats and oils, the next important element of diet, are derived from vegetable and animal sources, and are for the most part composed of olein, palmitine, stearine, and other fatty substances, all of which contain glycerine in their composition.

We have seen that glycerine and phosphoric acid are some of the components of lecithin, the fat of red blood corpuscles. The nucleins and nucleo-albumins are in close chemical association with glycerin-phosphoric acid in relation to the nuclei of all animal cells in and around which is always to be found a certain amount of potassium, mainly in the form of chloride, carbonate, and phosphate of potassium.

Salts, the salts contained in food are mainly those which have already been enumerated as being present in ordinary drinking water.

The main salts of food and drink are *potassium*, *sodium*, *calcium*, *magnesium*, *iron*, *sulphur*, *phosphorus*, *iodine*, and other less important mineral substances present in food and water, such as copper, lead, arsenic, etc.

Sulphur is present in the blood, bile, and all tissues of the body, and its sources are always the

same as the four alkaline minerals. The acid radicle of sulphates is electro-negative.

Iron is, of course, one of the most important metals in the body, being the element of the colouring matter of the blood. It is probably present in the "colloid" form during life, and only becomes crystalloid as hæmin and hæmatin, after death or removal from red blood corpuscles.

The reader is reminded of the close association of iron and potassium with phosphorus in the red blood corpuscles, and indeed in nearly all tissues and cells of the body.

Less iron is needed medicinally to cure a case of anæmia, and the illness mends soonest when potassium is administered at the same time as iron. Iron, like potassium, is electro-positive.

Just as the total number of red blood corpuscles and their contained colouring matter falls in an advanced case of cancer, so also does the more preponderant metal of red blood corpuscles (potassium) also fall, showing the importance of the association above described.

Phosphorus is mainly obtained from food, and is seldom or never present in water, except from water obtained from a well near a graveyard, in which case it is derived from the matters given up by the dead bodies interred in the neighbourhood.

Phosphorus as a component-element of all tissue cells needs careful consideration in dealing with cancer problems. We find phosphorus in combination with fatty acids in lecithin as distearyl glycerin-phosphoric acid linked up with cholin in all nerve tissues, and cells. We have seen that thema in

phosphorus compound of red blood corpuscles is lecithin in close association with potassium. The acid radicle of phosphates are electro-negative. Phosphorus occurs as the phosphate of sodium, potassium, calcium, magnesium, iron, etc.

Iodine is present in small quantity so far as we at present know in the thyroid secretions, and is known as *Iodothyrin*, and possibly has a close association with potassium. Iodine is electro-negative, and has a great affinity for potassium, which is an electro-positive metal.

Iodine from the thyroid glands seems to be of some importance in the economy of the body, and seems to have a strange relationship to the causation and maintenance of cancer.

What that relationship actually is can only be surmised from the results of experiments which indicate that relationship.

Thyroid extract has been given to cancer cases with the idea of causing some change in the cancerous tissue; and there is some evidence to show that the artificial administration of thyroid gland does influence cancerous tumours in some degree.

One of the functions of the thyroid gland is to maintain the nutrition of the skin, hair, nails, and the working of brain cells. I will show from actual practice that potassium also does the same.

The thyroid gland of the neck also controls the nutrition of certain mesoblastic tissues, and more particularly appears to preside over the control of mucin formation in the subcutaneous tissues, and over the stature of the body, as well as the formation of pigment in the skin.

If the thyroid gland has so strange a power over epiblastic and mesoblastic nutrition, it is quite likely that it also has an equal though hitherto unrecognized control over the economy of hypoblastic cells.

During the period from birth to twenty-five, or the period of the thymus gland, the calcium and magnesium salts of the body are being usefully utilized in bone formation and other metabolic processes. The thyroid gland, however, is also the subject of disturbances during the period of life after twenty-five years of age, that is, during the period of the surplus accumulation in the body of the earthy salts.

Goitre has long been attributed to the drinking of permanently hard water (water containing an abundance of calcium and magnesium salts) such as naturally exists in some parts of Derbyshire and Switzerland, so much so that in England parenchymatous goitre is known as "Derbyshire neck."

An exceedingly strange coincidence exists between cancer and certain functional derangements of the thyroid gland.

A general or parenchymatous goitre of the thyroid gland is commonly associated with cancer in various parts of the body, though more particularly with cancer of the genital organs in women, especially in cancer of the womb.

The thyroid gland is also itself occasionally the seat of a somewhat virulent form of cancer; therefore there is nothing inherent in the thyroid gland itself which prevents it from taking part in the

cancer process. Cases of cancer of the thyroid gland present many curious side issues. Not only does a cancer of the thyroid gland tend to cause secondary growths elsewhere in the same person, but even when the gland and the primary tumour is removed, leaving only secondary growths behind, there is a marked tendency for the sufferer to show many of the symptoms of Graves disease, such as palpitation of the heart and circulatory disturbance, itching of the skin, pigmentation, wasting of the body, glycosuria, and certain nervous symptoms.

The foregoing clearly tends to prove that even secondary growths of a removed primary malignant thyroid gland themselves possess the power of acting like a deranged but non-cancerous thyroid gland. This goes far to prove that cancer cells still retain some of the functions of the same nature of cell when not cancerous, or that certain cancer cells can cease to be cancer cells and assume comparatively non-cancerous functions, whilst other cells of the same cancerous tumour continue their cancerous career.

Sufferers from secondary thyroid cancer also show febrile symptoms and strange variations in the size of certain groups of lymphatic glands, which will swell up and enlarge and then resolve again without any apparent reason. The breasts of the same class of case will show indurated and nodular masses just like primary cancer of the breast, which will fluctuate in the same way as the glands in the neck, axilla, or groin.

We have seen that the pituitary gland, the parathyroid glands, and the suprarenal bodies are

somewhat allied in function, and that disease of the pituitary glands leads to excessive bone growth or "giantism."

The thyroid gland governs the stature of the body, because when it does not exert some of its functions during infancy little or no growth of the body takes place, and then we have what is known as dwarf-cretinism. On the other hand the thyroid, if apparently uncontrolled by a diseased pituitary gland, will cause over growth or "giantism." Now we know that the structure and functions of the pituitary gland are similar to those of the suprarenal capsules; therefore we may expect that the suprarenal capsules have some control over the thyroid gland, also perhaps over those functions of the thyroid gland which tend to regulate the pigmentary, circulatory, and nervous manifestations. The administration of thyroid gland to a dwarf-cretin at once causes the cretin to resume his hitherto arrested growth.

The parathyroid glands seem to be complements of the thyroid gland in many of its functions, more particularly those functions which govern the nervous system, such as those symptoms which occur in Graves Disease, or Exophthalmic Goitre, and in Myxœdema.

The suprarenal bodies play a great part in the control of the pigment manufacture of the body. Potassium restores to a great extent the pigment of white or grey hair.

Benign growths of the thyroid glands are nearly all confined to the first period of life, *i.e.*, the period in which the calcium and magnesium

salts are being usefully utilized in the body, such as occurs in the period of life before the age of twenty-five or so.

From what has been said, therefore, it would appear that there is something inherent in these organs and their associations which should materially assist in the elucidation of the cancer problem, if what has been said could be utilized in such a manner.

Mucin is a substance derived from the action of the nuclei and protoplasm of certain cells of the body, and we find that mucin is closely allied, and is almost chemically identical, with nucleins and nucleo-albumins.

We find that the administration of potassium salts to a patient causes an increased secretion and greater fluidity of mucin in some cases, and in other cases again a slight diminution of mucin secretion.

Potassium in combination with iodine as potassium iodide has a strange influence on the mucin functions of the body.

Iodine, as iodo-thyrin, exists normally in the body as a product of the thyroid gland.

My professional experience in parenchymatous goitre and in the goitre accompanying cancer leads me to make the following positive assertion:—

The administration of potassium salts (not necessarily iodides) *leads to the correction, diminution, and cessation of some diseases of the thyroid gland.* Therefore it is important to notice that here again we have a strange and subtle physiological antagonism between potassium and the two earthy salts calcium and magnesium.

This action of potassium on the thyroid gland leads me to believe that X-rays and Radium act on cancer by making use of the available potassium already present in the body of a person who is the victim of cancer and on whom X-rays and Radium are used. If a cancer, perhaps of the womb, accompanied by parenchymatous enlargement of the thyroid gland, be treated by exposure to the action of X-rays or Radium, at the same time that large doses of potassium are administered, the enlargement of the thyroid gland at once begins to diminish.

Concerning the above foregoing statement as to the action of X-rays and Radium I will presently have something to say, as I am certain that they "fix" or "actinise" potassium which they find in the blood circulating in the locality and cause the cancer cells to undergo a change in growth and action leading to ageing and quiescence. This will be the possible true explanation of their action on animal tissue and on cancer in general.

We will now return to the action of the four alkaline metals obtainable from food and drink, namely, potassium, sodium, calcium, and magnesium.

Sodium, the metal normally present in the fluids of the body, is present in animal and vegetable food, is constantly obtainable under all circumstances, by persons throughout life from birth until death, and therefore does not call for more than passing reference. As it is not likely that this metal will have any particular relationship to cancer other than perhaps as a coadjutor of its

fellow alkali potassium ; though indeed sodium may be extremely useful as an agent for maintaining the alkaline balance between itself and its congener potassium and the earthy salts.

Calcium as well as *magnesium* is present in all water, however soft, with the exception, of course, of rain water or distilled water. Calcium and magnesium are present in animal food, mainly as the phosphate of calcium and magnesium, so also from vegetable food, which is one of the main sources of calcium phosphate.

The *herbivora* among animals obtain their sodium, calcium, magnesium, and potassium from the vegetation which they eat and the water which they drink.

Most potassium, however, is obtained from vegetable matter.

The *carnivora* obtain their calcium, magnesium, sodium, and potassium from the raw fresh flesh of the herbivora, which they daily kill and consume, and also from water.

The lion and the tiger maintain their supply of potassium as potassium phosphate directly from the flesh of the herbivora which have obtained the salt from the carbonates, etc., present in the vegetation they eat, and also from the phosphates, all of which they store up in their tissue cells.

Here then we see *both the herbivora and the carnivora exist under equal conditions as regards the four alkaline metals of the body.*

Both herbivora and carnivora, however, are subject to the same influences as regards the two life periods referable to man ; in other words, they

have a thymus period and a post-thymus period, *i.e.*, the period when lime and magnesium are usefully utilized, and the period in which they accumulate.

The herbivora, especially the domesticated members of the genus such as oxen, horses, sheep, pigs, etc., are said not to suffer as frequently from malignant new growths as do the carnivora. If both domestic and wild herbivora were permitted by man and the carnivora to live to a ripe old age, there would be no doubt that malignant disease would be more observable in the herbivora than at present is the case. We know that all the herbivora are just as liable to benign new growths as the carnivora or man; and the commencement or germ of the benign new growths certainly are existent in these animals during the thymus period of life, even if they only develop in size during the first part of the post-thymus period.

Potassium in food is obtained from flesh (meat and fish) and mostly vegetable foods; from natural wines, fruits, fruit drinks such as cider, perry, and other fruit wines and beverages; from tea, cocoa, and coffee, and from malt liquors made from malted barley and hops by the direct process. All "refinement" or "special" preparation of food or drink which cause them to depart in the least from that which is natural tends to "de-potash" or "de-kalise" them, and so deprive their consumers of an element of diet, which on the face of it seems to predispose to cancer those so deprived.

Potassium has been dealt with in a special chapter by itself.

The elephant lives many years into the post-thymus period, or period of calcium and magnesium surplus, and therefore is subject to want of balance between the four alkaline metals.

The dog presents a strange contrast, and falsely tends to support the fallacious theory that the carnivora are more subject to cancer than the herbivora.

The reason advanced to account for the fact that the dog is somewhat subject to malignant new growths is the fact that it is said to be a meat-eater; is this so?

That the dog and wolf in the wild states are all meat-eaters cannot be denied; but the domestic dog cannot be described as either a meat-eater or a vegetarian. The dog can be shown to be an animal who obtains a great deal of sodium, calcium, and magnesium, but very little potassium.

The dog is fed upon cooked, chiefly boiled flesh, effete and impoverished flour in the form of biscuit, and some vegetables from which every scrap of potassium has been extracted in the cooking.

No wonder the average dog and cat is frequently seen to go into the garden and imitate the herbivora by eating grass.

The sudden eating of vegetation by a meat-eating animal is, I believe, to be an instinctive demand of the tissues for potassium (lacking for the most part in water), and constantly lacking in food prepared by modern civilized cooking. This was also the probable reason why Nebuchadnezzar went into the fields, ate grass, and lived to an old age.

Dogs have been known to go into the garden

and eat fruit such as strawberries and other accessible vegetable food containing something of which their instincts send them in search. There is possibly no real virtue in the rawness of the vegetables : it is the fact that their potassium is not removed by faulty methods of cooking.

Cats in towns have been seen to climb on the table and eat the leaves of plants and flowers.

In Chapter VIII. the different solubilities of the four alkaline metals were pointed out to be as follows :—

The salts of potassium and sodium are all freely soluble in water, more particularly in boiling water.

On the other hand, the carbonates and phosphates of magnesium and calcium are very, very sparingly soluble, if at all, even in boiling water; the magnesium carbonate being very slightly more soluble than the almost insoluble calcium carbonate and phosphate.

It is noteworthy that whilst the sulphate of magnesium is soluble, the sulphate of calcium is insoluble in comparison.

It can easily be understood now, that if potassium is a very soluble salt, that it will pass through the body with exceedingly great rapidity, which means that the supply needs to be continually kept up, if the balance between the alkaline metals in the tissues is to be maintained.

The danger therefore of the potassium index falling below what is safe is a very constant one.

Further, it can be understood now that if food is continually submitted to processes by which the

potassium salts are liable to solution as by boiling (animal and vegetable food), then it does not require a great mental effort to appreciate the fact that most adults may live a life peculiarly devoid of anything like an adequate supply of potassium salts.

Any housewife could easily make a list of the vegetables which she habitually prepares for human consumption, and which are always cooked as follows :—

They are immersed in water and boiled till they are soft, and just as they are kept for a more or less lengthy period boiling, so they become more and more deprived of potassium, and so consist only of vegetable detritus or rubbish mixed with calcium and magnesium, and are in consequence almost totally devoid of potassium in some instances.

Meats that are subjected to boiling and stewing are in the same way impoverished in potassium salts.

When we consider the rapidity with which potassium leaves flesh and vegetable tissues, and the small quantities which is obtained from water and from cooked vegetables, it can be acknowledged that the amount of potassium obtained from the so-called civilized kitchen is practically negligible. Yet potassium appears to be a salt of vital importance to all living matter.

According to the method prevalent of cooking vegetables, which are one of our main sources of potassium supply; the water in which our vegetable foods are boiled, though as a rule thrown away, would appear to be more useful than the vegetables

which are usually served up as food. For the foregoing reason, vegetable soups and dishes which retain the water in which vegetables are cooked seem the more beneficial.

Boiled beef and all boiled meats would also appear to be less beneficial than roasted meats.

Steamed and roasted vegetables, for the reason that they retain their juices and salts, are incomparably superior to the article boiled in water.

Stews and hashes contain more potassium in their gravies than in the solids.

There is an important article of diet which contains a large quantity of calcium phosphate, but also contains an appreciable proportion of potassium: this is the milk of all animals, human or oxen.

Study of the secretion of milk, and its consumption, is exceedingly interesting from the point of view of cancer problems.

The milk gland of the woman and occasionally of the man, more particularly of women, is exceedingly liable to be the seat of cancer, both carcinoma and sarcoma. The secretion of milk by a woman deprives her body of a large proportion of potassium as well as calcium, and so, conversely, the growing infant and suckling child obtains naturally food replete with potassium salts, which is very noteworthy. The stroma of a carcinoma may, and perhaps does, partake of the nature of sarcomatous tissue in some respects.

The mamma of the herbivorous cow, eating as she does a vegetable diet replete with potassium, is seldom the seat of cancerous disease; but, on

the other hand, the cow suffers a great liability to tuberculosis.

The human female, on the contrary, is very seldom attacked by mammary tuberculosis, but is very frequently the victim of cancer of the mamma.

We have seen the strange antagonism of sodium and potassium against calcium and magnesium, in that the free administration of either sodium or potassium leads to an increased output of calcium and magnesium, real and apparent.

The free access of potassium and sodium to the body of the cow will then keep her calcium and magnesium index somewhat lower than that of the human female, who gets little or no potassium in her food in comparison, and a comparatively excessive addition to her body of the salts of calcium and magnesium. The excess of calcium and magnesium may account for the rarity of tuberculosis in the female human mamma.

Throughout the whole world pathologists have noticed the extraordinary affinity of the epithelioid cells of a tubercle nodule for the deposition of calcareous and earthy matter.

Therefore the contrast between the cow and the woman as regards prevalence of a particular disease of the breast is interesting : the contrast being, of course, that between cancer and tuberculosis. Cancer and tuberculosis are not usually associated in the same victim.

The cow is a free potassium feeder. The woman suffers in civilized life from potassium starvation and calcareous and earthy surplus in her blood.

It is strange now that cancer is more prevalent in the post-thymus period or period of life when the calcium and magnesium salts begin to form a surplus in the blood in comparison to potassium, and thus create an unbalanced alkaline metallic index.

Cancer is more prevalent in gouty persons subject to calcareous and earthy deposition, and the non-gouty person who is more subject to tuberculosis does not as a rule show signs in the body of gouty calcareous depositions and concretions.

Different members of the same family show different proclivities for these two diseases. Tuberculosis is a bacillary disease, essentially a disease of the potassium-feeding cow ; and the other, cancer, a disease of tissue growth and metabolism, which attacks the human female and male who are subject to calcareous and earthy surplus, and who suffer from gout.

Gout is a disease which causes a rapid using up of the small amount of potassium which gains access to the body, and which is needed to carry off by the kidneys and other secretions the deleterious products left by faulty bodily chemistry and by errors in diet.

Meat carries into the body certain matters not present in vegetables, and which are known as *waste product compounds*, which tend to cause more potassium to be removed from the body than would otherwise be necessary. It therefore behoves a meat eater, if he would avoid the ill-effects of too copious a meat diet, to freely partake of suitably cooked vegetable food rich in natural potassium compounds.

CANCER AND HUMAN HABITS.

Let us now review the prevalence of cancer and the habits of human life.

The civilized European cooks his food by the well-known processes of boiling, stewing, and roasting.

He roasts, boils, and stews his meat, and for the most part he boils his vegetables, and so removes nearly all the potassium in the water, which he discards, and consumes the vegetable debris containing mostly calcium and magnesium, but nearly devoid of potassium.

Cancer is said to be particularly prevalent in river valleys and along the banks of rivers, the reason for this being that the population mostly gather in these localities.

I have good reason to believe that cancer is not in any way an hereditary disease.

Certain families are more liable to cancer than other families, however ; but I have noticed that those subject to cancer are all of the same generation : they are usually brothers and sisters, and as such are brought up under the same conditions as regards habits and the cooking of food.

I knew personally a whole family of seven—three brothers and four sisters—all of whom died of cancer. All of them objected strongly to vegetables, all of them preferred boiled meat, they seldom or never partook of fruit, and preferred spirits to malt liquors.

That both husband and wife should die of cancer, one after the other, is not extraordinary ; they live

under the same conditions as regards habits and food cooking.

Certain houses have been described as "*cancer houses*," and it was thought that there was some infection lingering in the house which caused cancer, because different people who had resided there for some length of time usually died of cancer.

The explanation of the whole of the foregoing is as follows :—

Mankind and womankind possess the monkey-like quality of imitativeness. In large human communities, methods of cooking are usually, without exception, identical throughout the whole population concerned.

Many people frequent the same eating houses and restaurants, and many housewives prepare their families' dietary in the same way; the members of the same family learn to cook their food in an identical manner, and continue to do so all their lives. A wife prepares food for herself, her husband, and children in but one way, and so, perhaps innocently, tends to support the false doctrine of heredity of cancer. It is not surprising then that many persons belonging to the same family occasionally die of cancer one after the other.

Persons inhabiting a so-called "cancer house" will be liable to learn and adopt the methods of cooking from others resident in the district in which exists the so-called "cancer house."

There are many so-called "cancer houses" where there are many men and women.

In Chapter VI. I remarked on the peculiar position occupied by negroes in relation to cancer, and discussed cannibalism in one of its bearings on cancer.

The explanation of the negroes' position is I think as follows :—

The savage African negro, resident in the interior of Africa, enjoys his comparative immunity from cancer because his method of preparing his food and drink differs in every essential from the methods practised by the more civilized negro and white man.

The negro of Central Africa is particularly fond of a raw meat diet in which he gets his potassium salt directly from the herbivora.

His method of cooking is somewhat different to the European, and he is particularly fond of roasted roots, yam, and other starch carrying roots.

He also roasts bananas and plantains, and on occasion eats parched or roasted cereals such as maize.

When the savage African negro cooks his food by boiling he usually puts his yams, his bananas, his green plantains, his meat, and cereals into a pot, boils them all together, and consumes the solid and liquid contents to the last atom.

The negro in the wild state is also a free consumer of fruits, one of whose main properties is to supply potassium to the animal body.

The American negro, on the other hand, for a long time after he became a slave, enjoyed the same immunity from malignant disease as does the savage of all countries at the present day.

The same with the negro of the West Indies and the Coast Towns of West Africa and aboriginal races elsewhere.

These latter are rapidly losing their freedom from cancer and becoming the victims of disease, because they are adopting the methods of the more civilized races in the preparation of food, whereby their alkaline index is becoming unbalanced; in other words, they boil out the potassium salts from their food, and discard them in the water.

Let us now consider drink in relation to cancer. The African savage prepares drink from the palm tree sap, known as palm wine, and rich in potassium salts.

He also brews beer by crushing maize, millet, and other cereals, and fermenting them. The Polynesian prepares similar drinks, such as palm wine, kavakava, and beers, all drinks naturally replete with potassium salts.

The civilized man, on the other hand, with the exception of water, and natural beers and stout, has adopted a form of fluid refreshment totally and absolutely devoid of potassium salts—distilled alcoholic spirits containing absolutely no potassium.

Natural fruit wines, and beverages such as cider, perry, meads, lemonade, and fruit drinks generally, as well as yeasted ginger beer, are richer in potassium than the finest whisky or brandy money could buy.

Cancer becomes more and more prevalent as time goes on, and appears to keep pace in direct ratio to "improvements" introduced in the preparation of

articles of food and drink. A short explanation will be interesting as follows:—

Natural wines contain a large percentage of assimilable potassium salts in solution.

Mankind refines and sophisticates his wines by precipitation methods, and so deprives them to a great extent of many of their natural antiscorbutic properties, and suffers in consequence. "Plastering" of wine leads to the removal of the natural tartarate and the substitution of potassium sulphate, which is not an assimilable form of potassium.

He has abandoned the potash-carrying natural wine for the potash-free artificially distilled spirit and water.

Refined sugar contains only one two-hundredth part of the potash present in unrefined sugar.

He has prepared and "refined" the flour and other cereals from which he makes his bread by removal of the more valuable parts of the grain, until bread is as devoid of potassium to almost the same extent as whisky. Refined flour contains only one-fifth of the potassium present in wheat, and decorticated and polished rice contains only one-twelfth of the normal potassium.

Man has adopted for the most part the habit of drinking spirit distilled from the worts of grain, and thereby obtains a carbo-hydrate stimulant totally devoid of potassium, which he adds to the aerated distilled water, and consumes as his sole source of fluid. This appears to account for the more rapid increase of cancer amongst males in comparison than amongst women in the same

periods. It would appear that "potash water" is the only proper, sensible, and correct diluent of whisky, and other spirits generally.

The consumer of malt liquors, on the other hand, is not so liable to be deprived of the potassium salts boiled out of the malt and hops, as the beer drinker consumes the fluid containing the potassium salts; the same is the case with the natural wine drinker. The consumer of tea, cocoa, and coffee is also better off as regards the potassium supply than the "whisky and soda fiend."

The spirit drinker, on the other hand, has a balance on the wrong side of the account in potassium, as he causes an increased output of an already scanty, extremely fleeting, salt from his already none too well supplied tissues. The drinker of beer made from artificial malts is, however, not more fortunate than the spirit drinkers.

The foregoing in my opinion amply serves to explain the increase of cancer during the last half century.

The increase of cancer has kept steady pace with food "refinement," and is going up on account of the prevalence of spirit consumption as opposed to the drinking of the potassium carrying malt liquors and natural wines.

It is better to be rheumatic from drinking good natural beer with its redundant sugar and gain some potassium, and I firmly believe a more prolonged immunity from malignant disease, than to consume whisky with all its attendant harm to the internal organs and have an additional liability to the early occurrence of cancer.

The decorticated rice of the Japanese, his saké and arâk distilled from decorticated rice, and the same rice diet of the East Indian Indo-Chinese and the population of Malaya, wherever they adopt the civilized method of boiling rice and then pouring the water off, will account for the modern increase of cancer amongst these persons.

The Polynesian, who eats much potassium-containing vegetables and other foods, like the cow, appears to be very liable to tubercular disease of the lymphatic glands and lungs; so also are all strict vegetarians for that matter, as instance the frequent deaths of the larger apes in captivity from tuberculosis.

I think I have said enough to arouse thought and interest in the habits of man as a possible cause of cancer, and it certainly looks on the face of it as if the surmise of the causes of cancer were not very far removed from accuracy.

The problem of cancer as regards diet is not by any means a matter of comparison between a meat and a vegetable diet so much as it is a matter which turns on the continuous maintenance of a correct alkaline mineral balance with especial reference to potassium. Neither does cancer depend on whether food be raw or cooked so much as on the exact method of cooking that food. Neither also is cancer a disease of the blood, but depends rather on the maintenance in the blood of those salts in proper proportion necessary and vital to the healthy functions of the cells of the body liable to become cancerous, but which draw their nutriment from the blood under all conditions.

CHEMICO-PHYSICAL PROPERTIES OF THE FOUR MINERAL ALKALIES OF THE BODY.

Metals are either electro-positive or electro-negative. Potassium is the most electro-positive metal, and oxygen the most electro-negative element. Potassium, sodium, calcium, and magnesium are all electro-positives in relation to the physiology of the animal tissues viewed from the galvano-chemical standpoint of the changes which take place in the tissues. These four metals combine with acid-radicles or the halogens to form salts. The acid-radicle of sulphates is electro-negative and the acid-radicle of the phosphates is also electro-negative.

Selenium forms an acid-radicle just as sulphur and phosphorus and the acid-radicle of the selenates is electro-negative. Iodine, chlorine, bromine, and flourine are all electro-negatives. Phosphorus and sulphur, which give rise by combination with oxygen to acid-radicles, are elements which are allotropic.

It would appear then that the administration artificially of any electro-negative substance such as selenium, iodine, arsenic, lead, silver, gold, copper, and any other elements electro-negative to potassium would be beneficial in promoting that branch of physiological chemistry which refers to the galvano-biological action of potassium. Nature seems to have selected iodine as the particular electro-negative complement to potassium as an alterative for the epithelial tissues.

The *spectroscopic* examination of the four alkalies, potassium, sodium, calcium, and magnesium, show striking contrasts.

The spectrum of sodium shows a radiation band in Frauenhoffer's line D, 50 in the yellow.

Potassium shows a radiation line in Frauenhoffer's lines A, 17 and B, 27 in the red, but also shows a radiation band near Frauenhoffer's line H, 153. This last line is the *furthest in the violet end of the spectrum of the four alkaline minerals* of the body.

Magnesium shows three lines in Frauenhoffer's 75 green and three lines between Frauenhoffer's 90 and 110 blue.

Calcium shows lines at Frauenhoffer's B, 35 red and E, 65 yellow, but also shows a band near Frauenhoffer's G, 130 violet. It will now be seen that potassium and calcium each have a band in the violet end of the spectrum, potassium possessing a band most near to the Becquerel rays of radium and X-rays. Sodium only possesses a band in the yellow end of the spectrum, and magnesium possesses bands in the green and blue. Calcium and potassium possess bands in the red and in the violet.

Elsewhere in this book it is stated that calcium when administered to a cancer case causes an increased growth of the mesoblastic or fibrous element of a cancer, in much the same way as does thymus gland. The author, by direct experimentation, has been able to produce a quasi-keloid condition of scars by the administration of large doses of calcium salts during the healing of a wound.

It is well known that the scar of a boil or a carbuncle is pitted or depressed. If during the healing of a boil or carbuncle large doses of calcium chloride are administered, the resulting scars of the boils or carbuncles will be raised and somewhat keloid, with a plentiful formation of fibroid induration in the area of past inflammation. It would appear, therefore, that the keloid following wounds and operations for tubercular glands has a distinct biochemical relation with calcium. We know that tubercular glands, and foci generally, tend to calcification, and it therefore seems to be that nature's method of increasing the resistance to tuberculosis is to cause accumulation of calcium in the body.

It has been pointed out that the potassium saturated mammary tissue of the cow is liable to tuberculosis, and that the calcium saturated mammary tissue of the woman is liable to cancer; here then, on the face of it, appears another evidence of the biochemical antagonism of potassium and calcium in the animal body. This is interesting, especially when we find that both potassium and calcium are the only minerals which possess bands in the violet end of the spectrum.

It is also significant that calcium should have any influence on the production of fibroid increase, because if we examine the possible biochemical results of a broken bone we are at once struck with the fact that at the site of fracture a large quantity of calcium salts must be present from the action of the tissues on the calcium salts at the broken ends of the bone. Every surgeon knows that the first thing to occur after a fracture of a bone is for the

fibrous elements in the neighbourhood to undergo rapid proliferation with the formation of much fibrous tissue. It is from this fibrous tissue becoming further influenced by the deposition of calcium that the new bone for repairing the fracture is made.

Whilst considering the effects of calcium on metabolism it would be well to consider carefully an aspect not generally dealt with but which is worthy of passing comment. I stated elsewhere that there is a close connection between goitre of the thyroid gland and calcium, and between goitre and cancer. There is also a well-known enlargement of the thyroid gland coincident with every catamenial period of a woman, and more or less enlargement during pregnancy. The author has stated that he believes that the suprarenal glands control certain functions of the thyroid gland. In certain diseases (Graves) of the thyroid gland there is an increased pigmentation of the skin even when the suprarenal glands are healthy, but when the suprarenal glands are diseased, as in Addison's disease, there is great wasting of tissue and intense pigmentation of the skin. This looks as if the facts are the exact opposite of what is stated in text-books, and that the over pigmentation is due to uncontrolled thyroid action and not to active suprarenal influences. The same applies to "giantism" and "dwarf-cretinism." The suprarenal glands are said by Mikhalkovics to be developed from germinal epithelium from the genital ridge in the embryo. If this is so, then a great deal which is obscure at once becomes more plain. The cells lining the Graafian follicles of an ovary are also

derived from the germinal epithelium of the genital ridge of the embryo. The corpus luteum of a Graafian follicle of the ovary therefore is composed of cells whose ultimate origin was the same as the cells of the suprarenal glands. Both the suprarenal glands and the corpus luteum contain lipochromes and luteins. Does the function, actual or presumed, of the corpus luteum tend to support the connection of the thyroid with calcium and calcium with cell metabolism? The answer is Yes! The corpus luteum of menstruation lasts for twenty days and is withered in twenty-eight days. The uterus is quiescent whilst the corpus luteum is active, but at once resumes its periodic function of endometrial hæmorrhage directly the corpus luteum atrophies.

The corpus luteum of pregnancy lasts during most of the nine months of pregnancy, atrophies towards the end of pregnancy, and then the uterus expels its contents, and resumes its periodic monthly hæmorrhage. It would seem then that the corpus luteum is a temporary oft-recurring suprarenal-gland-like tissue created purely to regulate uterine function. How does it effect its results? Possibly by regulating the calcium and potassium balance of the woman.

We have seen that calcium saturation leads to thyroid enlargement. We know that just before the catamenia the thyroid glands of all women enlarge. The thyroid gland of all pregnant women is also enlarged. During pregnancy all the surplus lime salts of a woman's body is directed towards the fœtal metabolism of bone. During lactation

all the surplus lime salts are excreted as calcium phosphate in the milk.

During pregnancy a great deal of potassium is used up in cell proliferation in the enlarging mammary glands, in the growing fœtus, and in the increased mucus and other secretions. During lactation a great deal of potassium is excreted in the milk. During pregnancy and active lactation the periodic monthly uterine congestion and hæmorrhage is entirely suspended, with the exception of the loss of blood at parturition when the fœtal calcareous metabolism is about to be altered to maternal lacteal calcareous metabolism. If one may use the term, the "calcium pressure" of the intermenstrual period is regulated by the corpus luteum of menstruation, and leads to thyroid enlargement just before the next catamenial period. The "calcium pressure" of pregnancy and lactation being more prolonged, needs a larger and more active and longer-lived corpus luteum in order to divert the calcium into the proper channels, first of all into the fœtus, and then into the mammæ. So strong seems this protection of the uterine tissues during pregnancy from calcium, that when the "after-birth," as occasionally happens, becomes calcareously infiltrated and degenerated, the uterine tissues invariably escape any similar action.

During the intermenstrual and pregnancy periods the "calcium pressure" rises, causes thyroid enlargement, and then follows uterine hæmorrhage and so on.

The presence of a fœtus seems of importance, for if in certain conditions the fœtus dies or is

"withered," then the occurrence of deciduoma malignum is possibly the result of "calcium pressure" in the ovum uncontrolled by the usual fœtal organs naturally employed in fœtal ossification and calcium metabolism. The calcium metabolism of the pregnant uterus and its rapidly-growing contents; the concomitant enlargement of the thyroid gland in pregnancy, and immediately before menstruation; the relative size, origin, and nature of the corpus luteum, and the fœtal and maternal economy of calcium during and immediately after pregnancy; appears to throw some light on cancer from the point of view of the association of lime and potassium in tissue metabolism. Increased pigmentation of the skin is a phenomenon of all pregnancies.

It is useful to remember, that menstruation begins when ossification is about to slow down and cease, the thymus gland is all but functionless, and the period of calcium accumulation in the body is commencing, as shown by the presence of calcium phosphate ("tartar") around the lower teeth of persons over twenty years of age, and other so-called calcareous diseases.

A further antagonism of calcium and potassium salts can be adduced as follows:—Iodide of potassium has long been known to cause reduction of an enlarged thyroid gland. During pregnancy, when the thyroid gland is always somewhat enlarged, the skin of various parts of the body is subject to marked pigmentation; during this time calcium, though held up in the maternal blood, is being strongly diverted from the maternal to the fœtal

metabolism. During lactation pigmentation tends to disappear, whilst calcium and potassium are being freely removed from the maternal circulation in the milk. If very large doses of iodide of potassium be given to anyone, so that iodomata and "iodism nodules" be formed in the fibrous regions of the skin, these nodules and iodomata will be most rapidly removed by a few large doses of calcium chloride even though potassium iodide be continued, showing here also the biochemical antagonism between calcium and potassium and iodine and chlorine in the body.

It is quite possible that the corpus luteum temporarily antagonizes the suprarenal glands, and allows free rein to the thyroid gland to cause pigmentation by potassium, while the calcium of the maternal circulation is at the same time diverted to the fœtus in utero.

Magnesium appears to be complementary to, and to control calcium, because the administration of magnesium seems in some unexplained manner to cause retrogression of fibrous warty growths of the skin. It is also possible that magnesium has the power of arresting and regulating the proliferation of bone cells, which are possibly over stimulated by calcium. Sea bathing, or rather the swallowing of sea water whilst bathing, seems to be beneficial in cases where fractures of bones have not hardened, but the fibrous tissues at the site of fracture have enormously overgrown the requirements of adequate reparation. It would appear, then, that the potassium and magnesium salts in the sea water correct this overgrowth of callus and lead to the prompt

solidification of the faulty union. As we have seen, the spectrum of magnesium is intermediate between the lines of the spectrum of calcium.

Sodium is complementary and possibly mainly adjuvant to potassium and calcium, because we find the entire spectrum of sodium situated in the far yellow end of the spectrum, but between the two extremes of potassium and calcium. From what has been said above, it would not be surprising to find that various tissues of the body are biochemically and biogalvanically controlled and stimulated by various of the four alkalies of the body or combinations of them.

Iron is common to all the tissues of the body, and is electro-negative to potassium.

Finally, the exact salt of any of the four alkaline minerals may have a vital importance on the problems herein dealt with, for instance, a chloride of any of them may be more beneficial or harmful according to circumstances than a carbonate or phosphate, or an iodide than a sulphate, and so on, *mutatis mutandis*.

The thyroid gland is the active metabolising agent of potassium salts of the body in health and disease. All rational treatment of cancer should take the thyroid gland into practical consideration. This brings iodine, as the element present in iodothyrin, into prominence also as a collateral therapeutic element in the treatment of cancer.

Chapter X.

SOME OBSERVATIONS MADE BY THE AUTHOR ON THE ACTION OF ACIDS AND ALKALIES IN CANCER.

The reader is respectfully requested to bear in mind that the cancer cases herein mentioned were hopeless cases of cancer who had refused operation, and who had requested that any method which would appear to be scientifically indicated should be made use of, whether for good or ill.

It was clearly explained to them that what would be done could only be purely of a tentative nature, with the view of determining certain of the problems dealt with in this book.

The author would pay a grateful tribute to those dead and gone who had been willing in the past to lend themselves willingly and knowingly for the attempted elucidation of problems still puzzling the profession of medicine and terrifying the lay public.

The heroism of men and women doomed to die of a dreadful disease, who calmly offered their bodies for experimentation for the benefit of others, is a heroism quite equal to the most glorious deed

in the excitement of endeavouring to slaughter one's fellow man on the battlefield.

In 1892, being compelled (for want of better) to accept the various prevalent opinions extant, provided they were blessed by the "general consensus of expert opinion," I treated a series of cancer cases under the acceptance of the statement made by certain "cancer experts" in the profession that cancer was an infectious disease due to a micro-organism or psorosperm. I gave large doses of salicylate of soda, quinine, salicylic acid, salol, carbolic acid, mercury, iodine, arsenic, etc., with absolutely no benefit to the sufferers. I injected a series of cases with chlorine-water locally, hoping to effect either some beneficial local chemical change or to kill some of the germs which were alleged to be the cause of the disease. I have tried the much vaunted violet leaf and willow decoction cure with temporary but no ultimate real relief. After total failure in treatment based on the statements of others as regards the cause and maintenance of cancer, I began to carefully research and investigate *de novo* for myself, accepting nothing that I did not myself find, and believing nothing which I did not see a good scientific reason for its existence.

There are related in Chapter VIII. the reasons for administering (in 1894) thymus gland to several cancer cases, and the resulting rapid overgrowth of the tumour.

It was learnt then that the thymus gland by its relationship to some quality possessed by the body, and present in every case of cancer, (calcium), was

able by that relationship to produce the effect it did: rapid overgrowth.

It will now be as well to relate my personal discovery of the fact that the administration of calcium salts also produces an exuberant overgrowth of already ulcerated cancers.

The probable relationship between the thymus glands and calcium, and their proclivity to cause growth in a cancerous tumour has been mentioned, and the relationship of calcium metabolism to the period of the presence and the absence of the thymus gland has also been dealt with.

It has long been known that when cancer, particularly of an internal organ, attacks the body, more especially in cancer of the alimentary canal, that the natural gastric juice, as found in the stomach, undergoes a strange alteration in deficiency of one constituent: hydrochloric acid.

Normal gastric juice contains pepsin, hydrochloric acid (·2 per cent.), mucin, salt, and water.

Some experts in therapeutics assert that potassium when administered causes a diminution of mucin in the stomach. With this statement I am only in partial agreement, because although in many cases potassium appears to diminish the amount of mucin secreted by the cells of the body, there are very many more occasions on which potassium salts, apart from the iodides of potassium, increase the mucin secreted by cells of the body.

Take, for instance, cancer of the womb. I have found that in cases of cancer of the womb in which the discharge was serous and very devoid of mucin, that the administration by mouth (or

locally) of potassium at once produced a change in the secretion, whereby it promptly assumed a more natural proportion of healthy mucin.

The particular change in gastric juice mentioned above, was the fact that the gastric juice was found to be markedly deficient in hydrochloric acid. Was this deficiency the cause of the occurrence of the cancer or because the cancer already existed ?

It occurred to me to conduct some deliberate experiments with mineral acids in cancer cases in order to try and find the reply to the foregoing question, and with the permission of certain cases which were inoperable I did so.

Pepsin is active in the presence of any mineral acid, for example, hydrochloric, nitric, nitro-hydrochloric, or phosphoric acid, in proper proportion. Reasoning therefore from this standpoint, I proceeded to administer to some cancer cases the mineral acid which they lacked, and which I thought they needed.

The apparent results of the continued administration of a mineral acid to a cancer case is extremely interesting.

In cases, for instance, of epithelioma of the skin, which had involved the neighbouring lymphatic glands, and which had become ulcerated and fungoid, the following took place without exception :—

The ulcer became very foul and offensive, in spite of all efforts to the contrary, it also became deeply excavated and the skin became undermined, but the cancer appeared to spread more rapidly and

widely below the surface and to involve more and more of the tissues.

In cases which were not ulcerated and to whom mineral acids were given, the following systemic disturbances were noted just the same as in the ulcerated cases :—

The administration of mineral acid seemed to produce a strange impoverishment of the blood, the patients became rapidly pale and anæmic, their blood-colour index fell rapidly, and they became dropsical, their feet became swollen and puffy, and they were very subject to attacks of sudden breathlessness. They were quite incapable of the least exertion. The appetite failed, which it ought not to do, and there was absolutely no change for the better, in fact, quite the contrary.

It is quite unnecessary to state here that on the supervention of the foregoing symptoms the administration of all mineral acids was at once discontinued, nevertheless I had learnt that the deficiency of hydrochloric acid in the gastric juice in a cancer case was possibly intended by nature as a protection to the patient against the action of an unneutralized mineral acid in the body, and the deficiency was not as many think, one of the causes of cancer, which I must confess I was open to believe, because the patients became worse under mineral acid. This is now an ascertained fact, and needs no further elaboration.

To me it is now clear that the absence of hydrochloric acid in the stomach is a fortunate provision of nature; but, like other fortunate provisions of nature, it possesses an additional action which I will

now consider. The absence, however, of hydrochloric acid, which I believe to be originally aimed at preserving the potassium index, in the long run actually acts by preventing the necessary additional potassium from being acquired by the processes of digestion in the body, especially in the later stages of the disease, when it is most needed and would be most useful.

This absence of hydrochloric acid bears an important relation to the functions of the pancreas as the chief source of supply of potassium, nucleins, and nucleo-albumins from the disintegrated cell nuclei which are only acted upon by the pancreatic digestion carried on in the small intestine.

The researches of Pavlov of Russia and Starling in England have shown us that, besides the power of dissolving cell envelopes and of hydrolising proteids in the presence of pepsin, possessed by hydrochloric acid, there was, like every other substance in the body, a second and even third reaction pertaining to the acid of the gastric juice.

The gastric juice dissolves cell envelopes and hydrolises proteids, but possesses no action on nucleins and nucleo-albumins, *i.e.*, on the solid constituents of the nuclei of animal and vegetable cells.

At the end of gastric digestion, the acid gastric juice on entering the duodenum causes a substance known as "secretin" to be manufactured by the cells of the duodenum, which, being taken up, stimulates the pancreas or "sweet bread" to secrete its proper fluids. Among the properties of the juice of the pancreas is the disintegration of nuclei

of vegetable and animal cells and the liberation of the potassium compounds with nuclein and nucleo-albumin. This is said to be effected by the special ferment—*trypsin*.

The absence therefore of hydrochloric acid in the stomach indirectly leads to a deficiency of pancreatic secretion, and therefore the partial non-digestion and scanty absorption of the potassium compounds contained in the nuclei of animal and vegetable cells partaken as food. Even in this latter event the cells of the small intestine seem to obtain a fair supply of the potassium available.

In Chapter IX. it was explained that potassium was the most electro-positive element. Examination of the chemical formulæ of the nucleins and lecithin will show that in relation to potassium, their component chemical elements are all electro-negative to potassium, it therefore follows that their electro-magnetic principal must be potassium. This is the reason why so extremely soluble a substance as a potassium salt can remain in a tissue cell as a fixed component of the substance of a cell. Potassium, iron, iodine, and all mineral substances in the body are present *vitally* in the "colloid" form. Iron, though electro-positive, is electro-negative to potassium; hence potassium and iron are associated with red blood corpuscles as an electro-magnetic couple, and that is why anæmia is benefited so much when potassium is given with iron at the same time. I have good reason to believe, therefore, that all chemical changes which take place in the body are chemico-galvanic polarisable reactions, the result of the

electro-magnetic relationship of potassium in cells to other elements and metals in the body, present naturally or artificially.

The stomach, the duodenum, the pancreas, and in advanced cases the liver, are all subject themselves to cancer; therefore these organs can possess no quality, influence, or ferment which will cause the slightest action in preventing or curing cancer without making use of some natural inherent property present throughout the whole body.

Careful research and consideration of all the foregoing points have led me to believe the following:—

That inasmuch as trypsin, one of the pancreatic ferments, has the power to liberate from the nuclei of cells the potassium-nuclein compounds and nucleo-albumins, that the injection of this ferment, or other extract of the pancreas into the tissues round about a cancer, has no other effect than to destroy all cells with which it comes in contact, both normal cells and malignant cells, and so by a process of "robbing Peter to pay Paul" a certain amount of beneficial potassium compounds are locally obtained from blood cells, tissue cells, and cancer cells, and so the necessary potassium compounds are locally liberated as a temporary increase, and so made use of with the benefit alleged by some who assert that trypsin cures cancer directly, which I am inclined to doubt.

This local liberation of potassium compounds, and the fixing of them in cancer and other cells, is in my opinion the only possible explanation of the action of trypsin, radium, and X-rays, with this

exception: that X-rays, by their too frequent application and action, overgrow normal epithelial cells and lead to local potassium and nuclein exhaustion and so to the occurrence of epithelioma by artificially producing exhaustion deficiency, which occurs in any part of the body as a preliminary to cancer formation. X-rays by their action cause a great deal of pigmentation in the skin as the result of the chemical rays causing local hyperæmia, which furnishes a great supply of available potassium to the locality; this potassium, as stated elsewhere, is the cause of the cells being able to manufacture pigment.

Let us now return to the consideration of potassium compounds in the smaller intestine.

Cancer of the small intestine, particularly of the jejunum and upper part of the ilium, is practically unknown; at any rate, if there are any cases, I have not seen them recorded anywhere, and I myself have never seen or heard of a case.

In 1906, whilst examining some cancers, I succeeded in obtaining evidence of tyrosin and leucin being present. At that time I made a communication to the *Lancet*, April 28th, 1906, p. 1209, entitled "Tyrosin as a Probable Cause of Leucocytosis in Cancer," in which I showed the chemical relationship of tyrosin to hydroparacumaric and hydrocinnamic acid. Cumaric and cinnamic acid when injected under the skin in the forms of salts of soda cause a marked assemblage of white blood corpuscles in the locality so injected.

During pancreatic digestion of proteids in the small intestine tyrosin and leucin are formed.

Tyrosin is para-oxyphenyl-a-amido propionic acid, and is found in many tissues of the body such as the spleen. Leucin is a-amido-caproic acid : it is also found in the pancreas, spleen, liver, thymus, thyroid, and salivary glands. The relationship of tyrosin chemically to cumaric and cinnamic acids, and the fact that tyrosin was always present along with leucin in the small intestine as the result of the pancreatic digestion of proteids, led me to attribute to them the normal presence of white blood corpuscles in the wall of the small intestine during digestion, and therefore I thought that the presence of white blood corpuscles in and around a cancer was due to the same reason. Possibly this is correct, and possibly they are attracted locally when trypsin is injected into a cancer. It would appear that the injection of trypsin into a cancer is tantamount to injecting all the products of pancreatic digestion into a cancer, and this might as well be done at once.

When cancer occurs in the duodenum it does not travel downwards towards the jejunum, not because, as some persons think, that it meets with tissue resistance, but because it does not extend as a disease among cells which have free access and a free supply, comparatively speaking, of potassium-nuclein compounds, which a knowledge of the difference between gastric and pancreatic (tryptic) digestion tells us occurs in the small intestine, and, if my hypothesis is correct, accounts for the singular immunity of the small intestine from cancer as a general rule.

We have seen and known that potassium salts

have a strangely beneficial action when administered in cases of diabetes due to defective action of the control of the sugar economy of the body by the liver, because improvement in the sugar economy of the body is at once apparent.

It has been stated in Chapter IX. that cancer is prevalent in certain families as the result of potassium starvation due to food deficient in potash salts. Diabetes is also a disease peculiar to some families. Often both husband and wife will be found to have, both of them, diabetes, or one will have diabetes and the other will have cancer or diabetes and cancer together.

The pancreas is scientifically supposed to be endowed with the power of indirectly controlling the output of sugar or the formation of sugar in some subtle manner, and it is supposed that one of the ferments of the pancreas acts in some mysterious way.

My own impression, gleaned from the observation of the sugar present in many cancer cases, in carbuncles, in erysipelas, and other diseases producing disturbances in the blood, is that it is mainly the liberation of potassium nuclein compounds in the small intestine by pancreatic digestion normally carried on, which aids the liver in maintaining the sugar balance of the body by providing the liver with the very necessary potassium salts. The above is one of the main reasons for the conclusion that as potassium benefits sugar control, it should be useful in treating and preventing cancer.

In the lower part of the intestine, the cæcum,

colon, and rectum, which have no particular excess of free potassium, as it has for the most part been wholly absorbed by rapid diffusion through the wall of the small intestine, we find cancer to repeatedly occur. In fact, the further we travel along the intestine from the small intestine, the region of the potassium salts of digestion, the more frequent becomes the occurrence of cancer in the tube of the intestine.

When we observe that primary cancer of the liver is exceedingly rare and doubtful (as to taking origin in the true liver cells), and that the small intestine is free of cancer, and we also know that the fluids passing through the wall of the small intestine and the blood arriving in the liver are replete with potassium-lecithin compounds, this immunity of these two portions of the alimentary system is not surprising, but seems strikingly instructive.

The stomach, on the other hand, subject as it is to the continuous action of its acid contents and also the frequent presence of chlorides, can well be understood to be the subject of malignant disease, because, as I believe, the natural supply of potassium from food in the first place is deficient, and is removed by the action of the acid contents of the stomach from its tissues and cells. The acid secreted by the stomach actually deprives the stomach walls of potassium salts and compounds.

It was the realization of the above facts that years ago led me to entirely reverse in my own practice the method of treating stomach and liver derangements as generally recommended and

followed by so-called experts in materia medica and digestion generally.

The experience of years, during which potassium salts have been used by me in cases where it is the custom of others to use sodium salts, has more than convinced me of the correctness of my views. Sodium, as the salt of the fluids of the body, is only useful medicinally as a "transporter" and neutralizer of acid, and not as a tissue component.

The fluids passing through the wall of the large intestine and the blood circulating therein, contains scarcely more potassium than the blood in the rest of the body, hence I believe lies the liability of these tracts to cancer in contradistinction to the small intestine.

It would appear that the vital necessity of potassium to the red blood corpuscle, necessitates the holding up and continual retention from tissue cells and their nuclei of a large proportion of the already too scanty supply of potassium salts, which the body is scarcely able to obtain under ordinary modern conditions of drink and diet.

During the last fifteen years I have never used a sodium salt in a prescription for a dyspeptic or case of liver derangement.

I have entirely reversed of my own volition the method practised and recommended in text-books on medicine in the two above conditions.

Briefly put, they recommend the salts of sodium for medication of the stomach, and the salts of potassium as solvents for uric acid and other deleterious compounds in the tissues and the blood.

My opinion that potassium salts, as salts of the

tissues and cell nuclei, were more useful when administered for the purpose of aiding the cells of the gastric mucous membrane and liver to perform their function, than any amount of sodium simply used as a temporary antacid.

My invariable experience of the good results obtained, have confirmed me absolutely in the wisdom of rejecting soda in preference to potassium.

Sodium salts, on the other hand, as the salts of the fluids of the body, I have used in large quantities as the only natural solvent of uric deposits and other gouty and gouty-rheumatic affections. I am well aware that this is quite contrary to the published works of certain learned pundits in my profession.

I can only speak by the results of actual practice, with which I have reason to be more than satisfied.

There is only one precaution which the habitual prescriber of potassium need take, and that is to protect the heart muscle from being affected, which is quite easily done by the simultaneous administration of strophanthus and strychnine.

Careful reference to my notes and to my list of patients during the last fifteen years, and inquiry at the laboratories of the various chemists who have dispensed my prescriptions, reveals the following extraordinary fact, which is certainly as strange as it is true.

It has been found that I have used an enormous quantity of potassium citrate, bicarbonate, and hypophosphite, where other doctors have used sodium; and now the extraordinary coincidence

crops up that not in one single instance have any of the numerous patients that I have habitually cared for during fifteen years developed in any part of their body whatsoever a single cancer amongst them all. *Actually not one single case of cancer has ever to my knowledge occurred amongst the clientele of my practice.*

If the above is a mere coincidence, it is the most extraordinary coincidence that has occurred yet throughout my life.

I have reason to think that, unbeknown to myself, many obscure cases of internal disease in my practice which may have been commencing cancer, have recovered absolutely without having revealed the fact of the existence of cancer, simply as the result of having potassium administered to them for some other reason.

Not only have I never seen a case of cancer occur in my practice, but all the cancers, without exception, that have come under my notice for operation and treatment have come to me as already well-established cases of cancer, or been sent to me for operation by other medical men.

The above is worthy of note, not to show my cleverness in preventing cancer, but to illustrate a fact which, if not a coincidence, is certainly of value in support of my hypothesis that if humanity were kept adequately supplied with the proper amount of potassium, malignant disease would for the greater part cease to attack so many as it does at the present day.

I have repeatedly been privileged to look through the prescriptions given to bad cases of

advanced cancer by the many and various medical advisers and cancer specialists and experts; and I have waded through as many as fifty different prescriptions given to one case by many doctors, and have not come across a single prescription containing one single grain of a salt of potassium. They had one and all tried every possible known and unknown so-called remedy for cancer, orthodox and unorthodox, and seemed to have steered clear of potassium in any form, except when they have given arsenic, purely for the supposed benefit of the arsenic, without reference to the potassium present in one particular preparation of arsenic—liquor arsenicalis. Strangely enough those cases of cancer which have been given liquor arsenicalis have a history of now and then improving, and inquiry shows it was when the preparation was actually being taken and not in the intervals.

It is quite probable that calcium and magnesium, in some imperfectly understood way, governs the stability of certain tissues, and by reason of their very insolubility and slow absorption and removal, this would appear to be the case. Their action is explainable by supposing that they slow tissue metabolism and maintain a state of fixity and retard physiological tissue chemistry.

If they served to maintain a certain condition, they might, if in excess in relation to the more soluble alkali potassium, produce a state of affairs in which their maintenance of equilibrium of the health of tissues may be such that the condition which they maintain, if unduly accentuated, may lead to results productive of disease.

We know that calcium and magnesium in man and other vertebrates play the part of mechanical stiffeners of bone; but calcium and magnesium are also found in large quantity in the body of living animals, as component parts of their tissues; yet these animals, known as invertebrates, have no sign or vestige of the formation of anything like bone, not even as a shell or carapace known as an exoskeleton.

This shows us undoubtedly, that the functions of calcium and magnesium are multifarious, which is also the case in the human body.

I would again remind my readers that every cell of the body is a distinct unit as regards its own entity, under a common government of the nervous system, and drawing nutriment from the common source of supply, the blood and fluids of the body.

The tissue cell of man then is only after all a living invertebrate animal, without a bony skeleton either inside or outside its organization.

It would be idle to further discuss the fact as to whether calcium and magnesium have the properties indicated above, because anyone acquainted with the merest rudiments of biology, physiology, and medicine, knows this.

During the first period of life—namely, from birth to the extinction of the thymus gland, which is generally supposed to cease its existence and functions at the age of fifteen years, nevertheless, I believe, continues those functions more or less until the twenty-fifth year—it is noteworthy that the cells of the skin, and the appendages of the

skin, such as the hair and nails, and also the elasticity of the skin, are all maintained at a definite level condition of growth compatible with the actual needs of the body.

After twenty-five years of age, however, the rate at which the cells of the skin and the appendages thereof grow, and are cast off, becomes increasingly rapid comparatively with the period of life before twenty-five years. In some parts of the body during this later period the hair grows rapidly, in other parts it is discarded. The eyebrows and beards of men increase in later life, but the hair of the top of the scalp in men and women tends to diminish in growth and fall out.

The cells of the cuticle of the skin dry and become corneated and cast off at an exceedingly rapid rate as age advances, and the skin loses its elasticity and becomes flaccid and wrinkled. The nails become brittle but grow very rapidly. The administration of potassium renders the nails less brittle and more lustrous.

All these things occur to the skin and its structures in the later or calcareous period of life, when the amount of calcium and magnesium circulating in the blood is in large proportion greater in comparison with potassium than during the first period of life. A fall in the amount of potassium in the later period of life is therefore more likely to eventuate in cancer than during the first period of life.

Functional and structural diseases of the thyroid gland are also peculiar to the calcium or later period of life.

Reference to the contrast between tuberculosis and cancer shows that cancer is a disease of later life, and that tuberculosis is very much more prevalent, widespread, and terribly acute and destructive in the first period of life, because research has shown that the older we get the more chronic and less acute do tubercular processes tend to become.

The foregoing is the result of my own researches into age as a factor governing acuteness or chronicity of tuberculosis, and arrived at during my former researches on tuberculosis; more especially has the apparent relationship of the potassium and calcium periods of life been brought by these researches under my notice.

The fibrous structures of the scalp after twenty-five years of age tend to become adherent to the fibrous structures covering the vertex of the skull, and the two foregoing more or less tend to become adherent to the skull itself.

Advancing contraction of the structure of the scalp tends to diminish the blood supply to the scalp and so lessen the total supply of all the alkaline salts to the growing point of the hair, and thus the nutrition and natural functions of the hair cells are disturbed, the hair loses it colour and then tends to fall out.

It will be deduced from what has been previously said that the consequent diminution of the total potassium reaching the hair of the vertex of the scalp in civilized people in the later period of life will then be more marked than the diminution of the earthy salts.

On the other hand, the hair of the temples and the nape of the neck where the scalp is loose, the eyebrows and the beard, and on the chest and shoulders of men, tends to grow very rapidly and freely.

This is due to the fact that there is no strangling of the circulation, and if under the circumstances more earthy salts reach the hair in these positions, at any rate slightly more potassium also reaches them, that is comparatively speaking, than is the case with the vertex of the scalp.

It is noteworthy that although the hair turns grey, or in other words loses its pigment, which points to derangement of function, the hair continues to grow and vegetate. Nevertheless in the next chapter I will prove that the function of pigment formation of the hair, which is a product of the epiblastic cells of the skin, can be restored by the free administration of potassium, therefore the other functions of epiblastic cells are most probably equally controlled by the same metal and its salts.

Under certain conceivable conditions, undue cell growth and proliferation may be caused by calcium, and in the presence of a dearth of potassium salts become productive of disease.

Mucin, a product mainly of hypoblastic cells, as I have shown, is also for the most part directly affected by the diminution or increase of potassium gaining access to the blood, whether in food or drink, or when artificially administered in surplus by the physician.

If then potassium is able to control epithelial cells and their functions under normal conditions,

and we find that during the cancer period of life potassium tends to be scanty in supply and maintenance in the body, it is reasonable to imagine that perhaps the administration of potassium in cases of cancer will prove of benefit and restore the functions of all the cells concerned, tend to establish the necessary balance between the soluble and insoluble alkalies of the body, and so lead to amelioration of the disease, with retrogression and arrest, for so long a period as to be beneficial in prolonging life almost indefinitely in comparison with present methods, which are adopted empirically by those at their wits' ends to provide a remedy, which will take the place of the knife which has failed or which has become useless owing to the extent or situation of the cancer.

If it is possible also to prolong the period between an operation for removal of a cancerous organ and the recurrence locally or elsewhere in the body of the cancerous growth, much good will have been attained. If the natural forces or powers of the body to resist cancer can be thereby reinforced, some good will also have been attained. The sum of the foregoing would be a large gain in benefit to humanity. Even if one could only succeed, by some sure and rational means, capable of accurate and intelligent application, in prolonging some useful and much needed lives, then again a great deal worth striving for will have been gained. Nevertheless, the knife, as I will show later, can never be entirely displaced by any therapeutic agent, however successful.

The following letter, received from a firm of chemists who have dispensed a very large number of my prescriptions, will serve to establish and confirm my statements in the foregoing chapter as to my preference for potassium salts, and the fact that I have, as I have stated, used them for many years past in preference to those of sodium:—

T. BURDEN & CO.,
DISPENSING CHEMISTS.

PROPRIETOR:
G. E. BUTLER, M.P.S.,
DISPENSING CHEMIST.

TELEPHONE 5800 PADDINGTON.

41, STORE STREET,
BEDFORD SQUARE, W.C.

January 12th, 1912.

DR. FORBES ROSS.

DEAR SIR,

In reply to your letter of inquiry dated January 10th, we have looked through prescriptions made up by us for your patients since 1898, and find that during this period you have used more potassium salts than all of the prescriptions of the other doctors put together.

We find that you have scarcely ever prescribed an alkaline soda salt, preferring always those of potassium.

We are, Sir,

Yours truly,

T. BURDEN & CO.

CHAPTER XI.

ASCERTAINED AND PROVED FACTS RELATING TO THE ACTION OF POTASSIUM WHEN ARTIFICIALLY ADMINISTERED.

MANY years ago, when carefully noting the results of various drugs used by myself in the treatment of "Failure of the Heart in the Aged," a Paper on which was published by me in the *British Medical Journal* in the latter part of the year 1900, I was struck with the results of the continuous administration of potassium salts to these cases.

All authorities on the action of potassium salts on the heart assert that it is a depressant, and as such caution the profession against its use, a fact which tends to throw potassium salts very much out of use by many in the profession.

With the foregoing I am not entirely in accord, because if potassium must be admitted to cause palpitation of the heart when administered in large doses continuously, as I have seen it do repeatedly, I also claim that it tends in smaller doses to benefit the rhythmic action of the heart, and is in many respects and for many reasons otherwise beneficial.

So eminent an authority as Sir Lauder Brunton mentions the effect for good in regulating cardiac rhythm on page 185 in his book, entitled, "On Disorders of Assimilation."

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Potassium in very large doses has no permanent ill effect on the heart, for directly the administration of potassium ceases, the heart at once becomes regular and steady in action. Further, any harmful action which may be occasioned by potassium can be amply safeguarded by strophanthus and strychnine.

I will now describe the results of the administration of potassium on the hair, nails, and skin of elderly persons not the victims of cancer, and on persons who were the victims of cancer during the administration of potassium salts by myself.

It is necessary here to state that after my experience of administering acids and any other compounds such as citrate of ammonia, all of which tend to decalcify and de-alkalise the blood, I have studiously avoided, in cancer cases at any rate, any such process, because one must necessarily lower the potassium index at the same time that one attempts to lessen the earthy salts.

Being convinced from experience that the alkaline balance was really a matter of the amount of potassium present in the blood, I proceeded to work on the lines of taking care of the potassium supply of the body; and leaving the sodium, calcium, and magnesium to look after themselves, because, whatever happened, their supply at any time would be fully kept up by food and drink, so that it was only necessary to attend to the supply of the one drug which was likely to vary in quantity and proportion to the other salts in the body, that salt being potassium, as carbonate or phosphate.

As we have seen before, although the supply of potassium to the body under conditions of civilization tend to become more and more diminished, it would appear that as life advances more and more potassium is needed to counterbalance the accumulating surplus of the earthy salts in the body, and it is perhaps the accumulation of the earthy salts of the body which leads to the overgrowth of the structures mentioned in the latter part of the previous chapter.

We have seen that an excess of earthy salts may lead to an enlargement of the thyroid gland, and it is known that any absence of the action of the thyroid gland, the result of disease or its removal, leads to the condition known as myxœdema, in which occurs a serious disturbance of the nutrition of the skin, hair, nails, and function of the brain cells which are originally derived from similar cells of the epiblast.

We will now consider the action of potassium on hair.

If an elderly person, suffering from gout, failure of the heart, or cancer, be made for a certain length of time, say a month or six weeks, to artificially take into his or her body a definite and ordered amount of potassium, the following change in the hair will certainly take place:—

If the hair be previously white it will be found that it will for the most part regain its colour, quite apart from the administration of any drug such as iron or arsenic.

If the hair be previously grey or iron-grey it will become generally darker.

The first localities of the scalp which will be found to show this change, in white or grey hair, will be a darkening of colour on the temples and the nape of the neck.

These preliminary changes will be followed by the appearance of some normally coloured new hairs throughout the whole extent of the scalp, with the exception of those parts which had ceased to have any hair bulbs from which hair could possibly grow.

So striking is this change, that many elderly lady patients have been accused by their friends and relations of resorting to artifice to produce the resultant darkening and hair rejuvenescence, as the result of taking potassium salts.

The action on the nails was equally striking; where the nails were found to be brittle, the brittleness appeared to cease and a strong, thick, healthy, tough nail, with all the appearance of the vigorous health of youth, seemed to replace the previously cracked, thin, and effete digital appendage.

The next point noted was that at first the scales, which were removable from the skin of the body by friction with the hands or towel after the bath, were at first increased in quantity, and then occurred a gradual diminution of the total amount of epithelial scales lost from the surface of the skin, which then gradually sank to only that loss associated with younger persons.

The skin as a whole tended to show the same pigmentary change as the hair, for it generally ranged a shade or so darker than normal. And on exposure to the rays of the sun there was a decided tendency to an increase of "tanning."

The consistency of the skin, which is the last change to be noted, also undergoes favourable transformation; it became somewhat more tight and elastic, with a decided tendency to smoothness and freedom from the smaller wrinkles so common in the skin of elderly persons.

The rejuvenating effect of potassium on the skin and its appendages of elderly persons was one of the reasons which led me to seriously consider its possible beneficent action when administered to a case of cancer.

There is no doubt that potassium exercises a peculiar influence over the epithelial structures of the skin, especially in cases where there is a profound disturbance of the skin as a whole, and which effects the cellular elements of the cuticle. There are certain forms of acute and chronic eczema in which the administration of potassium salts is at once attended by improvement. It cannot be wholly, if at all, attributable to the so-called anti-gout action on the skin, because potassium citrate has repeatedly succeeded where lithium and such uric acid solvents as piperazine and other allied drugs have failed.

In chronic psoriasis, a disease characterized by excessive exfoliation and faulty growth of the epithelial cells with local inflammation of the skin; and in some ulcers, and chronic and irregular thickenings of the cellular layers of the skin, the exhibition of potassium salts locally, and by the blood as an internal medication, is often followed by cure where every other means have failed utterly. The foregoing therefore appears to substantiate my

hypothesis that epithelial cell growth is regulated for the most part by potassium salts.

My researches and work have been amply justified by finding that on treating a case of cancer with large doses of potassium under suitable safeguards for the heart, that exactly the same changes of the skin and its appendages at once became apparent as in cases which were not the subject of cancer.

I have already stated that the administration of potassium salts, apart from the iodides and as well as the iodides, to some cases of parenchymatous goitre tends to cause a diminution in the size of the thyroid gland.

I have found that in goitres accompanying cancer in women that the administration of potassium salts, apart from iodides of potassium, also tends to diminish the size of the thyroid gland in that particular cancer case.

Potassium has been found to diminish the amount of sugar present in the urine when it has been administered in cases of diabetes, especially where the functions of the liver were most concerned. The loss of potassium from the body has been shown to occur in the condition known as "gout." It is well known that gouty persons often suffer from "gouty diabetes." Diabetes is well known to be favourably influenced by potassium salts. Diabetic persons often end up with cancer, and nearly all advanced cancer cases have diabetes. It ought therefore to follow that cancer should be closely connected with the potassium chemistry of cells.

I have found that the glycosuria, present in many cases of cancer, carbuncle, erysipelas, and other acute infections of the blood, was very much benefited, and in some cases abolished, by the administration of potassium salts.

We have seen that the vegetable-eating cow who obtains a heavy load of potassium salts from her food is not subject commonly to cancer of the breast or mamma; we have also seen that the human female, whose habits tend to lead to impoverishment of her blood in potassium salts, is exceedingly liable to cancer of the breast. On the other hand, we noted the freedom of the woman from tuberculosis of the breast and the great liability of the cow to tuberculosis of the same organ, and generally throughout its whole body.

We know that the administration of potassium markedly increases the amount and alters the consistency of the mucin which the cells of hypoblastic origin are able to secrete. I have mentioned the lack of mucin in many cases of cancer, especially of the womb, and that the administration of potassium salts to these cases at once produces a marked change in the quality and quantity of mucin secreted.

We know that mucin and the nucleins and nucleo-albumins are intimately allied chemically; we therefore associate mucin with the particular functions of the nuclei of mucous cells, and therefore we must associate potassium with the functions of the nuclei of all cells, since we find that in and around the nuclei of all cells is much potassium.

Cancer formation, as I have shown in Chapter II.,

is essentially a matter of disturbance of the nucleus of a cell and its centrosome, and its developmental functions.

As quoted in Chapter II., Messrs. Gaylord and Aschoff have shown that in any portion of the intestine liable to and about to become cancerous, or in which the cancerous change is commencing or is in progress, that the "goblet" cell or mucin cell of the intestine has disappeared, showing that the mucin function of that tract of epithelial cells has become suspended, and points to derangement in the potassium index of that tract of cells. We now begin to realize the importance of the influence of potassium on mucin formation, and the inferences to be drawn therefrom.

The deductions which we are compelled to draw from the foregoing facts are overwhelmingly in favour of potassium playing an important part in the problems presented by the disease popularly known as cancer.

Cancer is not purely a disease caused by irritation leading to excessive overgrowth of the epithelial cells covering any particular part of the body, but is a disease arising from some deficiency already present, in the body, which prevents the proper control of the rapidly multiplying cells.

Sir Willoughby Wade, of Birmingham, in a paper by himself entitled "Speculations on Cancer," published in the *British Medical Journal* early in 1906, did me the honour of extensively quoting my work on cancer cells published in 1905. In this paper he put forward the contention that cancer was possibly caused not on account of

something present, but on account of something which may be absent from the body. I contend that my researches, so far as my experience has led me, tends to provide Sir Willoughby Wade's speculation with an answer. The something wanting was a sufficiency of potassium salts in the body.

Sir Alfred Pearce Gould, an earnest and liberal-minded worker in cancer, publicly said a few years ago, "Tell us what cancer is, and we will find the cure."

I have often heard the same authority express the opinion, when discussing cancer at the Middlesex Hospital, that some day a very simple therapeutic agent of universal potency in the animal creation will perhaps be discovered, and which will have a profound influence on the causation, growth, and arrest of the cancerous process. In my humble opinion that therapeutic agent will be found to be a normal and universal accompaniment of cell life, but one which for divers reasons will be subject to fluctuations and variations under certain definite conditions, and so give rise to the process of local new growth known as cancer.

I have endeavoured to answer every possible objection, and to advance every possible evidence in support of the hypothesis set forth at the commencement of this treatise, and would ask my critics to as far as possible place themselves in the position of the advocate of the hypothesis as set forth herein, and honestly see if their objection will be as strongly tenable in the face of what has

been said of potassium, if the objection which they seek to advance is first weighed in the same scale.

It is a strange thing that concerning almost every "cure" for cancer, which has been advanced by either the medical profession, or by the greatest quack or impostor that ever existed, if that so-called "cure" could be shown in any way to benefit a case of cancer, or in any way to modify the course of the disease favourably, or even be suspected of prolonging life, that on examination, it will be found that, if the drug or nostrum which is lauded be carefully examined and looked into, potassium, in varying quantities and proportions, will be found to unwittingly form one of the main constituents of such drug or nostrum.

Take, for instance, the so-called "violet-leaf cure," or the "willow-infusion cure" of cancer.

These two "cures" are made by procuring violet leaves in large quantities and boiling them down and then drinking the water in which they were boiled.

Willow bark and willow leaves have been treated in the same manner, and the water in which they have been boiled has been drunk with the assertion that cases of cancer have been known to benefit. The above claims, put forward for both "cures," have been supported by members of the profession on many occasions.

It can be proved that in each case the person drinking the effusion in question was after all going a long way, and taking a great deal of trouble, to obtain potassium salts from vegetation, which could have been more easily procured from a chemist's

shop, in greater quantity and more continuously, and with perhaps happier results.

Every quack nostrum prepared by the infusion of any herbs can be shown to contain, all of them, one common product of nature present in all vegetable life—potassium salts.

No method of treatment yet practised by the "ultra-orthodox" amongst the members of the medical profession but can be shown scientifically to owe its method of action to influencing directly or indirectly the potassium economy, and perhaps, also the economy of the earthy salts of the body.

Why should not Sir Alfred Pearce Gould's therapeutic agent not prove to be potassium salts?

The action of potassium salts in the body is a natural though varying one. It is just this variation that I contend is the cause of the commencement and maintenance of cancer, and also occasionally of its spontaneous cure, when an increase of potassium is in some unwitting manner brought about.

During the growth of a cancer the double condition of attempted cure and continuation of the disease exists in the same tumour, as I have shown in Chapter II. This can only take place by some natural power of the body, which however, is insufficient in force to act simultaneously on the whole growth. Why is not this natural influence of the body after all not the vital action of potassium on cells, which metal, as I have shown, tends under certain conditions to be inefficient in amount but is always present to some degree in health and more or less in every case of cancer?

There is a preparation of arsenic, known as the liquor arsenicalis, which has been said on occasion, when taken in large and repeated doses (with great danger to the patient), to have occasioned arrest in some cancerous conditions.

Liquor arsenicalis is made by boiling arsenious acid with carbonate of potassium. It is not surprising, therefore, that some improvement in cancer cases has been reported when treated by liquor arsenicalis.

Arsenic, as we know, retards tissue waste and metabolism in the body, and therefore arsenic acts on the skin and other tissues beneficially by preventing the excessive loss of potassium, as well as the liquor arsenicalis actually administered in a case of cancer having potassium as one of its components.

We have seen that potassium increases the pigment in the hair and skin, and we know that sunlight by means of its actinic rays (violet and ultra-violet rays) can produce increase of pigment in the skin.

This increase of pigment by sunlight follows inflammatory action in the skin due to the chemical action of the violet rays on the skin, which causes an increase of blood to the part, and which results in a comparative local excess of potassium when compared with normal conditions of the part so affected.

If no potassium salt existed in the body, or if the body possessed no inherent means of increasing its own pigmentation, then no amount of sunlight and no amount of inflammation would increase its pigmentation.

It is not an "influence" of the sunlight, and inherent to it, which produces this effect, but it is due to something in the blood which, arriving in large quantity in the locality inflamed by the rays of the sun, tends to increase the pigmentary functions of the cells so freely supplied with potassium containing blood.

The same result can be produced in the dark, and under cover from the sun's rays, by a mustard cataplasm, which, if the skin be thereby reddened, will produce a local pigmentation in exact conformation to the shape of the cataplasm. This proves that there is some inherent quality for producing increased pigment in the body, and which appears to be potassium.

Radium and X-rays act by producing a result which scientists attribute to those rays which are situated in and beyond the violet end of the spectrum, more especially the Becquerel rays—alpha, beta, and gamma rays—these rays probably act by causing a local increase, and in comparison a surplus, of potassium salts to the part of the body on which they act. Radium and X-rays probably act on epiblastic, hypoblastic, and mesoblastic cells, and all blood corpuscles, by destroying some locally, and so permitting their potassium-nuclein compounds to be taken up by other cells which may be unaffected, and so produce the improvement which is claimed for them in their action in cancer.

X-rays, on the other hand, however, by causing excessive overgrowth, in the presence of bodily potassium deficiency, may lead to cancer formation.

Potassium, spectroscopically examined, shows a

well-marked spectroscopic manifestation in the violet end of the spectrum far beyond that shown by either calcium or magnesium.

It is exceedingly strange then that both radium and X-rays, which are supposed to benefit cancer by their violet and ultra-violet rays, should possess a spectroscopic complement, potassium, circulating naturally in the body and in close biological contact with the nuclei of the cells in vegetable and animal life. To my mind this last coincidence is somewhat more than significant.

From what has been said of potassium hitherto in this book, the artificial administration of potassium ought to benefit a case of cancer by producing a profound alteration in the condition and growth of the tumour. It should tend to arrest the progress of the disease locally; it should tend to remove its malignant nature and reduce it to the level of a benign growth. Under the administration of potassium a cancer should not only cease to grow, but should appreciably shrink, and the parts effected should in great measure return to the normal: irritation, which might be wilfully caused in the cancerous locality, should not result in cancerous increase, all ulceration should heal up, and the general health of the patient should improve.

The administration of potassium salts should increase the alleged beneficial action of radium, because the cause of the action of radium may be that it can and does utilize the potassium already present in the body, which I contend it does. The administration of quantities of potassium salts to a patient before and after the use of radium should

result in increasing markedly the benefits derived from the use of radium or X-rays.

The local administration of potassium by electric perfusion of the cancerous locality by the positive pole of an electric current passing through a suitable solution of potassium salts should prove equal to or signally helpful to the action of radium in the treatment of cancer, or may even be sufficient to effect arrest without any other agency.

In the next chapter I will discuss the foregoing actions by quoting a typical case of extensive, inoperable, and apparently utterly hopeless case of cancer of the womb.

I will also mention the results on other cases of cancer in other parts of the body and on recurrences after operation.

I will refrain from giving a list of cases, as I am not concerned so much in advertising myself or my work as in placing my results at the disposal of my fellow professionals, who will then be able to try them personally for the benefit of suffering humanity under their care, and at the same time feel that at any rate there is some scientific basis for the procedures recommended, which cannot be alleged or claimed for any of the remedies so kaleidoscopically popular and evanescent amongst the orthodox cancer "specialists" in the profession hitherto.

After all is said and done from the theoretical and inferential standpoint, there still remains the supreme and final test of "proving the pudding by the eating thereof," which we shall proceed to do in the next chapter.

Chapter XII.

THE TREATMENT OF INOPERABLE CASES OF CANCER, WITH SPECIAL REFERENCE TO THE ACTION OF POTASSIUM SALTS.

The most severe and complete test of the efficacy of any particular drug or therapeutic agent, made use of in medicine, is that it should be found to be beneficial in very advanced and extreme cases of the disease for which it is used.

For this reason I propose to illustrate the action of potassium medication on an advanced case of cancer of the womb, as the best means of bringing out the properties of potassium salts, which I endeavour to set forth in this book.

It is necessary, however, to warn anyone attempting the treatment of an advanced and inoperable case of cancer to take particular precautions against the occurrence or continuation of conditions set up by the micro-organisms usually associated with septic infection, putrefaction, and other conditions due to uncleanliness so commonly associated with advanced cancerous disease, especially in the presence of ulceration.

Many of the local conditions present in advanced and ulcerated cases of cancer are as much due to

intercurrent septic infection as to the cancerous disease itself.

Many of the symptoms and causes of the rapid decline of a sufferer from cancer into the grave are as much due to the aforementioned causes as to cancer itself; and it therefore behoves us to adopt, with the strictest precautions, every possible means known to surgical science in order to prevent the septic infection of a cancer, or terminate its continuance if already started.

This latter result is one of the justifications commonly advanced by surgeons for the use of the knife to remove the primary focus of cancer in the early stages before the occurrence of ulceration, and no doubt the contention has very reasonable grounds.

Unfortunately, as stated elsewhere, many cases of cancer come for relief when the disease is beyond all human aid, as has hitherto been the case.

The case of inoperable, ulcerated, and very far advanced cancer, which I am now about to quote in illustration, presents a history very common to a great many cases.

The patient usually introduces himself or herself with the following statement:—

"Up till now I have seldom seen a doctor since childhood; in fact, I have never seen a doctor, nor have I been ill in any way whatever during the last five (or ten) years."

The above is very interesting, and goes to prove that the patient has had no opportunity of obtaining from any member of the medical pro-

fession a course of treatment with potassium salts, administered perhaps by the physician for "gout," "rheumatism," or any other likely or similar affection.

Further inquiry usually elicits from the patient that they are not particularly fond of vegetables, and that the vegetables which they eat are those usually cooked by having nearly all the natural potassium salts boiled out of them.

If the patient is a man, one may elicit the fact that he never drinks natural wines, seldom touches malt liquor, but confines himself, if sufficiently well off, to whisky and soda water, of which he imbibes a fair quantity.

Careful inquiry, especially amongst women who do not care for vegetables, will elicit the fact that every now and then they will confess to being attacked with an uncontrollable craving for fruit, of which they have availed themselves from time to time.

The foregoing seems akin to the habits of dogs and cats in domestic life, described in a previous chapter of this book. Here also there seems to be a natural craving for salts of potassium, always present in fruits of every kind.

This instinct of both human beings and dumb animals to obtain such food as invariably contains potassium is noteworthy. It has no reference as to whether the food be cooked or uncooked, but being a natural instinct is gratified in a natural manner, and manifests itself for articles of food in the natural state; because it must be remembered that cooking is an artifice adopted by man in the

preparation of food, and, provided the cooking is correctly carried out, there are many more advantages in consuming the cooked than the raw article of diet, more especially as regards a vegetable diet, which is liable in the raw state to convey infection of all sorts, and so cause many other diseases.

It may be found also that a cancerous person has been a free eater of much cooked and stewed meats, which means that to a large extent the meat has had its potassium salts extracted therefrom. The meat-eater is no more liable—because of meat eating—to cancerous growth than the vegetarian, as shown elsewhere in this treatise; but the meat-eater requiries more potassium salts in his vegetables, and more vegetables, than a person who eats sparingly of meat, or of those articles of diet of an albuminoid nature which do not contain "waste product compounds" such as eggs, milk, cheese, and similar products.

When treating an advanced case of cancer, or indeed a "recurrence" not suitable for operative aid, the question of diet need not in any way exercise the calculation of either physician, surgeon, or patient, as the sufferer may be permitted to partake of any and every article of diet which their capricious appetites may invite them to; because if the various reasons set forth in previous chapters hold good, then the artificial administration of sufficient potassium salts will meet every circumstance and existing condition.

The amount of sodium, calcium, and magnesium, gaining access to the patient's body in food and

drink, and the amount of the same salts being lost and excreted from the body, may be left to take care of themselves. It must also be borne in mind that the administration of potassium salts in appreciable quantity to a victim of cancer, or even to a healthy person, has the effect of at once altering the attitude of the tissues of the body to the earthy salts by increasing their expulsion, as I have carefully set forth in a previous chapter.

The following is a description and course of an actual recent case of hopelessly inoperable cancer, which has been subjected to the potassium treatment with and without Radium, and by "electric perfusion" of the locality of the cancerous growth, without operative removal of any part or organ:—

CASE OF INOPERABLE CANCER TREATED BY POTASSIUM AND RADIUM.

A.B.C. Aged 59 years. Widow. No children. Saw me early in this year, March 6th. The history she gave was that she had never seen a doctor for many years, nor had ever had occasion to take a dose of medicine during that period. She stated that she did not care for vegetables and seldom ate them. She preferred meat and that well-cooked, or stewed.

She confessed that occasionally she was attacked during the last few years with occasional craving for fruit. As regards the cause why she consulted me, she stated that she had never felt a pain or ache until she suddenly, without any warning, was the subject of two or three severe bleedings at intervals of a few days.

There was, however, absolutely no pain or discomfort except when subject to examination.

Immediately before seeing me she had consulted a well-known expert in diseases of women and cancer, in Birmingham, and who had told her that she was the subject of far advanced, ulcerated, and inoperable cancer of the womb, and that she had better sell everything she possessed, make her will, and settle up her affairs, as she would be dead within two months from February, the date when she saw him. She was naturally very despondent, hopeless, and alarmed. I examined the patient, who complained of pain as a result of examination, which also instantly produced a free and smart bleeding from the locality of the cancer. The cancer was probably one and a half to two years old. She was thin and ill, sallow of skin and wrinkled, and looked much older than her real age. Her hair was snow-white and her nails thin, cracked, and brittle. There was some sugar present in the urine.

The cervix was enlarged, tuberous, and ulcerated; presenting a deep ragged ulcerous gutter in its posterior lip, the whole of the pelvis was infiltrated, and the organs were immovably fixed by cancerous infiltration. The anterior and posterior vaginal walls were infiltrated and nodular; the base of the bladder was undoubtedly affected. The womb could be made out through the anterior abdominal walls, as an enlarged nodular irregular organ somewhat fixed in the abdomen. The inguinal glands on both sides were very much involved and apparently very infected. This case was about as hopeless and as terrible an involvement of cancer as I have ever seen. The patient inquired if an operation would relieve her, and I replied "Possibly, but in only one way";

because the extent and the terrible nature of the operation needed, would be such that it would very probably kill her from shock, either on the operation table or immediately afterwards.

She asked if I was willing to attempt it; and I replied that I was willing to do so if she desired it, but that I did not think it would be the slightest use, as the cancer could not be entirely removed and would immediately recur, locally and elsewhere.

She inquired if anything else could be done; and after discussion, and carefully explaining my reasons for the procedure which I proposed to adopt, and pointing out to her all doubts and uncertainties connected with the treatment of inoperable cancer; I advised a prolonged course of heavy doses of suitable potassium salts; and then when her body and the diseased area were thoroughly saturated, that either X-Rays or Radium should be used with the view of "fixing" the circulating surplus of potassium locally. Eventually it was decided that Radium as being the most controllable agent should be applied.

The patient was put on a course of potassium citrate and potassium phosphate, 90 grains per day, accompanied by strophanthus and nux vomica, until by March the 22nd she began to complain of palpitation of the heart, and her urine was freely loaded with phosphates of calcium and magnesium. The glycosuria previously present was now practically absent. The Director of the Radium Institute in London very kindly saw her in consultation with me early in March; and he also noted the conditions described above, and particularly the difficulties of examination and the liability to free hæmorrhage; which however had ceased to be spontaneous since the commencement of the potassium treatment. The inguinal glands were much smaller.

The mucous secretions of the parts had by this time improved to a large extent, and the patient's condition and appetite had become markedly improved. On March 23rd, a tube containing Radium Emanation was placed by me in contact with the cancerous organ, and left there for twenty-four hours, when it was removed. An interval of rest of twenty-four hours was now allowed to elapse and the potassium administration was increased to 180 grains within the twenty-four hours. At the end of the foregoing period, the radium tube was again placed in position and left there for another twenty-four hours, and then finally removed, and potassium was given during the next twenty-four hours to the amount of 180 grains, when the dose was allowed to lapse back to the 90 grains per diem previously mentioned. The total time-dose of radium, during the two periods, was 2482 milligram-hours. When I first saw the patient on March 6th, she had a uniform parenchymatous enlargement of the thyroid gland.

During the administration of potassium salts from March 6th to March 23rd, the enlargement of the thyroid gland had been steadily and rapidly diminishing.

After the application of Radium Emanation, the diminution in size of the thyroid gland in the neck was most marked, and I attribute this to the heavy loading by potassium salts during the radium treatment; and also to the action of the radium in making use of the potassium salts in the blood and so causing a change in the tissues, not only locally; but also in so distant an organ as the thyroid gland, situated so far away from the sphere of action.

Immediately after the potassium-radium treatment, the mucin present in the secretions markedly increased in quantity. The patient was now allowed to return home into the country, and to attend to her affairs as she had ceased to have spontaneous hæmorrhages, and although subject to mild attacks of palpitation of the heart, was very much better in her general health and appetite, and was able to attend to a very trying and important establishment in the Midlands.

After six weeks' holiday, early in May, the patient returned to town and saw me with regard to her condition. She had been steadily taking potassium salts from March 6th until then. She informed me that she felt better and stronger every day; that she had seen no hæmorrhage; and that, as far as she could tell, there appeared to be nothing the matter with her except an occasional intermittent discharge.

On examination the previous condition described had apparently been almost entirely remedied, the cervix was reduced in size, and it was not possible, by manual examination, to detect any evidence of ulceration. The inguinal glands were almost imperceptible. The infiltration in the pelvis had enormously decreased, and the parts were unrecognisable as the same which had been examined on March 6th. She was seen on May 21st by the Director of the Radium Institute, to whom she expressed herself as feeling much better. It was decided, in compliance with the patient's own request, that as she had appeared to improve so much during the last two months, that further potassium-radium treatment should be carried out.

The former potassium administration which had been continuously pursued, was now increased to 180 grains per diem. It was found, however, that the condition of the neck of the womb was such that the healing and contraction of the entire region had progressed so much that the cervix was in a condition of firm stricture, and that the passage of an instrument into the cervix was difficult, and was followed by evidences of pent-up discharge.

The patient was submitted forthwith to the action of a radium tube for twenty-four hours. She was then put under chloroform by Dr. P. H. Parsons, and the cervix was dilated and freely curetted, and the body of the uterus also explored and curetted. Much muco-pus which was imprisoned within the womb was evacuated. At the end of the operation the Radium Emanation tube was passed, for the first time since the commencement of her treatment, right into the body of the cervix, and left there for a further twenty-four hours. At the end of that time it was removed. The total time-dose of Radium Emanation was 2415 milligram-hours.

The patient was ordered to continue her potassium treatment, and went away to the country until June 10th when she returned to town and expressed herself as feeling "quite well, much fatter, and enjoying life and attending to her affairs." She was examined by me and I was surprised to find little or no evidence of there having been cancer of the womb. No inguinal glands could be felt.

She was requested to see the Director of the Radium Institute, who examined her thoroughly, and expressed his unbounded surprise at the apparent state of improvement in the direction of arrest of disease which had been able to supervene in so short a space of time, from March 6th till June 10th.

He verified my observation that the cervix had become small and apparently healthy, that all ulceration had healed up and that the mobility of the organs in the pelvis had been nearly completely restored, that the infiltration of the vaginal walls and base of the bladder had quite disappeared; he expressed himself as much encouraged, as surprised, at the apparent benefits derived from the combined potassium-radium treatment.

Here then was an advanced case of cancer, pronounced to be hopelessly fatal by a well-known and independent specialist on women and cancer in England, yet who after two months' continuous potassium treatment, with radium to fix the potassium in the cells, presents all the appearances, if not of cure, then of undoubted arrest of the disease, with almost complete retrogression and resolution in the tumour and surrounding cancerous infiltration. There is now no glycosuria.

Since the operation, by which a large quantity of pent-up secretions were liberated and removed, there has been no evidence of their return or accumulation, and emphasis is laid on the fact that under potassium the parts have twice recovered from a condition in which the tissues have been twice denuded.

The first condition of the denudation was due to the natural ulcerative process commonly resulting in advanced cancer; this had become healed and was covered over at the time of the operation of curetting. The second denudation of tissue was done by the curette; when some of the tissues of the cervix were severely scraped, and indeed the whole of the internal uterine surface. In spite of the above, the whole of the area disturbed has a second time settled down and healed up.

The above shows that under the potassium treatment,

interference with the cancerous tissue appears to be vastly more safe, and very much more salutary to the patient, than could possibly have been the case under former conditions of treatment. From the time of the curetting in May, until she was seen by the Director of the Radium Institute and myself on June 10th, she had been treated by local electrical "perfusion" of the tissues with potassium salts. At the present time this lady, who was apparently doomed, is as far as we can judge in a condition of such improved health, with so great a disappearance of the local disease, that if one is not justified in using the word "cure," at any rate, the term "arrest" of the disease is more than justified. If, as I believe, potassium is one of the wards to the key of the chamber of secrets pertaining to cancer, then the continued administration to this lady of a small quantity of potassium will serve to maintain the condition of arrest indefinitely, or at least for a very long period. A continued increase in health and weight, with marked gain in strength, can be confidently looked for and will undoubtedly occur. The increase in weight under electrical perfusion is most noteworthy, being either due to the improved assimilation under potassium salts, or to the action of the electric current on the nerve-centres causing more regular tissue metabolism. The palpitation of the heart under potassium appears to be a symptom of hyper-thyroidism due to the action of potassium on the "heart-accelerating" functions of the thyroid gland. Her skin is as fresh now and as rosy and pink as that of a girl of eighteen summers, and her hair and nails are much improved in appearance and colour. A striking fact is the almost total disappearance of all wrinkles from the skin. Lecithin, in the form

derived from the yolks of fresh eggs, was administered to this case from the commencement. Fresh, new milk for the same reason is also useful. Yeast may prove useful also for the sake of the nucleins and potassium-nuclein compounds, in which fresh yeast abounds.

No improvement of a cancer case should be reasonably expected as the result of potassium administration under a month or six weeks.

During the treatment of a case of cancer by potassium the surface of the mucous membrane can, by various agents such as alum, acetate of lead, sulphate of zinc, and other well-known exfoliants of mucous surfaces, be made to throw off large and extensive epithelial casts. The casts are composed of the epithelial cells of the upper layer of the mucous membrane over the cancer and in close proximity to the ulcerated margin, and are produced without any tendency of the cancer to spread locally and superficially.

The ulcerated surface can be irritated by such preparations as iodine or iodized phenol without fear of doing harm; indeed, it appears that the use of the above substances is quite as beneficial under the circumstances as they are in conditions of health, which has not hitherto been the case when treating extensive cancerous disease. Irritation therefore, *per se*, is not the only cause of cancer, though it might be called the actuating cause, and the loss of alkaline balance the predisposing cause.

It would appear that one of the methods by which nature endeavours to rectify the disease is by the free and unlimited local exfoliation of old

and effete epithelial tissues. The ultimate result however, is of most importance, as the ulceration rapidly closes in, and what appears to be a healthy state of the tissues seems to supervene.

For the purposes of maintaining antiseptic conditions such applications as aristol, iodoform, ichthyol, acetate of lead, alum, sulphate of zinc, etc., may all be used either in the form of pessaries, or as solutions for injection. Chinosol will be found to be a very useful local antiseptic for douching purposes, as it is not poisonous and causes no irritation, and may be used indefinitely.

A CASE OF APPARENT PREVENTION OF RECURRENCE BY POTASSIUM.

M.B. Aged 65. *Married. Mother of six children. Was operated upon for cancer of the breast nine years ago by a well-known London surgeon; she belonged to the stout, robust, red-faced, gouty, plethoric type of elderly woman, whom the late Sir William Mitchell Banks indicated as very likely to contract cancer.*

She was, however, a typical example of the person whom I assert, for the same reasons, to be most benefited by the administration of potassium salts.

Shortly after the operation for removal of her breast, she came under my care for another complaint in which I used potassium salts continuously and freely. At the present time she is alive and in good health, with no evidence of the return of the disease.

Some persons would claim this to be evidence of the success of the knife, unfortunately the operation which was done for removal of her breast was an old form of a

very incomplete type of operation in which the disease invariably returned in from two to three years.

At any rate as she has been taking potassium off and on for nine years, and has escaped recurrence of cancer after a type of operation which is invariably followed by recurrence, it is not too much to expect that possibly her continued immunity is due to the biological action of potassium on cancer cells which must undoubtedly have been left behind at the time of the operation.

Why should an appreciable interval of time elapse between an operation and recurrence of cancer in the operation wound? The cells of the cancer which recurs are always identical with the cells of the cancer which was removed, therefore it seems more than likely that cells which may have been cancerous or likely to become cancerous have been unavoidably left behind by the operator. Nevertheless these cells seem to lie quiet in the body for many years and then commence the cancerous process in the locality of the operation scar and are then termed "recurrences."

Too often fortunately, after an operation for cancer, does the disease recur within a few weeks along the scar of the knife or in the stitch holes. This shows that the skin had become affected by the original cancer cells.

What valuable deduction can be drawn from the foregoing? It is this: that owing to the inflammatory reaction and the increased access to the parts of blood and fluids of the body, containing even a small amount of potassium, which occurs immediately after an operation, I believe that cells

which are cancerous, or liable to become cancerous, are rendered benign and quiescent for the time being, and will remain so as long as the patient's general proportionate bodily supply of potassium salts keeps up, and on the day in which it falls markedly, the cancerous process will resume its methods in certain cells left behind at the operation, and so we have what is known as "recurrence."

The question might be asked, Why then, if cancer is produced by a faulty balance in the alkaline salts of the body, does not cancer break out as a general disease all over the body? The reply I believe is as follows:—

If the potassium balance in the later period of life becomes such that a locality, subject to exhaustion by irritation of any sort or overgrowth as the determining or actuating factor, becomes the subject of cancerous change, some compensatory influence in the body partially restores the alkaline balance as regards earthy salts, and so protects other areas, but is never sufficient to allow a wholesale rectification of a cancerous locality when once the process has begun.

Elsewhere in this book I have shown that cancer tends to recover and progress at the same time in different parts of the same tumour in the same person.

Cancer has been known to undergo spontaneous cure, apparently without any medical treatment. This must be due to some natural agent, force, or power, present in the body but subject to variation. I do not believe that it can be a ferment or enzyme present in the blood or tissues, or secreted by any

particular organ, for the reason that (in spite of certain experts and researchers in cancer to the contrary notwithstanding) all the organs whose ferments they allege are useful in the prevention and cure of cancer, are themselves peculiarly liable to cancerous change in their own tissues.

Surely, if the powers of these organs lay in the direction of cancer prevention by their own secretions, then cancer should never occur in their own cells, because at no time before the commencement of the cancerous change, can it be imagined that their secretions and fluids are totally devoid of the cancer preventing ferment, which would be an absurd and unthinkable freak of nature.

On the other hand, the varying proportions of potassium and earthy salts which I have shown as likely to occur naturally in the body, and the fact that potassium is also vitally concerned in the work of all cells, makes it not beyond the bounds of possibility that in the variation in proportion of the alkaline metals we will find the key to the cancer problem.

It has occurred that a surgeon has attempted to remove an internal cancer, and has separated the tumour on five of six sides; but has found that, owing to the vital connexions of the cancer on the sixth side, he was compelled to abandon the attempt at removal. Nevertheless, after this apparent failure, the cancer has been known to spontaneously disappear within a short period after the operation.

The explanation which I would offer for this occurrence is that owing to interference with the

circulation of the parts, the cancerous tissues have been subject to prolonged local stagnation of potassium carrying compounds in the blood and fluids, and so these have beneficially influenced the tumour, and led to its absorption or destruction by the so-called "natural forces" of the body.

APPARENT DISAPPEARANCE OF "RECURRENCES" UNDER POTASSIUM SALTS, WITHOUT RADIUM.

M.G. Aged 48. *Widow. Mother, one child. Red-faced, stout, plethoric, and gouty. Was operated on for cancer of the right breast, and the most extensive operation known to surgical science (Halstead's operation) was performed. Six months afterwards, six large nodular recurrences made themselves evident in the scar. She was treated by the local electrical "perfusion" of the nodules and tissue round about them with potassium and also by the administration of potassium by the mouth, with the result that the nodules rapidly softened and have apparently disappeared up to the present time, which is now six months ago.*

This case was not treated with Radium at any time, but had iodine injections under the skin. She has put on weight, and her skin shows the same improvement as that of A.B.C. Two of the nodules ulcerated and were curetted to remove the sloughs, and at once healed up healthily under potassium treatment. At present only slight scars remain to mark the locality of the recurrences.

POSSIBLE UNINTENTIONAL ARREST OF AN EPITHELIOMA BY POTASSIUM SALTS ADMINISTERED FOR OTHER REASONS.

A.L. Male. Aged 60. *Was seen, and complained of obstruction in swallowing. On examination he showed that he was possessed of a stricture of the gullet, midway between the throat and the opening into the sac of the stomach. A series of bougies were passed in order to dilate the stricture from time to time, and he was told that the obstruction was probably malignant at his age, and that it would most likely prove fatal in an appreciably short time.*

He had been losing flesh rapidly, and showed every clinical sign of cancer of the gullet. He was given potassium salts for another ailment, and refused to have any more bougies passed, as he alleged that his swallowing had suddenly become easier, and was getting better every day without any mechanical interference on my part.

He continued to take potassium, off and on, for his stomach and liver; he passed through a very grave attack of double pneumonia three years after that, and seven years from the date of his supposed cancer of the gullet he died from a hæmorrhage in the brain without ever having any more symptoms from the trouble which had existed in his gullet.

Was this a case of unwitting and unintentional arrest of an epithelioma of the gullet by potassium salts given for other reasons?

Within the last two months I have operated on

an exceedingly large and extensive cancer of the breast in a comparatively young woman, and the most severe operation that could possibly be done was accomplished. The skin over the tumour appeared to be extensively infiltrated. In the natural course of events I do not see how this poor creature can escape recurrence sooner or later, in spite of what has been done, and she has been warned of this liability, and is now undergoing treatment with potassium in order to prevent recurrence. I shall watch her career with the utmost interest and hope. My reasons for confidence in her case are that, although she possessed a very virulent and extensive cancer of the breast, she showed signs at the operation that her cancer was amenable to potassium treatment. For a fortnight before her operation she was put upon the treatment by potassium salts, and then at last decided, on advice, to have her breast removed, which I did by Halstead's method. Before the potassium treatment, the glands in the axilla were very much enlarged and showed signs of cancerous infection At the operation, after a fortnight's treatment by potassium, it was not possible to find any lymphatic glands in the axilla by feeling for them, and after the glands were removed, only three the size of a pea were found, with a few old, dead, and whitened cancer cells in them (under the microscope). There was then no sign of hyperplasia of the glands, showing that the potassium salts tend to lessen the need of the presence of white blood corpuscles in the glands at any rate.

There are at present under treatment, many

apparently hopeless and inoperable cases of cancer, including lay persons, and doctors or their relations. Some of them are very much improved, and their further progress will be a source of great interest and solicitude to the author. It is, however, as yet rather too early to say much more.

With reference to the treatment of cancer of the mesoblastic tissues, or sarcoma, it is best to commence by administering in large doses the four alkaline minerals of the body together, because sarcoma occurs mostly at the period of life when calcium and magnesium are most needed and most usefully metabolized. Ultimately, according to the particular tissue affected, one or other of the soluble alkalies together with one or both of the alkaline earths will probably prove serviceable with the same technique as recommended for potassium.

Although epiblastic epithelioma has so far yielded to treatment with potassium, as the only artificially administered alkali, it is probable that in hypoblastic epithelioma one or other of the remaining three alkalies, sodium, magnesium, or calcium, may be necessary in order to maintain equilibrium and stability of metabolism at the same time that potassium is used. Certain organs also may, when the subject of cancer, need the administration of one particular alkali more than or as well as the others, or combinations of the four alkaline metals of the body.

Concerning the administration of stimulants and natural wines to sufferers from cancer, the following will be of interest :—

Certain experts in cancer, for want of being able

to find a cause for the disease, have from time to time sought to prove that the cancer was due to the consumption of too much sugar. Actually, my own researches and opinion lead me to assert that the very contrary is the case. If we are guided by nature, we cannot go wrong in any matter pertaining to health. Sugar has been universally placed in vegetable life for the food of animals, and is to be found in all fruits and vegetables. The negroes of the West Indies on sugar plantations, who have in the past shown a singular immunity from cancer, have always been most prodigious consumers of crude sugar. Crude or brown sugar contains a large proportion of potassium salts, which is for the most part removed from the white or refined article. Sugar does not predispose to, or cause, cancer. No cancer case therefore need be deprived of sugar or much needed stimulants.

A note of warning is very necessary from the author to all concerned in the treatment of cancer as outlined in this book. Because the author has worked in the direction of endeavouring to find the most likely cause of cancer, and therefore its probable and possible therapeutic treatment, apart from the use of the knife in the early stages, there is no reason why he need be regarded as anathema and unworthy of a hearing by members of his profession who possess a more "orthodox" and "conservatively-defined outlook."

Because any other member of the medical profession should decide for himself, or on account of the "general consensus of expert opinion," that cancer

is quite incurable except by the knife, it by no means follows that this really is the case. Nevertheless, the above is the almost universal opinion held by the majority of the medical profession, and as such should be taken into serious consideration. The treatment of cancer by a therapeutic agent which can be used by any competent and intelligent doctor, is not a matter which would lead anyone to imagine that the author of this book was in any way materially interested except from a humanitarian standpoint. Whether the potassium treatment of cancer is successful or not in the long run, is of no material advantage to the author; but for the sufferer from cancer, on the other hand, it is a matter of life and death : it is for him or her of paramount importance, materially and abstractly, first and foremost on this earth. As such therefore, from the point of view of the sufferer from cancer, it is inhuman for anyone to seek to introduce any element of professional interest, or prejudice, or predilection.

There are many in the medical profession who will at once refuse to listen to or attempt any form of treatment other than that recognized and smiled on by the "experts" in cancer, or rather cancer as it has hitherto existed and been treated.

There are those in the profession who will attempt the treatment at the earnest request and pressure of a dying man or woman, and only half-heartedly carry it out.

There are those in the profession who are of an introspective and pessimistic turn of mind who will start by saying it is no good, will honestly believe

it is no good, and will ultimately prove themselves to be quite right.

There are those in the profession, very few thankfully, who won't be bothered and who don't care.

There are those who take a delight in proving everyone else but themselves to be quite wrong.

There are those in the profession who, with the best of intentions and otherwise, spend their time in eagerly misrepresenting affairs and other persons.

There are others, very many, whose name is legion, who will strive hard, and worry, and fret, and eagerly watch, and become over anxious, and earnestly try and give the method a fair and just application (not *trial*).

To these latter the author desires to address a few remarks for guidance, based on his own opinion and experience. The author believes that it is better to remove a primary focus of cancer by surgical operation, than to let it remain as a source of possible future renewal of the disease. The secondary nodules in the internal organs, the recurrences after operation, and lymphatic glands beyond reach, are what is aimed at in the potassium treatment.

A cancer nodule can remain quiescent and harmless for many years, and may cease to be a cancerous nodule even though as a nodule it may not entirely disappear and leave no trace of its previous existence.

Quite large nodules of recurrent cancer (after operation) have disappeared under the potassium treatment, leaving only the faintest trace of their

existence. It takes a long time for all trace of a previous nodule of cancer to utterly disappear. The result of years of potassium starvation are not removed in a day.

The fibrous framework of a cancer tends more or less to persist for a considerable time after the cells have become harmless and quiescent or have disappeared therefrom. A cancer that has ulcerated or been scraped or curetted will heal over under the potassium treatment. All usual aids to health, and to heal wounds and ulcers, and antiseptic precautions, must be made use of, and "mono-pharmacy" eschewed as a modern therapeutic curse.

Remember that a cancer case is as responsive to treatment by iron as any non-cancerous case of simple anæmia.

The general health of a patient is the first thing to improve. The colour of the skin first, then the sense of feeling stronger and better, then the tumour will be noticed to slowly diminish in size, glands will begin to disappear, and as a rule will do so utterly.

A cancerous nodule will disappear the more and more slowly the nearer it comes to extinction; it diminishes in size at first more rapidly than towards the end.

A cancerous nodule takes some time to grow and become perceptible—perhaps one or two years. It will therefore take an appreciably long time to diminish and disappear.

Change in the cancerous nodules cannot be expected before six weeks' treatment, though occasionally it can be seen sooner.

Because some thickening or trace of a previous cancerous growth can be felt, it does not follow that the locality is still cancerous.

If the appetite improves, the skin improves in colour and consistency, the hair darkens, and the patient puts on weight, and feels better and is stronger, and the cancerous nodules show even the very slightest change—then "carry on" hopefully!

On no account pay undue attention or become anxious concerning a patient's complaint of "palpitation of the heart"—it is a small matter. Better palpitation of the heart, which ceases when the need for heavy doses of potasssium has passed away, than failure and death on account of stupid and unnecessary timidity in treatment. Let the above symptom guide treatment, but not deter in any way.

Push potassium, if need be, mercilessly, and at the same time support the heart with strophanthus and strychnine; opium (Bimeconate of morphine) will control pain and diarrhœa, or strophanthus-hyperperistalsis of bowel. Potassium phosphate can be given in as large a dose as 240 grains in one dose, once a day, without doing any harm.

The heart rapidly recovers its normal action and full strength directly the need for very large doses of potassium passes off.

A moderate daily amount of potassium citrate and phosphate, with a weekly dose of five grains of potassium iodide, or a few drops of plain iodine, will suffice to keep an arrested case of cancer *in statu quo* and promote further improvement and return to health. Pay absolutely no attention to,

and ignore totally, all matter extant in text-books on therapeutics and materia medica concerning prevalent opinions on the harmful effects of potassium salts or what they are or are not supposed to do—the information found therein is for the most part erroneous and misleading.

Remember that the author speaks entirely of hopeless, far advanced, totally inoperable cases of cancer and recurrences after operation.

If potassium is used for the first time five minutes or so before death, allowance must be made for the "brevity of the exhibition," and needs no learned disquisition to a medical society or a medical publication, in order to prove the futility of such a procedure.

Push potassium first, and push potassium last; and the result will take care of itself, and does not depend on any virtue of the author real or imagined. All difficulties of technique and treatment can be overcome by an adequate admixture of "brains," and other alkalies.

LOCAL ELECTRICAL PERFUSION.

Potassium can be administered locally as well as by the mouth. A suitable solution such as one of potassium phosphate, thirty to sixty grains to the ounce, rendered slightly alkaline by the addition of three to five drops of the liquor potassæ in each ounce, is that used by myself.

This solution is used in connection with the positive pole, because potassium is an electro-positive metal and tends to travel from the positive

pole towards the negative pole. If then the positive pole accompanied by a solution of potassium is introduced into the neighbourhood of a cancer, on turning on the current a stream of potassium will be carried through the tumour towards the negative pole which might be placed on any other part of the body.

By this means potassium can be made to pass in any direction through a cancer or along the lines of the lymphatic vessels and glands by simply moving the negative pole from place to place, either directly over the cancer or along the lymphatic lines. Simple injection of a solution of potassium will not suffice, as the "dispersing" effect of an electric current, in all directions with and against and across the currents of the natural fluids in the tissues, are not otherwise obtained. This is important.

I use the term "electrical perfusion," in preference to ionization or kataphoresis, because it is possible, by using a hypodermic syringe filled with sterilized potassium solution as the positive pole, to inject the neighbourhood of a cancer, at the same time that an electric current is passed down the piston rod of the syringe, through the fluid in the syringe, and along the needle and out into potassium solution which has been purposely expressed into the tissues (see Figure II.).

For "perfusion" of the cervix and uterus itself the following simple apparatus is all that is necessary:—a long vulcanite vaginal tube, having a lead terminal with the usual holes at the end, and having a copper wire passing along its

interior, is introduced, and one or two drachms of a solution of potassium is passed down it. The positive pole is now connected with the copper wire, and the negative pole is used on the surface of the abdomen (see Figure I.).

Electrical perfusion of other parts of the body such as the mouth, stomach, colon, and rectum can easily be performed. It may, however, be necessary as time goes on to take surgical measures in order to reach other parts of the large intestine, gall bladder, stomach, kidneys, or pancreas (see Figure III.).

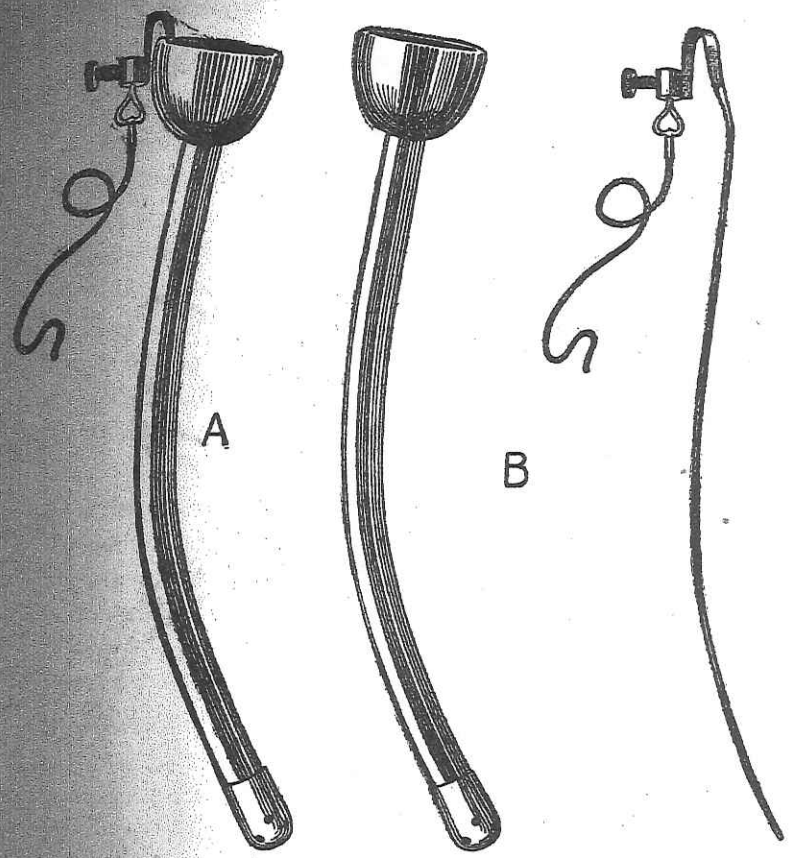
Although iodide of potassium can be used by the mouth with benefit to a patient suffering from cancer, and although the iodides of potassium may benefit a co-existing enlarged thyroid gland, it would appear that the potassium is of as much value as the iodine.

It is not necessary, however, to use potassium iodide for electrical perfusion, and to bear in mind that iodine is likely to be liberated, and so cause irritation and harmful local reaction at the time when it may not be desirable to disturb the tissues unduly.

Electrical perfusion with a potassium electrolyte fluid seems to cause a marked and rapid gain in weight in every patient; this may be due partly to the potassium salts acting on the blood and tissues, partly to the improvement in the cancer, and partly to the effect of the electricity on the nerves and ganglia of the internal organs.

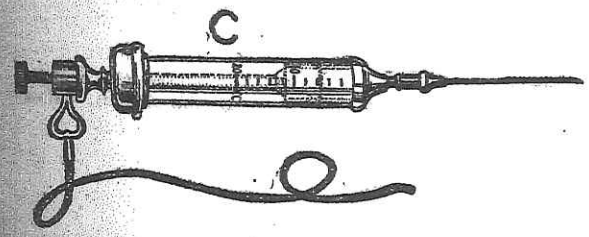
A constant current (galvanic) battery is the best means of electrically "perfusing" a cancer

FIG. 1.



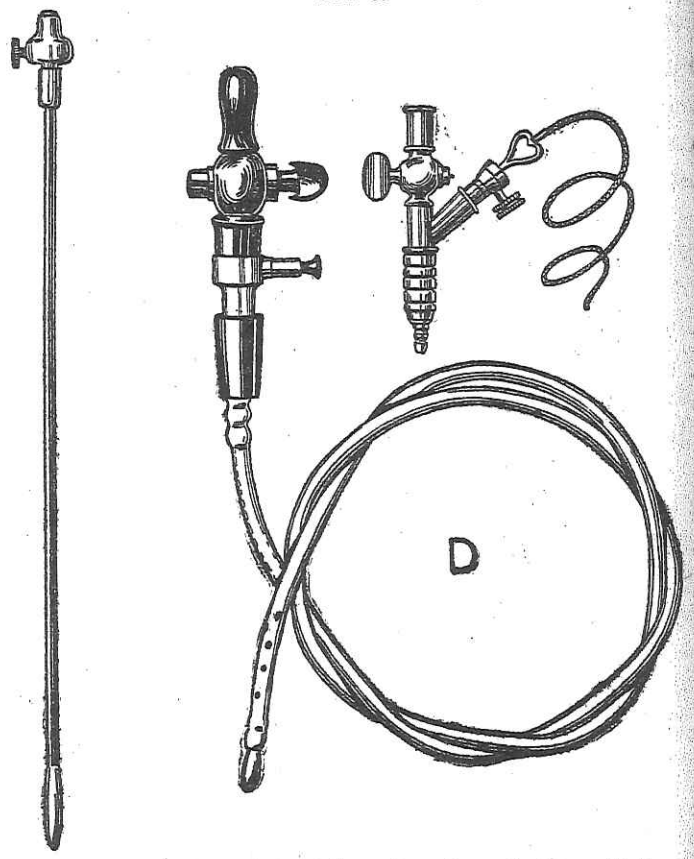
A. Vaginal tubular electrode, with copper wire style for "perfusing" the vagina and uterus with potassium electrolyte solution. B. Copper style with union screw for positive pole, and vaginal tube without copper style.

FIG. 2.



C. Hypodermic syringe, with special copper piston and union screw for "perfusing" cancerous nodules with potassium electrolyte solution for positive pole.

FIG. 3.



D. Irrigating and "perfusing" electrodes to be used with positive pole of constant current for treating the rectum, colon, stomach, and bladder.

Made by H. L. Trudgett, Surgical Instrument Maker, 26, Darnley Road, Hackney, London, N.E. Telegraphic Address: "Trudgett, Hackney."

case locally; but the patient should be duly informed that no sensation or "thrill" will be felt whilst the battery is acting, as most lay persons accustomed to the popular electric (Faradic) machine will imagine that because an electric battery does not cause a "thrill," that therefore it is no use and that the medical attendant is merely fooling them, or is himself a fool who does not know what he is about.

An interrupted (or Faradic) current can be used, but must not be strong, especially in cases of internal cancer, as the oscillation of the current causes much discomfort to the patient. In this latter case either pole can be used, as each pole is alternately positive and negative in turn as the current oscillates.

A very efficient ten-celled constant current battery can be obtained from the Sanitas Electric Company of 61, New Cavendish Street, London, W. (Telegraphic Address: "Lumignons, Wesdo, London) for about £3, the cells of which will last for about four months.

Chapter XIII.

PROBABLE FUTURE POSITION OF THE KNIFE

The author of this work, speaking as an operating surgeon, and one who continues to use the knife in suitable cases, is painfully conscious that any cure for cancer, which is really a cure, must comprise a successful treatment of the most advanced and hopeless cases as well as the earliest and most remediable. Further, the cure for cancer when discovered must prove its efficacy by preventing the occurrence of the disease, which will be the supremest test of efficiency.

Supposing a cure for cancer were to be discovered to-morrow, it will never be that the knife as a means of treatment of cancer will ever be supplanted, however weak and broken a reed it may prove. The knife will have to be resorted to on many occasions, even after we understand the true cause, and have successfully devised a means of checking or preventing a cancer at any stage.

The reasons for these statements are that wherever a cancer has grown it will leave ineradicable traces of its existence, and it will not be the cancer itself which will then have to be removed by the knife, but it will be the damaged part consequent on the cancerous growth which

may have become arrested that will require the surgeon's aid. Let me explain. The tube of the intestine may have been the seat of a cancerous growth, which may have been arrested and rendered innocuous, nevertheless the tissues remaining as a result of the previous existence of the cancer will by contraction lead to constriction and stoppage of the flow along the intestines of their contents.

The surgeon will have to step in here and remedy the condition which, even though the cancer had ceased to be a danger to life, yet life would be lost purely on account of the mechanical result of the remains of a growth which, once upon a time malignant, had as a result of successful treatment become biologically harmless though mechanically dangerous and menacing.

Numbers of situations in the body can be enumerated in which occasions will arise where a pre-existent cancer which has been cured, will leave mechanical disabilities which the surgeon's knife will be imperatively called upon to remedy.

This, however, will not, and can never, constitute a claim for the knife as the ultimate real cure for cancer, although no sane person will deny—in a limited number of suitably early cases of cancer, occurring in organs which the surgeon can safely attack and apparently remove the disease—that the knife is at present the only means whereby we can attempt to cut short a disease, which when once beyond a certain well-known limit places the knife, as a cure for that disease, entirely out of court. It also brings every operating surgeon in charge of an

inoperable case of cancer down to expedients which, by their very empiricism and the absence of knowledge of how and why they act, place him on the same footing as that of anyone holding officially-designated irregular and unorthodox views.

No surgeon fully acquainted with the science and art of his craft, and fit to be entrusted with the lives of his fellow men and women, will expect that if a cure were found for the cancerous process, that the knife would be relegated to the instrument cabinet, finally and for ever, where cancer was concerned.

Speaking as a surgeon, whose painful duty it has been to operate for the removal of cancerous organs and parts of the body, I am compelled, whilst urgently advocating the claims of the therapeutic control of cancer, to admit that circumstances may and will arise in which life cannot be saved without resort to the knife, even in cases which have been so-called "cured"; that is, in which the malignant qualities of the disease has been "arrested" by a therapeutic agent.

Supposing that a therapeutic agent could be found which deprived cancer cells and cancerous tissue of their malignant nature, and converted them into a mere mechanical mass or benign tumour, the knife might still be necessary for their removal.

The cancerous growth, even though shrunken, may from its size and position, although it be no longer malignant but have become a benign tumour, lead to conditions of obstruction of the function of some vital organ or part.

A true therapeutic cure for cancer will be one

that will be able to deprive the cancer cells of their malignant power, or to confer on the healthy cells of the body the power to check and destroy the now quiescent cancer cell.

It follows then, that under certain conditions, an arrested cancer may, owing to the deficiency in the body of the therapeutic agent at some subsequent date, resume its malignant character.

It would be very much better then to have removed this dangerous focus in the body, if removable, than to have let it remain.

A therapeutic agent might be able by its action to render a previously inoperable cancer operable, and so permit of its removal.

It is better far to be operated upon for a cancer, against the recurrence of which we may in the future possess a therapeutic agent on which we can depend, than to be operated on for a cancer, as hitherto, with the uncertain liability of its recurrence at any future time.

It would be better to have to rely on the surgeon's knife and skill, and the earliness of the disease, backed and reinforced by a therapeutic agent which would prevent or delay recurrence indefinitely, than to rely absolutely on the unaided and unseconded efforts of the surgeon's limited powers only as hitherto.

If a therapeutic agent could be found, which would prolong the period between operation and recurrence to such an extent that life was so extended that death could occur from any other disease, unconnected with cancer, then the science of medicine will have been amply justified.

Even if after very many years of healthy and useful life, gained after an operation for cancer by the use of a therapeutic agent, death should occur even from cancer at an advanced age, for reasons which will be understood after perusal of this book, then again medical science will have been amply justified.

Apart from cancer, no horror or terror of the knife is usually expressed by patients to such an extent as to prevent an operation for the removal of a tumour which is a mere benign mechanical lump in the body.

Therefore, the peculiar horror and objection to the knife in cancer lies in the apparent uncertainty of the efficacy of the knife in any particular case, and the possibility of its failure after repeated application on various occasions, in the same case, and so lends an additional terror.

The position of the knife might even be enhanced by the discovery of a true therapeutic agent in the treatment of cancer. It might be that a therapeutic agent could be got to work more efficiently on a cancer after the knife had rendered that cancer more locally accessible; for example, in cancer of the stomach, it might be necessary to cut down on the organ and fix it to the body wall, making a temporary opening therein in order to facilitate and render more efficacious the local action of a therapeutic agent, or its actuating influence, such as radium or electrolization.

The same methods apply to the gall bladder and any part of the tube of the intestine.

If a true therapeutic agent is found, which can control the local spread and extension of cancer

cells in a wound, then one of the greatest terrors of the modern surgeon who operates on cancer will have been removed, and no further or future reasonable objection can be offered to the procedures I have mentioned above.

A kidney could be cut down upon, fixed in the wound and treated, or removed as desirable; the bladder could be opened and treated locally, or by the natural passages; the female generative organs are fortunately easily accessible per vias naturales.

It might occur, as in the gullet, stomach, bile-duct, or intestine, that after a therapeutic agent may have altered the malignant nature of a cancerous growth, that the benign, simple, but resulting fibrous scar, left therein at the site of the original cancer, may lead to stricture or obstruction of the tube, and so endanger life. The surgeon's aid and knife in this latter instance would be more than welcome and justified.

It is better to submit to an operation by the knife in such a condition for the remedy of a purely mechanical process, with the power of control possessed by a therapeutic agent over cancerous recurrence, than to be operated on with the almost certain chance of recurrence without it.

Operations for cancer in the abdomen would lose half their terrors if a therapeutic agent were found which would diminish the extent of their ramifications, or spontaneously remove distant and outlying foci of cancer dissemination, unremovable in themselves, even though the primary seat of disease be extirpable by the knife. Numbers of situations in the body, therefore, can be

enumerated in which occasions will arise where a pre-existent cancer, which might have been arrested by a therapeutic agent when found, will leave mechanical disabilities which the surgeon's knife will be imperatively called upon to remedy. There is therefore no question of the material or financial interest of the surgeon being adversely interfered with by the discovery of such a therapeutic agent. Indeed, quite the contrary will result, because there are many cases, hitherto unassailable by the knife, which will eventually call for the aid of the surgeon, with the happiest results to both operator and patient.

Complications in the treatment of cancer will arise in connection with certain particular situations of the disease, for instance, in cancer of the head of the pancreas, causing obstruction of the common bile duct. Anyone attempting to treat cancer by the methods recommended by the author, will be hopelessly handicapped, because the flow of bile into the intestine will be obstructed, the patient will lose the benefit of the nutrition derived from its normal intestinal functions, and will die from inanition and poisoning due to fermentation in the intestine.

It will probably be necessary for the surgeon to step in and effect a direct union between the small intestine and the gall bladder, and so restore one of the vital digestive functions to the sufferer, who will otherwise be hopelessly lost.

It must be remembered that contraction of the cancerous growth under potassium treatment appears to be the rule, and that therefore, if the

growth surrounds any duct or tube of the body a contraction of the growth under treatment may cause a mechanical obstruction urgently calling for intervention by the surgeon.

The author would suggest to surgeons of liberal mind, who may desire to test the mineral treatment of hopeless cancer, that they should modify certain of their operations hitherto undertaken for the relief of cancer of the lower bowel. Colotomy, as now performed, aims mainly at preventing any further use of the part of the bowel below the cancerous obstruction, and as such, supposing a pre-existing cancer were to become arrested, the unfortunate victim would be doomed to a more prolonged life with an incurable colotomy wound, only remediable at great risk to life.

On the other hand, if the older operation of merely attaching the bowel to the abdominal wall and making an opening be adopted, in the event of the lower bowel having its functions restored, the patient will be much better off, and the colotomy wound may be allowed to close or be closed much more easily and safely. The author particularly lays emphasis on the above, because at the present moment, he has under treatment a case of cancer of the bowel, on whom "non-spurred" colotomy has been done.

After three weeks' treatment by potassium by mouth and local electrical perfusion, he reports the free and easy use of his normal alimentary canal, with the cessation of all bleeding and suppuration, and the improvement of a very cancerously infected colotomy wound, in which all suppuration has

ceased, the patient being sufficiently well to travel about England and attend to his business. To quote his own words, "I have put on seven and a half pounds in three weeks, and I have improved in appetite, health, and strength out of all recognition."

The foregoing case was operated on (colotomy) for hopeless cancer at a large London hospital, and the author does not expect that the surgeon at the hospital, who did the operation, will claim to have operated under a "mistaken diagnosis"; especially as at this particular hospital the entire surgical staff lay themselves out as, and claim, with justification, to be specialists and experts on cancer.

The author particularly requests that care will be taken not to confuse possible cases of leptothrix infection of lymphatic glands in the body with sarcoma, and then to expect that the disease will be amenable to the methods recommended by the author, even though they may be improved thereby. This warning is deemed necessary, as many cases of leptothrix and other specific infections may be mistaken for cancerous manifestations of the system which, although resembling cancer in their repeated recurrences, are not cancer, and are more particularly diseases of young adult life, and sometimes of middle age.

Chapter XIV.

SUMMARY: EXPLANATIONS AND STATEMENTS IN PROOF OF HYPOTHESIS.

Owing to almost insurmountable difficulties, which it is not necessary to enter into here in detail, few workers in research on cancer will at any time be able to put forth and publish anything like a complete and final exposition of any results gleaned in the field of their labours.

It is only sufficient here to point out that the arrangements of those directing the facilities for research, afforded by means of the resources furnished by the charitable, in institutions and otherwise, do not make them universally available, except to a fortunate few in the profession, who may or may not avail themselves to the full of the opportunities so generously provided by others outside the profession.

Unless a researcher in cancer happens, for fortuitous reasons, over which he can have had no previous control, to be able to find material already existing to his hands, the opportunity of independent but assisted research, uncontrolled and untrammelled by the jealous interference of others, is virtually impossible. The opportunities accorded to others in the profession, through no

lack of endeavour on his part, have not been at the disposal of the author.

For the above reasons, the author has been compelled to slowly and painfully work out details, and study such materials as he has been able unaided to obtain during the last fifteen years. Any more complete elaboration of his contentions would therefore occupy a much more extended period of time, and even then would not be as complete as he would desire.

The author would remind his readers that the hypothesis set forth in this book is the result of long continued microscopic, chemical, clinical, and surgical work and thought during many years.

The author has not suddenly decided without justification that one or other of the mineral salts of the body is the cure for cancer; neither does he put forward the administration of potassium salts *per se* as a sole, finished, complete, and final treatment of cancer.

What he has merely endeavoured to do is to indicate a rational line of procedure, and to show that the mineral salts of the body (and particularly potassium) play a far more important rôle in the causation and treatment of epithelioma than the profession has ever hitherto dreamed.

He has only attempted to demonstrate a general main principle, leaving the finer and more subordinate details, which will require still longer time and thought, to be worked out subsequently by himself and any others who may desire to do so. Put briefly, the main solution of the problem of the causation, treatment, prevention, and cure of

new growths, benign and malignant, will be found to lie within a ring-fence formed by the minerals of the body—*e.g.*, potassium, sodium, magnesium, calcium, and iron, along with the elements phosphorus, sulphur, chlorine, and iodine, and any break away from the normal will be due to want of balance or derangement as regards their normal proportions and combinations *inter omnes*.

As far as the work set forth in this book will suffice to prove a proposition, the author confidently asserts, without the slightest fear of error, that potassium, when used in the treatment of epithelioma arising from cells identical with those of the skin surface (epiblastic cancer), will certainly most favourably benefit the conditions found.

Epiblastic cancer of the breast (recurrence after operation), and the same epithelioma of the womb and the skin, is surprisingly amenable to treatment by potassium.

Cancer arising from the cells lining the surface of the alimentary canal (hypoblastic epithelioma) appears in some extent to be equally amenable to treatment by potassium; but the author is inclined, from clinical experience, to expect that in addition to potassium in hypoblastic cancer, one or other of the alkaline minerals, calcium or magnesium, particularly magnesium, will be found useful in conjunction with potassium.

Although magnesium salts (carbonate and sulphate) can be administered to healthy persons and children without causing illness, in cases of cancer, on the other hand the smallest quantity of a magnesium salt appears to produce a profound

systemic disturbance during its administration, but yet, when the administration is stopped, the sufferer appears to be somewhat better than before it was begun.

We know that magnesium, suitably administered by mouth or by electrical perfusion, in cases of warty growths of the skin, will cause such warts to disappear. Hypoblastic cancer of the intestine contains a great deal of the warty or polypoid element in its structure, and for this reason magnesium salts may be found beneficial.

In endeavouring to treat cancer (epiblastic or hypoblastic) it will be necessary, whilst using potassium, to be prepared to administer any other of the alkaline salts of the body according to need. The contents of this book nowhere seeks to interdict the use, where necessary, of even calcium salts to a case of epithelioma, only provided that potassium salts be also freely administered.

In sarcoma or cancer of the connective tissues of the body, such as of bone, fibrous tissue, or any other mesoblastic structure (hence the name mesoblastic cancer) it is almost certain that other alkaline salts besides potassium will be necessary in treatment.

It is for the above reasons that the author speaks of potassium as one of the wards of the key to the problem of malignant new growths.

The reader must be reminded that throughout this book the author has laid the utmost stress on the utility of the natural physiological action of the internal secretions of the various glands of the body, more particularly of the thyroid

gland, and its peculiar constituent iodothyrin. Every case of cancer under treatment therefore should be carefully examined as to the efficiency of the thyroid gland, which the author has indicated as being the metabolizer of potassium in the body.

If the thyroid gland is deficient in action, or absent as the result of operative removal, then the problem of the treatment of cancer by potassium is seriously complicated.

In cases of cancer of the thyroid gland, which has therefore led to its removal surgically, the administration of tablets of the dried gland will be necessary in the treatment of such a case.

Iodine, administered in small quantities, as a salt of sodium or potassium, or as plain aqueous or oily solution of iodine injected subcutaneously, and then electrically dispersed through the cancerous tissue, will always be beneficial, because iodine as a constituent of idothyrin is necessary to the proper functions of the thyroid gland, and perhaps also of the other ductless glands of the body indirectly. It must, however, be understood that any preparation of iodine recommended by the author is only intended as a stimulant to the thyroid gland and its functions, and not for its usual depurative or alterative action, which is quite different and foreign to the author's ideas. Very little iodine is therefore needed in the treatment outlined in this book.

Any vital disturbance of the general nutrition of a patient suffering from cancer, if in any way occasioned by the absence of the natural function of any vital secretion of the body, will add to the

difficulties, and will complicate the treatment of any case of cancer. Cancer of the head of the pancreas, which causes obstruction of the common bile duct and the prevention of the entry of bile into the alimentary canal, and the consequent lack of proper digestive influences peculiar to bile, and in addition, the fermentation and putrefaction occasioned in the intestine by the absence of bile, will seriously handicap and complicate the treatment of such a cancer (hypoblastic).

In cancer of the head of the pancreas also we have a strange refutation of the theory that certain ferments, secreted by various organs, will be found to cure cancer, for the following reason :—

If the pancreas produced a ferment to cure cancer, it would itself never be the subject of cancer; further, if the liver could produce a ferment from its cells which would prevent and cure cancer, then the moment that the pressure on the common bile duct caused a reflux of bile back into the blood, and therefore the return of the secretions of the liver directly into the blood without passing through the intestines, then the cancer should at once begin to be spontaneously cured, yet such is not the case, which shows the absurdity of the contention of those who hold that secretions or ferments, *per se*, of certain organs present in the body will cure cancer.

In cancer of the head of the pancreas therefore we find both the pancreas and the liver at once thrown out of court as possible means of curing cancer, under any circumstances, by reason of their natural ferments.

The secretion of the thyroid gland by itself will not prevent cancer, because we find that the thyroid gland itself is liable to cancer, though its surgical excision also removes one of the natural aids in the treatment of cancer, in just the same manner as the derangement of the liver or pancreas will interfere with the nutrition of the body, and so indirectly influence the treatment of cancer adversely under conditions previously discussed.

A great difficulty exists for the researcher in cancer on account of prevalent professional prejudice. The therapeutic treatment of cancer by a medicinal agent such as potassium, aided by one of the other alkalies, together with iodine, is from the outset heavily handicapped by prevalent professional practice.

None but hopeless, inoperable, and far advanced cancers will be available for some time to come. These cases come under treatment almost at death's door, when every natural force and power of the body is terribly exhausted, and therefore the medical worker is compelled to tax his skill to the utmost; so that whilst administering potassium, he must at the same time exhibit and administer every form of restorative, medicinal and dietary, known to medical science in order to rescue his patient from death.

For the above reasons, therefore, potassium will at first be found to apparently fail when used, as it must be, for moribund cases; but the author feels confident that the earlier cases begin to be treated with potassium, the more and more satisfactory will become the results.

The treatment of cancer by the method recommended by the author in this book has not one single element in it which will prevent its being used concurrently with any surgical procedure which the stereotyped and dogmatic teachings of the past has imbued medical opinion and treatment.

The treatment of a case of cancer can be undertaken after operation in order to prevent recurrence. The administration of potassium or other alkaline salts can be undertaken with the simultaneous existence of any affection or disease which experience tells us is liable to eventuate in cancer, in order to prevent such an eventuation.

The two main reasons why surgeons operate on cases of cancer are (1) to remove the disease, and (2) to afford as long a time as possible between operation and possible recurrence, if the first reason proves unsuccessful. The treatment outlined by this book seeks to effect exactly the same results, and therefore tends to make the surgeon's aims more certain and easy. The treatment of malignant growth by rectification of the alkaline balance of the body therefore, so far from being incompatible with surgical treatment, is actually a further justification and aid thereto.

Writing as a surgeon, it seems to the author that the administration of potassium salts and lecithin, to a patient who has had a primary cancer removed by operation with a view to preventing possible recurrence, will be an eminently justifiable and highly scientific line of procedure.

The author has been careful to verify by microscopic examination, and by every known

method of staining tissue in the laboratory, the fact that the case, A.B.C., of cancer of the womb described by him in this book was indeed what is known as epithelioma of the neck of the womb, and of this there is no possible shadow of doubt. A well-known specialist in Birmingham diagnosed this case as cancer from its appearance and clinical signs. The author of this book had no hesitation in corroborating that opinion based on his own experience in the diagnosis and surgical treatment of cancer during his whole professional career. The Director of the Radium Institute, whose opinion is worthy of the utmost respect, himself agreed as to the nature of the disease. In addition, the author examined microscopically some of the tissues both before and after curetting the uterus and cervix. He has no hesitation therefore in asserting that the case was one of bona fide epiblastic cancer. This case has become arrested, as the patient is apparently in good health.

The case, M.G., of recurrence of cancer of the breast herein described, was diagnosed as a cancer by another medical man who sent her to the author for operation, and the breast was removed by the most thorough method possible; she satisfactorily recovered, nevertheless the disease returned within a year. The primary tumour of the breast was subjected to careful microscopical examination, and was found to be cancer. The recurrences have disappeared under the administration of potassium salts, with plain iodine injected subcutaneously.

The author is quite prepared to have it asserted that cases that he has successfully treated are not

cancer, but are the result of "mistaken diagnosis." This is an old refuge of unbelievers, and has been used time and again as an argument against the spontaneous natural recovery of cancer. The author has therefore taken every precaution to be certain that cases treated by him have been cases of bona fide cancer.

Those of the profession who repeatedly advance the argument of "mistaken diagnosis," if they happen to be surgeons, occupy a very equivocal position, for the following reason: Granted a case which we commonly accept as cancer, and for which certain operations are undertaken for the attempted cure, a surgeon, who confidently asserts that a case which calls for the customary operation, but which may recover spontaneously or by reason of a therapeutic agent, is one of "mistaken diagnosis," places his own practice in a very invidious position. Presumbly, if the case did not spontaneously recover, or he had operated before spontaneous recovery, and the patient had died as a result of his operation, would he be so eager to advance the great argument of "mistaken diagnosis"?

If this parrot-cry of "mistaken diagnosis" is invariably correct, then a great many needless and fatal operations must unavoidably be undertaken by superlatively skilled and learned members of the medical profession without justification. So that we see, that the dogmatic holders of the impossibility of the spontaneous cure, and therefore the therapeutic cure of cancer, are on the horns of a very awkward dilemma.

Had the case A.B.C. been operated upon, she would most certainly have died, and, indeed, if the cancer had not been so terribly far advanced, she would most certainly have been subjected to operation by the specialist in Birmingham, because every sign and clinical symptom pointed inexorably to cancer, and he would have been justified in operating. If A.B.C. had died, or had recovered after an operation, no one would have attempted to argue that the case was one of "mistaken diagnosis," certainly not the operator.

"Consumption" was long held by the medical profession to be an absolutely incurable disease. So great was this obsession, that a certain important medical body, composed of the most eminent in the profession, actually broke and ruined a member of the medical profession, because he asserted in a publication that cases of consumption had recovered under his treatment. This appalling instance of professional prejudice and ignorance occurred in London, and put back the clock of the treatment of consumption for many years. Hundreds of thousands of people died in England between that event and the occurrence of the modern treatment of consumption of the lungs, which emanated eventually from the researches and work of a German physician.

The point that the author particularly desires to emphasize here, is that the very highest and the most eminent authorities on consumption in England and London had unanimously decided that consumption was absolutely incurable. "Do you know, Sir, that you have made the preposterous

claim of asserting publicly, over your own signature, that you are able to cure consumption of the lungs?" These were the words of the highest medical authority at that time in London, who was not only a titled member of the profession but the President of a very learned medical body in the United Kingdom. So much for human dogmatism, and so much for human intelligence as embodied by some of the greatest of experts, because we know now that *consumption is an eminently curable disease*, yet men have been ruined for attempting to turn the profession from its pig-headed and stone-wall attitude of non possumus.

"Consumption" of the lungs was due to the presence of the tubercle bacillus in the lungs. At the time that the medical profession were so absolutely confident that consumption of the lungs was incurable, surgeons were in the habit of operating on and curing diseases of bone and other tissues (without removing any organ or limb of the body) which were long known to be the result of the action of the tubercle bacillus also.

It was strange that expert medical thought was not able then to grasp the fact, that if tuberculosis of organs and tissues other than the lungs was curable at all, then possibly some treatment might be found which would result in a cure of tuberculosis of the lungs. We all know now that this is an accomplished fact, which was clearly and fully demonstrated to the world from German sources, although some unknown and obscure medical man in England had previously written of the possibilities, and been treated with contempt,

whilst another had been broken and ruined and cast out before all men in his profession as a disgraced and discredited pariah.

The author mentions the above in order to show that for the same reason cancer, because it is occasionally known to spontaneously recover without operation, will be curable by some therapeutic agent in just the same way, and by just the same means, that nature does it spontaneously.

The therapeutic agent that will cure cancer will be an agent which forms a natural constituent of the body in health, and therefore one which the body under conditions of disease will make use of to return to conditions of health. The body can only make use naturally of a natural means or force to effect the spontaneous cure of any disease. No medicinal treatment known to man is ever successful unless the body makes use of one of its natural means as the result of that medicinal treatment in order to effect a return to healthy conditions.

No disease, whether spontaneously cured or by means of drugs, ever recovers except by reason of the natural forces and constituents of the body. The spontaneous cure of cancer, therefore, which often occurs, is the herald and promise to mankind, that some day he will be able to put his hand with meticulous accuracy on the exact therapeutic treatment and cure of all malignant tumours or growths.

The members of the medical profession, who obstinately assert that cancer is finally incurable, would do well to bear in mind the fiasco of the

incurability of "consumption" of the lungs, and also of many other diseases, which have served to show the fallibility of human medical opinion, even that of the most expert.

All the foregoing remarks are particularly addressed to the members of the author's own profession, with the utmost consideration and respect for their honest opinions and convictions notwithstanding.

It may be complained, that the author has not provided sufficient proof of the universality in application of the treatment of cancer advocated in this book. It will be said by the ultra-critical, that more time and more work should have been devoted by the author, in order to arrive at such a condition of perfection, that the methods advocated by him should be incapable of the least possible question or doubt, that the author should have published nothing until he was perfectly and incontrovertibly certain of his grounds, in their opinion. The reply which the author would make is as follows :—

He is quite certain of the grounds he goes upon in his recommendation. He considers that fifteen years steady work, as shown by his publications from time to time in the medical press on cancer, and on blood, is ample proof of the honesty of that work and the duration thereof. He would point out that throughout the whole range of his work, without the slightest deviation, the entire trend of his researches has pointed to the results which he seeks to set forth in this book.

It would not be possible under any circumstances to meet the objections of every one.

Therefore, if the author were able to live another one hundred years, and at the end of that time bring forth by publication the results of his work to a surprised and astounded medical audience, he would still be met with the following objections : that he had not given enough time to the perfection of his medical researches ; that he had not completely verified his assertions ; that they would still be capable of further easy proof or disproof ; that he had not taken the trouble to do so ; that his cases, however numerous, were cases of "mistaken diagnosis" ; that further work and elaboration was necessary ; and that, as everybody knew that cancer was quite incurable, therefore the author's claims and assertions were too ridiculous for professional credence and respect. It is open to the meanest and most vacuous intellects to destructively criticize ; it is given to but few of the most intelligent to criticize constructively.

As the treatment recommended by the author is quite compatible with any reasonable and rational medical or surgical treatment of cancer extant, the author considers, that in order that others may benefit, who are to-day dying of cancer, that he may as well run the gauntlet of professional opprobrium at once, and the dogmatic criticism of those of the profession whose purview is somewhat restricted, after fifteen years' constant work and thought, as after waiting another 1,000 years, if it were possible. The sooner the battle is begun the sooner will come victory or defeat. Wisdom, like water, assumes the shape of the vessel into which it is poured.

It is particularly gratifying to the author to realize that, whatever the outcome of the impending controversy, this particular method of treatment (if it results in the opening of a vast field of knowledge in the action of the mineral salts of the body) will not be any more advantageous financially to the author, than it will be to the most humble and obscure member of the medical profession, who might choose to make use of it intelligently and with due safeguards for the benefit of his patients.

In the present book the author has been compelled to make frequent repetition, time and again, of the same arguments in the various chapters in order to drive home the particular bearing of a certain significance in a particular contention tending to support the wide basis of the action of the four alkaline minerals of the body (and their salts), and particularly of the basis of action of potassium in the treatment of epithelioma (or hypoblastic and epiblastic cancer).

The author respectfully requests his hostile critics to bear in mind, and give him credit for having really worked at the problem of the causation and cure of cancer, and not to approach the subject from the point of view that they are engaged in demolishing the chance ideas and the wild chimeric dreams of an individual, who had suddenly thought of a fantastic treatment, without due labour and serious consideration, and actual experimentation with convincing results.

The author desires to particularly emphasize the fact that he does not by any means recommend potassium salts to be used from the standpoint of

potassium iodide and chlorate, which are ordinarily used for their alterative and depurative action on tissue cells; but that assimilable salts of potassium such as the neutral citrate, tartrate and phosphate, and the bicarbonate and hypophosphite, be given entirely with the intention of their becoming more or less permanent cell and tissue foods and constituents. The foregoing is vital to the whole scheme of treatment.

A vast number of cases of cancer will most undoubtedly be benefited by the treatment which the author strongly recommends. No one can possibly be harmed by it—all must derive a great deal of benefit; but, for various reasons stated throughout this book, and particularly in this chapter, some cases will not be benefited unless under particularly favourable circumstances.

No reasonable person will expect that every single case of cancer will recover simply because potassium has been used, any more than they will expect that every other case of disease of any other nature will recover because a method of treatment, which has caused recovery in some cases, has also been used in the case or cases which did not recover.

SUMMARY OF PROOFS OF THE UTILITY OF POTASSIUM IN THE TREATMENT OF CANCER.

Potassium is the salt of the cells and nuclei of all vegetable and animal tissue throughout the universe, under conditions of health.

Potassium is present in nearly every water,

more or less, and as such is naturally obtained, more by water drinkers than those who refrain from drinking water as a habit. It is quite true that heavy water drinkers, besides potassium, obtain quantities of calcium, magnesium, and sodium in the water drunk; nevertheless, the author believes that no amount of calcium, magnesium, or sodium will become harmful in the body as regards cancer, provided a full supply of potassium be maintained at the same time.

The vegetable kingdom is replete with potassium, and the vegetable kingdom stands mid-way between animal life and inorganic matter. It is by means of the vegetable kingdom that the inorganic matters of the universe are woven into organic materials for the nutrition and support of animal life.

We find that potassium and the other alkaline earths are present in vegetable and animal tissues, they are therefore vitally necessary in the galvano-biological and chemical interchanges that take place between the vegetable kingdom and inorganic matter, and animal kingdom and the organic compounds with their embodied minerals derived from the vegetable kingdom.

The study of the physiology of cell life shows us that potassium is particularly associated with the nuclei and nuclein compounds of the cells of animal and vegetable life. Careful research has shown that the disturbance in epithelial cell growth known as epithelioma is entirely a matter of the disturbance of the nuclear functions of epithelial cells (and any other cells) in the body of mankind or animals.

Careful examination of the functions of the nucleus of a cancer cell, shows that it is subject to certain anomalies of its nuclear substance, in that certain bodies in the nucleus, known as "chromosomes," are subject to deficiency in number, which fact points to the possibility of this deficiency being due to the scarcity of some natural constituent of the body. We know that potassium is the salt of the nucleus of an animal cell; we also now know that, as cancer advances, the researches of the author shows that the potassium salts of the body become more and more diminished and scanty, therefore it is reasonable to associate "heterotype" or "reducing mitosis" with deficiency of potassium salts in the body of a person suffering from cancer.

We find that one of the mineral constituents of a red blood corpuscle, besides iron, is mainly potassium; we find that in advanced cancer the red blood corpuscle tends to become nucleated; we know that in health the red blood corpuscle contains no nucleus, but carries an enormous percentage of potassium suspended in its composition; we know that potassium is the salt of all cell nuclei; we find nucleated blood corpuscles in advanced cases of cancer; we are therefore justified in assuming that the appearance of a nucleus in red blood corpuscles is nature's method of fxing and holding some constituent of a red blood corpuscle, which may be difficult to obtain, or, when obtained, may be easily used up; and that therefore the nucleation of a red blood corpuscle is nature's method of availing herself of, and fixing,

an already too scanty and vanishing supply of potassium salts (phosphates, chlorides, and sulphates).

We are accustomed to associate with malignant tumours of bony structure certain large multi-nucleated cells, and also in health to find cells in the marrow of bone, containing many nuclei; the locality in question is also replete with lime and magnesium salts. Cancer cells possess many nuclei, and red blood corpuscles in advanced cancer become nucleated; and it is quite possible therefore, seeing that cancer occurs during the period of life when calcium and magnesium salts tend to accumulate in the body, to attribute to calcium and magnesium some katalytic or biological influence in cancer, which leads to multi-nucleation as the only method of retaining and keeping potassium fixed in the presence of calcium and magnesium. In other words, it is necessary, owing to the deficiency of potassium in the body, that the small amount of potassium still remaining should enter into organic compound with the chromatic particles of a nucleus, as a potassium nuclein compound or phospho-colloid of potassium in the nucleus.

We find that the red blood corpuscles in the course of a case of cancer suffer by deficiency in number from five millions per c.mm. to only one million per c.mm.; which means that, as far as the blood is concerned, as much as four-fifths of the fixed potassium in the corpuscles has disappeared, and that, of the remaining million corpuscles per c.mm. quite 50 per cent. of the colouring matter of this one million corpuscles is absent. We know

that potassium and the iron of the colouring matter of the blood are closely associated biologically, and that blood corpuscles will take up iron more freely in the presence of potassium salts than in their absence, we can therefore easily see that there is also here a deficiency of the linked potassium along with the colouring matter.

We find that all the blood deficiencies progress *pari passu* along with the duration and growth of a cancer; we therefore have here a close relation between the increasing and free growth of a cancer and the now undoubtedly proved absence of potassium from one of the main constituents (red corpuscles) of the blood.

We understand that the potassium salts in the tissues and blood are not used up and removed during the progress of a case of cancer in order to free and rid the body of a harmful material on account of which the cancer began; but that they are used up as fighting material in the course of the defensive battle against the disease, and in nature's endeavour to use her natural forces and agents, normally present in health, because we find that the administration of large quantities of potassium salts (in a form assimilable and useful as cell-food and constituents) is at once followed by marked improvement both as regards the malignant growth and its nature, and also the general condition and health of the sufferer from cancer.

We know that in certain conditions gain of weight and growth of the body is favoured by the administration of potassium, and that in cancer we find a steady loss in weight. It is the experi-

ence of the author that *cancer cases gain steadily in weight under the administration of potassium.*

If we examine the digestion, we find that the stomach, the pylorus, and the large intestine are all subject to cancer. The contents of the stomach and the pylorus are for the most part acid; the contents of the large intestine are very commonly acid or sub-acid. All parts of the body subject to cancer are liable to have acid or sub-acid secretions; the mouth, the vagina, the anus, and other parts of the body subject to epithelioma may from time to time show a sub-acid reaction in their secretions. It is very significant that mucin is very freely secreted in places where cancer tends to occur, and, as the author has stated elsewhere in this book, that mucin is chemically allied to the nucleo-albumins, and that when a follicle of the intestine is about to become cancerous that the mucin "goblet cell" of the intestine in that locality tends to disappear.

Text-books on materia medica state that potassium tends to diminish the secretion of mucin, yet the experience of the author is quite the reverse; for if a case of cancer of the bowel, which has had colotomy performed, be given potassium salts, it will be surprising what a vast quantity of mucin will at once commence to be secreted by the cancerous locality. This, in the author's opinion, is the first favourable sign in the treatment of a case of cancer of the bowel by potassium.

If potassium causes a diminution of mucin in the secretions, as some authorities hold, then potassium is here strongly indicated as a treatment. If, on the other hand, as the author asserts, potassium tends to restore the healthy and normal action of all cells, and therefore of mucin cells and their secretion, then in this latter event also potassium is strongly indicated in order to keep up the supply and to meet the great drain on the potassium resources of the body and of the cancerous region, where the forces of nature, by a natural means, are seeking to re-establish once more conditions of health.

We find that during digestion in the small intestine, potassium compounds are set free from food, and we find that these potassium-nuclein compounds pass into the cells of the small intestine, and then directly to the liver cells, and we find that the small intestine and the liver cells are not generally known to be subject to primary cancer. We know that the acid contents of the stomach tends to "dekalise" the cells of the stomach and pylorus. We also know that for the most part a great deal of the potassium is removed from the food before it reaches the large intestine; we also know that occasionally the contents of the large intestine are acid or sub-acid, and we find that cancer is common to these regions. We therefore are entitled to attribute the immunity of the small intestine and the liver cells from cancer to their constant "potashed" condition, and we are entitled to suppose that that condition is dependent on the potassium-nuclein compounds set free in the small intestine, because we find that elsewhere in the body, and for other reasons, potassium is also indicated as a factor in cancer. The permanency

or not of the association of potassium with the nuclei of cells is the determining factor in the absence or presence of the cancerous process.

It is not until nearly all the potassium salts in the body are used up, in fighting an advanced cancer, that the liver becomes secondarily affected by the disease.

Irritation causes loss of epithelium by overgrowth, and also loss by secretion, such as mucin; we know that potassium is carried away by every epithelial cell which becomes lost to the body, and also by the natural secretions, as in milk, in mucin from the bowels and stomach, in the saliva, in the urine, in the dejecta, and secretions from the genital passages of women; we are conscious also that cancer is prone to follow irritation; we are therefore entitled to assume that local deficiency of potassium is the predisposing cause of cancer, because the author is in the position to assert that the administration of potassium directly benefited cases of cancer, even if it did not lead to the rapid and speedy arrest of the tumour.

A cancer cell is an unhealthy cell, or is a deranged "hybrid-cell," as the author maintains. Unhealthy epithelial cells are restored to health by the administration of potassium salts.

By direct experimentation, the author has been able to prove to his own satisfaction, which everyone else can do for themselves, that the administration of potassium salts benefits and renders healthy all epithelial cells (hypoblastic and epiblastic), leads to the improvement of the functions of the cells of the cuticle, of the skin, and of the

hair and nails, and causes an apparent rejuvenation of the entire structures of the skin. If then these things happen in health, and as the author has shown, they also happen in cases of cancer, it is reasonable to expect that the cancer cell will be favourably influenced by the administration of potassium. The author has done this practically, and the result has been as satisfactory as could be desired or imagined.

Hitherto any interference or injury by surgical or other means to the surface of a cancer has been particularly dreaded by the profession, because the disease rapidly spreads and the wound refuses as a rule to heal. The author has found that injury to the surface of an epithelioma, under treatment by potassium, heals over and recovers just as easily and with that absence of septic influences which healthy tissues, when injured, are subject to.

The author has occasionally caused sloughing in recurrent nodules of breast cancer, and, instead of the disease spreading and becoming fungating and foul, the sites of the sloughs have healed as readily as the same injury to the most healthy tissue. The above is a fact which cannot be controverted.

It has never been safe to irritate or cause exfoliation from a cancerous surface hitherto, yet the author here asserts positively, that under the free administration of potassium neither irritation or exfoliation, from a cancerous surface or region, is in the least harmful, because the disease appears at the same time to continue to diminish.

Lymphatic glands, which are usually found

associated with cancer in certain regions, are seen to disappear and shrink in cases of cancer whilst under treatment by potassium.

We know that the liver is the regulator of the sugar economy of the body; we know that diabetes is often caused by derangement of the liver; we also know that certain diseases of the pancreas also lead to diabetes; we are entitled to suppose that the digestion in the small intestine is defective in disease of the pancreas; we find that cases of diabetes are favourably influenced by the administration of potassium in combination with lecithin; we find that in diabetes the other functions of the liver are very imperfect, and we know that those functions (urea) of the liver are benefited by the administration of potassium. We find that diabetes is common in gouty persons, and that gouty persons often develop cancer; we also know that gouty persons are benefited by the administration of potassium; we find also that diabetics are subject to cancer, and that many cancerous persons are actually diabetics—we are therefore entitled to assume that the administration of potassium to a cancer case will be beneficial for the above reasons, and *we find that this is so.*

In infants, children, and young adults, when the calcium and magnesium salts are being used up for bone formation, epithelioma is practically unknown. We know that the food of the infant is milk, which, although containing calcium lacto-phosphate necessary for bone formation and tissue stability, also contains a large quantity of potassium salts. The food of the young contains comparatively

more potassium in comparison with their body weight than does the food of the adult. We find that in adult, middle, and old age, cancer becomes increasingly prevalent, and we know that during this period the lime and magnesium salts tend to accumulate in the body. We have seen also the results of human habits as regards food and its preparation, its cooking and its "refinement," whereby it can be shown that it is for the most part deprived of its potassium salts, and that drink for the most part has also been altered to such an extent that it is very deficient of potassium. We are therefore entitled to regard deficiency of potassium as a prime factor, playing a very important part in the above circumstances.

Women are naturally slightly more prone to cancer than men, and it can be shown that this predisposition to cancer is due to their anatomical and sex physiology; and, further, it can be shown that there is in consequence a greater drain on the potassium resources of their bodies. This shows that loss of potassium tends to explain the greater predisposition of women to cancer.

Cancer is not due to poorness of blood, especially as regards iron or organic compounds, because it is just those persons who are plethoric, and whose systems are replete with those organic compounds, known as "waste product compounds," who are found to be the subjects of cancer. The herbivora, whose food and drink is replete with potassium, are more subject to tuberculosis than to cancer. Men and woman also, whose food and drink the author has shown to be singularly deficient in potassium, are

very liable to cancer. The young of animals and mankind are not liable to cancer (that is epithelioma), but are very subject to acute forms of tubercle. The adults of animals and mankind are liable to cancer, and the older they are the more chronic and the more curable does tubercle become. The reason for the foregoing is that in the young the potassium salts are more abundant than in the adult and the aged, and the lime salts are being usefully laid up in the young, but harmfully accumulated in the adult and aged.

The African negro who partakes of food replete with potassium does not suffer from epithelioma, and the same is true of the Polynesian and other vegetable eating races. The West Indian Negro, whose habit was to eat food replete with potassium, to drink freely of water, and to consume prodigious quantities of brown or crude sugar replete with potassium, was not formerly subject to epithelioma, but since his adopting the methods of cooking practised by the civilized races he is becoming liable to epithelioma, and the only reason that can be shown for this is that he is adopting their methods of cooking food and drinking distilled spirits, and consuming "white" or refined sugar, all of which are deficient in potassium salts, as is shown elsewhere in this book.

Any resident in countries inhabited by negroes will be able to testify to the common habit they have of drinking the water in which their food and vegetables have been boiled. This water contains a large quantity of potassium salts.

Negroes and Polynesians, however, are

particularly subject to tuberculosis in all its forms, and die very rapidly when infected.

Cancer and tuberculosis are seldom, if ever, present in the same individual. The author has shown that vegetable eaters, both man and animals, are subject to tuberculosis, and the scant-potassium eating man is alone subject to cancer; that man, when he obtains large quantities of potassium, is not prone to cancer, but when he cooks his food and adopts forms of beverage both deficient in potassium he becomes cancerous.

All forms of so-called "cures" or treatments of cancer by drugs which have been adopted in the past can be shown, if beneficial, to inadvertently contain some potassium in their combination.

It is significant that an ulcerated, discharging, and bleeding cancer, which is suppurating and foul, will at once begin to improve under the administration of potassium by mouth and locally by electrical perfusion. *No other treatment has hitherto been able to effect any such result.*

We will now consider the bearing of potassium on the various theories of the causation of cancer. Certain persons assert that cancer is due to an infection, and that a germ, by reason of irritation of the cells, leads to their cancerous growth.

If cancer is an infectious disease, and is to be cured; bacteriology, with which the author is well acquainted, leads us to expect that these germs must be destroyed by the natural phagocytic powers of the body. The author has shown that all cells are most healthy and most normal under treatment by potassium. If cancer cells are to be

destroyed and removed, this removal must take place by phagocytosis or cytolysis (germs and bacilli must be removed by the same process); any agent therefore which reinforces and strengthens the natural powers of cells and multinuclear white blood corpuscles in their phagocytic functions will be beneficial in the treatment of cancer. If an ulcerated cancer is kept under the local action of an antiseptic, and the cells within the body are at the same time made healthy by the administration of potassium as the author has shown, then the phagocytosis will go on satisfactorily, and the process will be the same whatever be the particular cause of cancer, even if it be due to infection by a germ or bacillus.

All phagocytosis in the body, in any infectious disease whatsoever, is dependent upon the potassium supply in the blood, and the glycosuria present in carbuncle, erysipelas, and other intense infective inflammations, is due to the using up, temporarily, of the potassium in the body, in order to enable the white blood corpuscles to obtain sufficient potassium to carry on their work of defence.

The author is quite confident of this, as the administration of potassium in the above ailments appears to assist their cure and check their recurrence most satisfactorily. If cancer be due to the growth of quiescent "embryonic cells" in the body, there is no reason why potassium should not control them; their arrest and removal will occur just as when the cause of cancer may be due, as many wrongly suppose, to irritation alone.

At any rate, whatever be the cause of cancer

now, or to be discovered in the future, the fact remains, that the treatment of cancerous patients by large doses of assimilable potassium salts (iodide of potassium is not an assimilable salt) is attended by marked improvement of the general health of the patient and the arrest of the malignant growth.

The author is well acquainted with the use and technique of X-rays, radium, and allied therapeutic agents, inasmuch as he, in conjunction with Dr. Norris Wolfenden, conducted the very first and most exhaustive experiments on bacterial cell growth under the X-rays, and showed the results of overgrowth, and the exhaustion of some natural component in these bacilli, purely as the consequence of the action of X-rays.

The author therefore feels entitled to claim authority in asserting, that in production of cancer by X-rays, the process is just the same as in the case of mico-organisms, that is, local overgrowth and exhaustion of some natural product in the body, and that for the same reasons, therefore, anyone deficient in potassium salts, who exposes himself to the continuous action of the X-rays, is liable to epithelioma of the skin. Proof of the author's joint work will be found in the "Archives of the Roentgen Rays," 1899.

The great and striking factor in epithelioma is that it avoids the young and attacks the adult. Both the young and the adult are subject to the same actions of their internal organs, with the exceptions of the calcium and magnesium metabolism of their bodies; the young obtain more

potassium relatively than the adult and use up their lime and magnesium salts. What then can possibly constitute the difference in their liability to cancer (that is epithelioma)? The answer is undoubtedly their habits and bodily economy as regards the different alkaline minerals.

The author, for fear of becoming tedious, refrains from giving further instances and arguments, but respectfully requests his critics to endeavour to answer any objection which they might raise to his recommendations by endeavouring to apply to them his theories of the rôle and function of potassium and the other mineral salts of the body, and the author feels confident that they will experience the utmost difficulty in escaping the certain answer which they would obtain from him were he present in personâ propriâ to answer their objections.

More particularly now does the author desire to call attention to the chemical and physical properties and solubilities of the various alkaline minerals of the body; and to point out that potassium has the furthest violet manifestation as well as the furthest red manifestation in the spectrum, that calcium has the next manifestation in the violet and one each less further in the red and orange than potassium. Magnesium has manifestations only in the green and blue in the centre of the spectrum, and sodium one manifestation only in the yellow. The red end of the spectrum is that of heat or molecular motion, the violet end of the spectrum is that of chemical action or dissociation. Magnesium and sodium

stand mid-way between the two foregoing, magnesium being mostly actinic.

Electrolysis of tissue leads to necrosis at the minus pole, to which the alkaline minerals are attracted in the form of caustic hydrates; and there is little or no tissue destruction at the plus pole. We see therefore that the evolution of gas at the minus pole in the presence of minerals in the blood leads to necrosis. Ionization by magnesium does not lead to necrosis of the tissue, neither does ionization by potassium or sodium—the above is instructive. The sulphate of magnesium is soluble, the sulphate of calcium is scarcely so. All the salts of potassium and sodium are extremely soluble. Calcium and magnesium are associated together in bone. Why this should be is extraordinary when one considers that calcium alone would have been quite sufficient for all practical purposes. The author believes that magnesium is the intermediate metal of the body between calcium and potassium, and as such will perhaps prove useful in many possible necessary modifications of the treatment of various forms of malignant growth. The author has good clinical reasons for making the proposition.

Having outlined and indicated the main general lines of the probable action of the alkaline mineral balance of the body in the problem of the cause and treatment of cancer, the author confidently leaves any further necessary secondary elaboration to the future efforts of himself and those who care to avail themselves of the contents of this book for the benefit of their patients suffering from cancer.

The author would particularly request that no member of the profession, who desires to be considered fair and impartial, will attempt to criticize or pass an opinion (without carefully reading this book) from what he thinks he himself knows or may have learned of the action of potassium in the body, or what is popularly supposed by the profession to be the rôle of potassium as an ant-acid or as an alterative (iodide of potassium); because therein lies confusion and misrepresentation of intention and fact.

The exact biological and therapeutic position of calcium, magnesium, and sodium in the treatment of cancer has still to be further worked out, and the author would be quite prepared (from what he has observed) to give any one of the alkaline minerals along with or without potassium, at any time in the course of the disease, if conditions called for one or either of them. Even calcium under conceivable circumstances may be necessary and beneficial.

The position of the sulphates, chlorides, iodides, and phosphates also need further elaboration, as very little indeed is known of their exact position and actions.

Assimilable salts of potassium, when administered to a bona fide case of cancer, will be found to benefit the patient in an astonishing manner, and will never cause the least harm or injury even to the most feeble and exhausted sufferer.

APPENDIX.

IONIZATION.

It will be as well to bear in mind the following:—

"As soon as any salts or acids are in solution in water they are more or less dissociated."

For example: KCl in water = KCl + K (HO) + Cl.
NaCl in water = NaCl + Na (HO) + Cl.

Therefore any solution of a salt not only contains the salt itself, but also its components in a state of constant change.

The chemico-electrical reactions of various compounds in the presence of each other give rise to the following law as regards interchange of their various elemental components:—

"The more strongly electro-positive element replaces the weaker electro-positive" (potassium + NaCl = KCl + Na).

"The more strongly electro-negative element replaces the weaker electro-negative" (chlorine + KBr = KCl + bromine [free]).

In the above examples potassium is more strongly electro-positive than sodium, and chlorine more strongly electro-negative than bromine or iodine.

During ionization therefore with iodine, in the presence of chlorides and bromides, the iodine remains for the most part free. This is important to know when using free iodine for ionization of tissues replete with chlorides or bromides.

Ionizing current:—2 to 3 milliamperes for each square centimetre of surface.

Solubility of the various alkaline mineral salts of the body.

All salts of potassium and sodium normally present in the body are soluble.

As regards magnesium and calcium:—

	Sulphate.	Phosphate.	Carbonate.	Chloride.
Magnesium ...	Very soluble.	Nearly insoluble.	Both insoluble, but slightly soluble in presence of CO_2	Soluble.
Calcium ...	Sparingly soluble.	Nearly insoluble.		Soluble.

Care must be taken when using magnesium and calcium as ionizing solutions to remember that these *alkaline earths tend to produce necrosis of tissue* if used in too strong solution, or for too long a period, or with too strong a current. This is more the case with calcium than magnesium, which latter can be used in solution on the skin and other accessible surfaces for destroying warty growths.

The salts of potassium and sodium do not tend to cause necrosis.

The salts of potassium and sodium used for ionization are, the phosphate, chloride, carbonate, bicarbonate, sulphate, and very weak solutions of the hydrate. Strength from 10 to 60 grains to the ounce.

The salts of magnesium used for ionization are the sulphate, the carbonate (heavy), and the chloride (10 to 30 grains to the ounce).

The salts of calcium used for ionization are the chloride and citrate (10 to 30 grains to the ounce) (lime-water is useful).

Any of the insoluble salts of magnesium or calcium, when moistened, can be used, with great care, for ionization.

The ions of potassium, sodium, magnesium, and calcium are carried into the body by the current from the *positive* pole.

The ions of the non-metals travel against the current, and therefore are carried into the body from the *negative* pole.

Iodine, which is a metalloid, can be used at either the positive or negative pole, according to the purposes for which it is intended in its action. *Tincture of iodine* can be painted on to the skin, or a cancerous surface, and then covered with an electrode moistened with saline solution and the ionizing current turned on. Solutions of iodine in saline solution, of various

strengths (5 to 30 drops of tincture to the ounce) can be injected into or around a cancerous nodule or gland, and then the ionizing current applied (negative and positive pole alternately).

The ionizing electrodes (zinc or lead) should be large, over large and thick pads of cotton-wool or lint, moistened with the solution of any element, used next the skin.

When ionizing an internal hollow organ, care should be taken not to use too strong solutions at first.

Few patients can stand more than three or five cells of a constant current battery, and only after long use can ten cells be borne for even a short while. A sitting should not last for more than half-an-hour, and should not be repeated at first more than once in two days. Ulcerated surfaces can be ionized by weak solutions of zinc sulphate and subacetate of lead or permanganate of potassium.

PRESCRIPTIONS.

Pessary for ulcerated cancer of cervix uteri:—

℞. Ichthyoli, ♏ iii.
Iodoformi, gr. iii.
Acid carbolic, gr. iii.
Plumbi subacetat, gr. ii.
Ol. Theobroma, q s.
Sig.: One at bedtime every night.

Vaginal Douche: Chinosol 10 grains to the pint of warm water.

Ointment for ulcerated surfaces:—

℞. Ichthyoli ʒ i.
Aristol vel. iodoformi, ʒ ss.
Acid carbolic, ʒ ss.
Vel. { Ung. zinci, oxid: benzoati, ℥ iii.
Ung. plumbi subacetat, ℥ iii.

Note.—Lanolin or lard can be used, but *never petroleum*, which is very irritating.

The addition of 6 to 9 grains of cocaine to three ounces of the above ointments will relieve painful ulcers; also chloretone (30 grs.) and chloretone gauze for the same purposes.

All cases of cancer should take 60 grains or more of potassium bicarbonate every morning in warm water (with or without effervescence) on an empty stomach. The foregoing is, in spite of the fact that calcium or magnesium may be needed or not, for their inverse or reverse effects or for various reasons, according to circumstances and needs of any particular case. The heart can be easily safeguarded by the medical attendant.

Opium in the form of pil. opii. gr. ¼ to ½ will be found useful to control pain or diarrhœa (morphia, codeia, heroin).

The following is a useful prescription :—

℞. Potass. citrat: ℥ iii. (vel bicarb:)
Potass. hypophosphit, ℥ iii.
Ferri et ammon. citrat, ℥ ss.
Liq. bismuthi et ammon. citrat, ℥ iii.
Tr: nucis vomic, ℥ ss. to ℥ i.
Tr: strophanthi, ℥ i. to ℥ ii.
Syrup simplicis: ℨ i.ss.
Aquam „ ℨ vi.

Sig.: One-twelfth part thrice daily in water.

Strophanthus causes hyperperistalsis of bowel, which can be controlled by opium.

The above can be modified as desired.

Calcium, by the mouth, can be given as chloride and lacto-phosphate, and *magnesium* as carbonate, citrate, and sulphate.

Tablets.—The following compressed tablets (chocolate coated) have been put up by Messrs. Parke Davis and Co. for some time past on the author's requisition :

"*A*" Lecithin, potassium compound (Forbes Ross).
"*B*" Lecithin, potassium, magnesium compound (Forbes Ross).

Both the above also contain *fractional* doses of iron phosphate and potassium iodide.

One, two, or three tablets to be taken three times a day, according to the direction of the medical attendant.

The above tablets are indicated in gout, diabetes; chronic suppurative, and infective conditions; and anæmia, and as

possible preventives of the above as well as of cancer, and are strongly recommended.

The ulceration of a cancerous nodule in the skin or on a mucous surface does not in the least tend to render treatment less useful; because it appears that one of the methods by which nature deals with epithelioma is to cast off the cancer cells by ulceration, though this process is never sufficient under ordinary circumstances.

If it be necessary at any time to use a curette or sharp spoon on a sloughing nodule, no fear as to its subsequent healing need be entertained, as the author has found that under the treatment recommended by him the denuded surface heals quite readily, with the ointment specified above, with ionization by iodine and potassium salts used locally and by the mouth.

The use of Radium and X-rays without a proper balance of the mineral salts of the body is like using a sewing machine on cloth to make a garment and forgetting to use thread.

AUTHOR'S NOTE.

Since this book has been compiled three months ago, the author has much pleasure in stating that all the cases described therein have continued to improve under treatment until some of them have practically ceased to be cases of recognizable cancer. Up to the present date it is interesting and gratifying to note that their progress and condition have been identical with those cases of cancer which have been described by well-known authorities as having spontaneously recovered from the disease.

October 1st, 1912.

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NOTE: For all Subjects dealt with in the Index, *see also* The Summary, pp. 223-40.

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