Adenoid Tissue & certain morbid changes - A critical resume

Introductory

My object in this thesis is not to present in any detail as regards minute & completeness, the morbid changes which may be met with in the adenoid structures of the human body, but from a comparative survey to endeavour to elicit the essential principles of their pathology, their relations & significance, the present position of our knowledge of the subject, & the most fruitful lines of future investigation.

I. The comparative development of adenoid tissue

By adenoid tissue I refer to the tissues of the following considerations, I may; perhaps, be allowed to extend the term beyond its strictly legitimate meaning, to include, not only those fixed aggregations of lymphoid tissue which exist in various parts of the body, where we have the cellular unit in relation with a specialized form of white blood tissue, but also the pre...
In dealing with the more or less fixed collections of adenoid elements, we have to note that there are differences in structure, if to some extent in function of this time, as we trace the ascending scale of the animal organism. This comparative development — which up till quite recent times had been little studied or appreciated, is now — thanks to the labours of many observers — first foremost amongst whom stands Koch, becoming much more clearly defined. From this advance, in regard to what has been already achieved, from what must inevitably follow in the future, we may hope for a clearer understanding of much hitherto unknown, in regard to the factors and accompaniments of many diseases, morbid and normal.

In some respects the lymphatic system of man and the higher mammals may be regarded as the veritable representatives of a function, which has in their care been delegated to the more highly organized mechanism of the
Blood vascular system. A more correct interpretation of the facts, however, would lead us to regard it as an instance of specialization of activity, a differentiation which is not yet complete, as is evidenced by the presence of the older forms of cells side by side with the latter development — the red corpuscles.

It is at the point when the entity of animal life has so far advanced in evolution as to possess specialized tissues in opposition to the self-contained cellular unit of the amoeba, that we first meet with the early beginnings of that subdivision of function, in which we can now recognize the initial stage of that developmental process which will ultimately end in the highly organized blood vascular & lymphatic systems of the higher metazoa.

In the metazoae we have reached a stage where this specialization of function has led to the appearance of ectoderm, endoderm & mesoderm. The mesoderm is represented by ameboid cells, derived originally from the endoderm, floating in the body cavity. The mesoderm has now these cells having the power of giving atrochely

endowing & disposing of foreign particles which...
have made their way through, thus playing a
similar part in the animal economy to the
more highly organized mammalian lymphocytic
the next most outstanding link in the chain
of development may be exemplified by the
condition of affairs in the Tenea group. In the
lower orders the mesodermic protective cells
are embedded in a mucoid intercellular substance
but in the higher members of the class we
reach a stage where, for the first time a
lymphatic system may be said to be present.
Here we find the mesodermic phagocytes
lying free in the perivascular spaces intercalated
in lymph plasma; these phagocytes function
as also shared by the kindred cells of the hea-
toneal endothelium. In addition according
to Gruber quoted by Melnikoff, these mesodermic
elements act as reducting & secretory organs.
Another suggestive fact to be noted at this
stage is, that in the higher orders of Tenea-
as in many of the Annelida—we have met
a fully developed blood vascular system (to- 
alongside of the embry lymphadencoid mechanism)
which hommes takes no part in any inflammatory
reaction. This reaction is entirely confined to
The lymphoid elements as has been conclusively shown by Heidenhain.

An apparently retrograde condition of affairs so homologous found in certain other higher animal forms e.g. in the Ancestrides where the lymph and vascular systems are evolved, the vascular cavity being identical with the general body cavity, the so-called hemolymphatic system being thus formed.

It is worthy of note homologous that as Hardy has shown in his article researches on the blood corpuscles of Astacus, it is at this stage that we can first recognize a definite distinction as regards structure & function of the free mecanemic cells. In the ray fish (Astacus) Hardy recognizes three distinct forms of these cells, his always found free. One with eosinophile granules, apparently non-phagocyte, another whose granules form a basophile reaction, hyaline in character, but which possesses distinct phagocyte qualities. The third with basophile granules is rarely found free in the plasma, but is common as a collected清单 in the form of a peripheral sheath around certain
needs which connect the central lacunar spaces in which the haemolymph circulates. We thus meet with what we can recognize as one of the earliest examples of true adventitious tissue into the mode of appearance of particular significance in regard to the study of the development in the mammalian series as well as from its parts to which we will afterwards refer to.

We may also mention here, that, according to Strickler, the so-called blood glands of the molluscs, Anopheles, Toxoplasmum, etc., practically be regarded from the point of view of morphology as the early representatives of the more highly specialized lymph glands of the Vertebrate Mammalia.

When we reach the Vertebrata we find that we now arrive at that point in the scale of evolution where the circulative mechanism has become permanently dual, the two divisions at first more or less akin in structure & function, gradually differentiating more & more distinct functions in the animal economy till they attain that ultimate divergence of function exemplified
in the higher Mammalia. In the three lower forms of Vertebrates — Fishes, Reptiles & Amphibia — the fixed elements of the lymphatic system are practically represented by one organ, the thymus gland. There is also however a certain amount of adenoid tissue scattered among the kidney of the fish, & in the Salamanders similar masses have been observed encapulating the liver. In the frog we find also rudimentary pharyngeal tonsils at certain times of the year according to Tuch, these adenoid tissues in the fat bodies of the abdomen & in the bone marrow.

It is only in the higher Vertebrata — Birds & Mammals that the typical lymph gland is found, & these become more & more numerous as we ascend to Man; also with the further specialisation & multiplication of function we have a general increase in the amount & situations of lymphoid tissue.

As regards the free elements, one may say that in all Vertebrates — according to the present state of our knowledge in the main points of structure & function — they may be regarded as identical. It is doubtful however whether this is really so.
at least as regards function.

Further investigation may show that really the white corpuscle of man, as compared to that of the hog, has a higher specialized activity in something of a similar ratio to their neural cerebral cells.

The development of Adenoid tissue as traced in the Mammalian foetus.

In regard to this matter much valuable information has been obtained by Bulland's researches & to whose labours I am punctually indebted for the following facts (576).

Naturally, in general, particularly the information obtained from the study of the comparative development of this structure in the Mammalian foetus have more points of correspondence to its comparative development, the main stages of which we have already attempted to elucidate, the sequence of events of this foetal development as gathered from the sections described by Bulland appear to be as follows.

At a very early stage we have a special condensation of fibrous tissue around the cavity of the primitive alimentary canal.
or entoderm, a condensation which is especially marked at certain points, which are afterward the seat of adenoid aggregation. Pharynx, larynx, intestines, bronchi etc., the etiology of this peculiar arrangement of connective tissue is according to Galland, explained by regarding it as the result of the invasion of epithelial ingrowth, in his special study of the development of the thymus he certainly gives good reasons for this assumption. A similar phagocytic deposition is also observed in relation to the thymus gland—at this stage an epithelial organ probably also of endodermal origin. The next landmark in the process is the dilatation of leukocytes in the interstices of the connective tissue, as one would expect on phylogenetic grounds this infiltration is first found to always in greatest abundance in the neighborhood of the thymus. As regards the question of the derivation of these cells, their appearance is less definite. It is certain that they first appear in the blood, are then deposited in the tissue, and then more directly derived from the connective tissue cells, but are the direct
representatives of the early, mesenchymatous elements, whose appearance and gradual development we have already referred to as taking place in the lower animal forms. The cause of their immigration from the blastema may be due in the first place to the initiation of the connective tissue formation, and in the second place to the blood flow of the horial circulation being retarded by the double capillary system.

At a similar stage, or previously in some specimens, we find evidence of the development of lymphatic vessels in relation, in the first place, to the subcutaneous connective tissue. Morphologically these vessels are the representatives of the early lacunae spaces of the Medulla, which in their turn are the direct descendants of the primitive body cavity of the early Metazoan. They are as he noticed above: as mentioned above, in the subcutaneous tissue, and in relation to bone, muscle, tissue in its various situations, are developed evidently by cell proliferation and general adaption of the structures originally forming the boundary wall of the spaces.

In consistence with the fact that the highest
...most specialised development of the glandular elements. As a tissue is reached in the lymph gland, we find that they only develop late in intra-uterine life, that they are only present in the mammals; that they are more numerous, more highly developed, in function, in the latter members of this group.

At certain points, as at groin, axilla, root of mesentery, neck, etc., we have a converging of the lymphatic vessels to form a place, the connective tissue in relation to this place is so modified, so to form a more or less nodular mass. In this mass as the result of modification from the adjacent blood vessels we have a definite capillary vasculation throughout its structure. An accumulation of leucocytes follows, chiefly from the blood, but partly also from the lymph streams. The connective tissue of the nodule differentiates into its typical glandular form, probably as the result of infiltration and consequent separation and modification of the places. The external sinus is formed from the vessels of the place which surround the nodule. The internal lymph vessels are derived...
do move from the original connective tissue spaces. The capsule is formed by the condensation of the surrounding connective tissue. The course of the lymph stream is at first external to the node, but when once the interfollicular lymphatics are developed, the circulation is carried through them. A point of importance is that the typical germ centres are not observed in lymph glands during foetal life. They do not appear till some little time after birth. The presaging are its main points in the intra-uterine development of adenoid tissue. From the first appearance of colourless cells in the blood, we have a continuous process of division and aggregation with the consequent formation of a definite and characteristic tissue in various positions throughout the body. Appearing earliest in relation to the Thymus and parangial tissues, then occurring in the sheaths of the blood and lymph vessels; in the mucous and serous membranes, was the final stage in the process the formation of lymph glands, of the Malpighian corpuscles of the spleen, the
appearance of lymphoid cells in the bone marrow.

In conclusion to this portion of my subject I would submit the following observable propositions which appear to be logically drawn from the study of these developmental facts.

(1) That the genealogical record of this tissue appears in all essentials to be direct, distinct and unbroken, that the various stages in the descent are at no time modified by the entrance of such extraneous elements as the adaption by the tissues of the special adenoid functions, numerous as are specific tissues with specific activities with a specific origin.

(2) That in its origin and development it is intimately connected with the Blood-Vascular Physiology system, and consequently its pathology must be intimately connected, more so in the lower forms, but in a decreasing ratio as we ascend the scale of the Mammalia.

(3) That as its connection with the Nervous system becomes less close, it is probable that it has gradually developed specific activities in other directions possibly in relation to Vitality & secretion secretion.
A more detailed study of adenoid tissue is now necessary, in order to define & appreciate its reaction to various moidal influences.

The Structure of Adenoid Tissue.

The Leucocytes.

There are few subjects in modern histology over which there has been more diverse opinion, than on the variety & structure of the white corpuscles. Exceedingly statements & irreconcilable declaration have been given by various investigators.

An eloquent suggestion that their precise anatomy still remains to be defined. The various stages of their evolution from the early mesenchymatous element is not yet clearly ascertained. In regard to their definition we can only say, that they are cells presenting the characteristics of a Prototrope organism, which exert most important functions in the nutritive tissues; that they preserve at all times their peculiar & specific character, never losing their individuality in either the epithelial or connective tissue cells.

As regards their classification it will be useful
be advisable to collate briefly the various merits & opinions which are at present current.

Wheaton Jones in 1846, & Rindfleisch in 1861, & Max Schultz, two years latter, were the hones in this investigation. They generally based their classification on the recognition of the fact that the cell substance was not uniformly homogeneous, but that in certain instances it was granular. Of these granules they recognized two varieties, coarse & fine.

On this basis Max Schultz classified the leukocytes into four varieties, up to the time of Ehlich, however, little attention was directed to their chemical constitution & function, as furnishing perhaps more logical standards of classification. Ehlich in 1897 attempted a new arrangement on the basis of the reaction of the cell substance to the then newly discovered aniline dyes. He also formulated his well known five particle granules, after according to the $\alpha, \beta, \gamma, S, E$ granulations. His classification has for some time remained the standard one, but it has been lately modified by the discovery that the $E$ & $\alpha$ granulations or "neutrophile granulations"...
really erythroid or react to the acid aniline dyes. Exhibit classification of the leucocytes of the blood is as follows —

1. Small, nucleated cells non-granular: the lymphocytes.

2. Finely granular cells, with neutrophil reaction in view vs. multiparticle nucleus.

   [In rabbit, aqueous base the granules give an amphophilic reaction.]

3. Coarsely granular cells with mytihle reaction: the commonly called eosinophile cell.

4. A cell with coarse granules, reacting to Evans aniline dyes — the basophile cell.

K 琳 stain：a modification is much simplified: namely:

Coarsely granular (basophile cells)
Finely granular (staining with acid dyes)

Coarsely granular (basophile cells)
Finely granular (staining with basic dyes)

Myeloid Cells
Lymphocytes

The above is perhaps the most generally accepted classification at present time but is certainly far too rigid & exclusive as I well endeavor.
It is now clear that from the results of his investigations on the lymphocytes has differentiated three cells.

He distinguishes between:

1. Lymphocytes, immature leucocytes, which have no phagocytic action.
2. Large myeloid cells - mononuclear with phagocytic action.
3. Smaller neutrophile cells. Polynuclear also phagocytes.
4. Eosinophile leucocytes - non phagocytes.

Kantack, W. H., has also attempted a subdivision of the leucocyte into two great classes - Haemio's and Eosinomic. The former characteristic is a coarsely finely granulated, being confined to the vascular channels. While the latter is coarsely granulated being typical of the lymph spaces.

Gulland takes an altogether independent standpoint, and denies the value of Ehrlich's classification. He states that we are not justified in distinguishing between Golomis and Haemic cells, and that in the present state of our knowledge.
the most logical differentiation, is to be based on the fact that the various cells are identical in origin, but undergo certain modifications which vary in this character, according to whether the cells are found stationary or moving. [The term stationary is not absolute, as there is always a certain amount of ameboid movement present.

Wernher, while apparently nominally adhering to Kamerer's theory, classifies for the practical purposes of his investigation as a simple classification & recognizes three main varieties of cells: granulated, rarely granulated, & hyaline. The most notable fact in regard to these cells may be perhaps most conveniently summed up as follows —

In the higher vertebrates we find several varieties of leucocytes which apparently differ in function. It is probable that these various forms represent successive stages in the life of the same cell. Leucocytes under certain favorable conditions — which chiefly exist in the gum center — divide by mitosis — rarely if ever by direct division to produce the daughter cell or lymphocyte. This cell according to its environment
assumes different characters and adopts special functions. We are enabled to classify the following well defined varieties:

(a) A cell, especially found in the lymph channel, with apparently homogeneous protoplasm, though often faintly granulated, is recognized as being practically a secondary stage of the lymphocyte, differing from it, however, in that
(i) the cell substance is increased.
(ii) it has developed active amoeboid and phagocytic properties, properties apparently not possessed in its earlier development.

(b) A cell, generally confined to the blood, forming 50 to 70% of the leucocytes present there, possessing a distinctly granulated cell substance, the granules of which react to acid aniline dyes, often apparently polynucleated, but more usually really polynucleous. Has markedly amoeboid and phagocytic properties.

(c) Cells also granulated, but which are not particularly distinctive of any tissue, & react only to basic aniline dyes.

Then generally, we may note that certain modifications of these three main types may be produced under certain conditions, for example
The hyaline cell may increase in size from the so-called: macrophages, which as Ruffer has pointed out to be normally in relation to the mucous membrane of the alimentary canal, the tonsil, & in the bone marrow. Similar cells have been described in relation to various tumors, especially epithelial in the epithelioidez, in the areas of cryptocytic inflammation, in tubercle nodules, various other chronic inflammations. Again the lymphocyte develops crowded granules, so-called increase in size, so forms the lymphocytes cell a recently but characteristic element in the blood picture, which is also regarded by some observers as being identical with the typical bone marrow cell, as described by Kollisch. In the marrow however, as has pointed out it has lost its amoeboid properties.

As qualifying the foregoing broad general statements, one must recognize the possibility of other modifications of the outstanding three main types, - the hyaline, the acidophile & the basophile. One must however insist against the present tendency to
Glandular Follicular Tissue

In the various locations where this tissue is found, whether it exist as the lymph gland or as a subsidiary & auxiliary structure in relation to various organs & body surfaces, as in the Malpighian bodies of the spleen, or as the follicular tissue of the mucous respiratory membranes, its essential idea of its structure is as follows:

1. A specialized variety of connective tissue existing in the form of fine meshed fillets & rich in cellular elements, with a high blood supply, in communication with lymph paths.

2. Enclosed by the tissue numbers of the cells - lymphocytes.

3. Further certain parts of this tissue structure are found are specially arranged to form the so-called germ centers. Here we have a peculiar arrangement of nuclei & supporting tissue so adapted that the cells enclosed are in favorable circumstances for proliferation.
IV

The Functions of Adenoid Tissue

A. The Free Cells

(1) Probably in fetal life they are, according to Woodhead Culland, concerned in some way with the nutrition of the foetus, possibly as hormonal carriers. (2) They also play an important part in what may be termed tissue 'moulding'. Examples of this activity may be found in the development of the tonsil, in the removal of the epithelial stroma of the lymph thymus, & in the histologic instance of the separation of the tail of the latter gland.

(3) What is their relation to the formation of red blood corpuscles? A certain number of investigators regard the red corpuscles as
the final development of the white cell.

According to Metchnikoff who appears to uphold this idea, the leucocyte, after its peculiar cycle of activity, becomes entangled in the meshes tissue of the spleen. Bone marrow, so Stein impregnated with haemoglobin, & released as a red corpuscle, & then having fulfilled its respiratory function, finally returns to the spleen & is destroyed there.

This opinion is, however, actively denied by a great many physiologists. According to Berggyn, Loom, Deng & others, we have developed from the mesoblastic cell, two classes cells, leucoblasts & erythoblasts, which are distinct alike in structure & destiny throughout the future life cycle, the one class forming the leucocyte, the other, the red corpuscle. Generally speaking, the tendency of modern opinion is now inclined to the latter view, though this may be no definite grounds for the belief, in essence it is only a probable hypothesis.

We have to regard the habitat of the two varieties of cells as being in the same class of tissue as in intra-uterine life.
Functions in extra uterine life

Here, undoubtedly the prime function of these elements is the protection of the animal economy from the innumerable noxious & toxic influences which it may encounter throughout the various possible avenues of attack to which it lies open.

In addition to render other services to the organism in the shape of a certain influence on nutrition, in their connection with blood coagulation, as auxiliaries in various reparative processes, from the pathological point of view they themselves have an intimate relation with certain edematous inflammations, hemorrhages, tissue degenerations, pigmentation, tumour growth etc.

The protective function of the leukocyte

This may be regarded in several ways, these main forms of which may however most conveniently illustrate this activity —
A. The method of absorption & phagocytosis.
B. By extra-cellular activity, or by suction & suction.
C. By the method of encapsulation & retention.

**Phagocytosis**

In the first place as an essential fact, one has to note that this naturally is a purely not so much of indeed at all of the younger cells, as found in relation to the medulla of the follicular nodes, but of the larger so called hyaline cells found more in the glandular, in the intestinal spaces in the lymph stream, (2) if the acidophile cells of the blood. We would naturally expect such a condition of affairs, because the latter are fully developed amoeboid organisms, possessing all the histogeny faculty. Secondly it appears that these two cells to a certain extent differ in their sphere of activity. According to Melchishoff, the mononuclear leucocyte or macrophage - or the hyaline - is the chief phagocytic agent in chronic inflammation while in acute it is the acidophile of
microphages which is chiefly concerned. As in typhoid, the bacilli are engulfed only by the acidophile, while in typhus, the giant cells, which according to this theory are derived from the coalescence of lympho cytes, are the chief agents concerned.

As to the general process of phagocytes one may enumerate briefly: (1) Melchnikoff's general conclusions. The main thread of the argument appears to be as follows:

On the entrance of bacilli into the system, the leucocytes are attracted to the point, this attraction being apparently in inverse ratio to the virulence of the organism - so they are either positively or negatively chemotactic - to quote the rather illogical formula - thus:

They engulf the microbes & by a process of intracellular digestion proceed to destroy them.

(2) They may, however, fail in this process, the leucine secreted by the microbes in self-defence, being too strong for them, acting as autolytic enzymes causing the death & disintegration of the leucocyte.

(3) The struggle between the two organisms may be so balanced that neither side gets
the advantage of the microbes still with unimpaired vitality, though prevented from doing immediate mischief remain in the interior of the leucocytes.

(4) Occasionally we may have an encapsulation of the attacking organism, as the result of its own reaction in the interior of the leucocyte, independently of preserving metabolically its virulence.

The last two possible consequences are especially observed in various chronic colicacies, as Tuberculosis, Bladder, Lung, and sometimes in a prolonged Gonorrhoea.

The leucocytes may also become in time by repeated contact with, partly chemotropic to those organisms to which they were formerly neglegible, & this immunity may be transmitted through successive generations of the individual, hence conferring upon him what practically comes to immunity from the disease produced by the organism in question.

To illustrate the question of phylogeny further, it will be as well before proceeding to the next division of the subject to give a few specific instances of this method of protection which occurs as part of the normal physiological
mechanism, this may be exemplified by reference to:

1. The peculiar activities of the wandering cells of the alimentary canal. These macrophages or macrophages whose special protective function therein has been carefully observed and described by Ruffet in the first instance & latterly by Hardy & Westminster.²⁰

2. The rimmed function which is subsumed in relation to the nasal mucous surfaces on which they are situated by the lymphoid cells of the tonsil, the pharyngeal, bronchial mucous membranes.

3. The large histiocytes which are also probably of adenoid origin have been shown to have the power of absorbing & destroying abnormal or worn out blood corpuscles, bacteria & other noxious material.

B The extracellular activity of the Leucocyte

This opens up a widely debated subject. In criticism of the phagocytic theory of Metchnikoff especially in relation to the question of immunity, we have a school represented by such
Humes as Wuttell, Behnning, Buchnel & Hunkin, whose tendency is to regard the chief protective agency of the body tissues as being localized in the plasma and not in the cells, they regard the organism itself as not being the essential factor but the toxins which it secretes, therefore in order to deal with these toxins there must be something more than extracellular activity. They find that antitoxic agent in the body fluids. Actually it has become the fashion to regard this protective power as being due to cell reaction found in the surrounding plasma, especially by the leucocytes. This theory has been backed up by many observations as that of Woodridge in which he pointed out that an extract of thymus gland substance had a peculiar bactericidal power. Hunkin has obtained from the lymphatic glands of dogs into a globulin, just as having a similar effect. He has identified the same of leucocytes on certain isolated bodies possessing similar properties which he claims he has isolated from the blood plasma. Corresponding from the other point of view Denny & Hunkin.
have shown that a solution of serum which has been artificially freed from leukocytes has lost its antitoxic powers.

The tendency is now rather to regard the process of ingestion of bacteria by the leukocytes as being preceded by the homing out from the cells of a toxic reaction, the organisms with weakened or destroyed innervation are then absorbed and digested by the intra-cellular activity and replenishing forces of the cell. KAUTZK and Hardy regard this reaction as being in some way connected with the cell granules; they claim to have observed a discharge of granules from the leucophilic cells as a preliminary step to the ingestion by lysoline phagocytes.

PETRIKOFF has now come to admit the possibility of such a preliminary extra-cellular action. Naturally however to the demonstration of the mode whereby such a process where chemical reactions are involved, is now much more difficult as a logical base as compared with the precise and satisfactory manner in which the intra-cellular phagocytes can be demonstrated.
by the ordinary histological methods. Kastack &
Kendrick's observations on granular discharge
are totally untenable, as not accepted by Hulland
Sherrington. 23

Ducharm who, although Prof. Adams
appears to corroborate them, Hulland inclines
for the view that the granules represent the
micromeres of the mitochondria of the cell and
there regard them as the food reserves of the
cell. 10

In all probability their disappearance
are due, not to any discharge of the cell substance,
but to degeneration changes in the cell due
to the toxic action of the attacking bacteria.

The most prominent example of the third method
by which the leucocyte exerts its protective
function, is the encapsulation of tubercle foci by
the consequent common secondary change of
the formation of a calcareous surrounding
envelope. 3 Yet whenever an initial of any
infected material, in addition to the ordinary
methods of attack, this is similar tendency
to isolate itself in the nervous material
as much as possible, by aggregation of the
wandering cells.
Other Leucocytic Functions

Besides the response to microbic attack, the vital action of the cells already mentioned, there is evidence to show that the lymphoid elements are engaged in the excision and removal from the body plasma of various - as auxiliaries to the liver, kidney, of various nervous elements, the result of normal metabolism. Probably the leucocytes which accompanies the digestive process is in part at least the response was consequent on the necessity of removing certain effects by products produced at that time.

Again, Heffner, 1 believes that one of the main functions of the white cell is to absorb lipins in the alimentary canal and convey them to the liver. All such histology must, however, till we have attained to a clearer knowledge of know the rudiments of cell chemistry, be regarded to a great extent as unscientific and premature.

The Leucocyte & Blood Coagulation etc.

As regards the action the doctrine taught
in our current text books by most medical teachers is briefly— that two factors are required, along with the presence in the fluid capillaries and of calcium. The two factors being a fibrin cement which is produced by the white cells, and a substance fibrinogen existing in the plasma. But according to Hildebrandt, both kinds of leucocytes in the blood i.e. hyaline granules, can produce a substance which determines coagulation without any extraneous assistance; further similar coagulating agents can be produced from cells as dense as those of the Thymus, Brain, Lungs, Testes, Kidney. The main chemical constituent in these agents appears to be nucleoalbumins. Schmidt says, source of the coagulating factors are derived from disintegrated white corpuscles, in both the fibrin cement and the fibrinogen. Both therefore may be present in the plasma. He further adds that these bodies are more abundant in meningous than in normal blood, and in these conditions, especially after death, they may increase to such a degree as to promote the occurrence of spontaneous coagulations and thrombos.
Wodrowe corroborates these observations and concludes also that the histoids which are present in the cell-body of the lymph corpuscles contain all that is necessary for the formation of albumin, and he regards the chemical constitution of these corpuscles as being in all cases allied to lecitin. He further adds that in certain pathological conditions which accompany an increased and more rapid circulation of lymph into the blood stream we have the production of a condition which he terms phloginogen intoxication. By experiments on dogs he demonstrated that a solution of phloginogen injected rapidly caused death, with a general tendency to retroversion, in this connection we may note that Edelburgh has found that phlogin tunicum nitricum in the blood of animals causes fever.

The leucocyte & repair

Two main varieties may be recognized in granulation tissue:
(1) Small round acidophilic cells with pyknotic nuclei; (2) Larger cells mono-nucleated, also acidophilic, which according to Hantrak this the most frequent type in cells.
The part these cells play, it is probably confined to performing nutrition in the reparative con
nective tissues, & to neutralizing by their specific activity the irritants present.

As regards the question of the transformation of leukocytes into blast cells, from the nature
of adenoid tissue, as we have already remarked, it appears to be unlikely. I in
any case the discussion would be useless from the point of view of the tissue.

I may close this portion of the discussion by referring to the notable adenoid masses of the
macrophages described in Carter's modification

in several pathological processes, for example

(29) Drennichmann has traced the ablation

of the reticulum cells in epithelium by leukocytes of the

masses of the cells evidently leukocytes. Carter described

a similar cell digestion in Cancer

B The Function of Adenoid Tissue

in collected form

To go into this matter carefully after the previous
discussion of the function of the cell element
V. The Pathology of Adenoid Tissue

A. The Free Cells

The morbid changes in these elements naturally occurring are:

(1) Increase or decrease in number
(2) Alteration
I may thus be allowed to define leucocytes as that transient increase in the number, especially in certain sections of the blood vessels, resulting as a concurrent change, along with certain pathological processes.
in character, or a change in the relative proportion of the different varieties. (3) Alteration of the ordinary habitat.

These various phenomena are homeostasis intimately connected, that the most satisfactory method is to deal with the whole question under the generic term of Leucocytes.

Leucocytes

(1) Artificially produced -

Leucocytes can be produced experimentally by the intravenous injection of various animal, vegetable, and chemical products such as lepton, N-acetylalbumin, urea, Fabricius' cement, Haemothrix, various volatile oils, etc. or other drugs.

The leucocytic phase is apparently preceded by a stage of temporary decrease in the white cells in which the term leucocytopenic stage has been given. According to Thunberg, this phenomenon is also seen in local leucocytic experimentally produced. He has found that

A definition might be - that increase in the number of the colorless cells of the blood which is often accompanied by a variation in character and relative proportion, which results as a coincident change along with certain pathological processes.
This diminution is chiefly confined to the granular leucocytes. The myeloid being little affected. Bruce in his experiments on the disappearance of leucocytes in the blood produced by repeated injection, explains this phenomenon as not being due to any destruction of the cells but simply to their being carried into peripheral tissues, notably those of the lung, liver, spleen, bone marrow; he substantiates his theory by control experiments counting in the examination of the tissues by section. Harington holds the same view & it is a most plausible explanation.

Physiological leucocytosis

Physiological leucocytosis has already been referred to. One may draw in this connection that according to recent observers this leucocytosis is increased in all stomach derangements & is entirely absent in malignant disease of the stomach.

A leucocytosis is also often observed during pregnancy, after hemorrhages, & before death. This transient leucocytosis is now homoeopathically denominated, or if it does occur can generally be traced to a certain specific cause: Lister explains it as being due
to decrease in cardiac action & consequent peripheral position of the leucocytes. There is according to Thruning a decrease in the leucocytes during starvation especially of the granular variety, according to Kastberger, the lymphocyte also decreases in this condition. Then lastly there is the natural decrease of leucocytes in old age, consistent with the general atrophy of lymphoid structures.

Pathological Leucocytosis

In many diseases an increase in the leucocytes has now been observed, more especially with regard to the acute inflammatory processes, as pneumonia, typhoid fever, diphtheria, severe inflammations etc. In the chronic cerebral fevers, syphilis, skin diseases etc. leucocytes 2 changes in the leucocytes have been described by various writers as Thorne, Limbeck, Riedel etc., but it is doubtful whether these phenomena in these conditions are in any way real or constant. They are probably, in most cases
accidental or dependent upon some coincident inflammatory changes. It is in the former class of disease where one would naturally expect constant & characteristic changes in the white cells phenomena likely to prove of value in questions of etiology. Diagnosis & prognosis, this expectation is justified, if some extent at least borne out by the history & results of the investigation. Brody in 1839 was one of the earliest to draw attention to the increase in the white cells in Pneumonia. Yirous described a leukocytosis in Pneumonia, the typhoid state & typhus fever. Mallory published in 1873 reports on the leukocytes in Eigritis, in which he concluded that there is a leukocytosis during the fever, a leukocytopenia at the close of the fever, followed by a return to the normal during convalescence. He also made observations on local & general eruptive conditions, in which he found an increase of leukocytes as long as lesions existed, but a fall to the normal directly this was relieved. Resorting in a series of observations
in various infectious & inflammatory conditions, generally, Mallory's views.

Some more recent results have been those of Thoma. *Rieder* \(^{35}\) from Lembeck in Germany, working on the basis of Schlich's researches & classification, has also been a certain amount of investigation of the subject in the English-speaking countries.

I will now quote a few of these observations relating to leucocytes & their anomalies, endeavour to deal with the general significance & probable functions of the process as a whole.

(i) The Leucocytes in Pneumonia

*Rieder* has found in the examination of 26 individuals with pneumonia, a typical leucocytosis regular in occurrence & constant in type. It begins shortly after the initial lesion, continues throughout the illness, & the fall of the leucocytic wave is followed shortly after by a corresponding fall of the leucocytic curve. According to Von Lembeck, if the case end by lysis we have no sudden fall of the white blood count, but a gradual diminution. As regards its character, *Rieder* has shown...
that there is a deficiency of the lymphoid cell [eosinophils granulated eosinophils] from the onset of the attack and increase of the lymphocytic [Finkle granulated eosinophils and eosinophils] & the normal ratio of the lympho mono nucleus was also lowered. Feline in that cases of emphysema ravenous pneumonia found at the height of the fever, the lymphoid cells were entirely absent, Wunden however claims to have seen a great increase in these cells at the time of the attack.

As regards the existence of any relation between the degree of the leucocyte & the extent of the inflammation, Puscher cannot draw to any parallel, though he allows the possibility of such. Stroheck believes however the being an intimate relation between them, though admits that occasionally that there may be a considerable amount of leucocytes with little or no inflammatory exudate.

From the point of view of prognosis, the cells in favourable cases are said not to be increased, indeed in fatal cases there is said to be a decrease. In this connection
Simbeck asserts that the main factors in the leucocytosis of pneumonia is on one side the violence of the attack, on the other the resistance of the individual attacked. Clearly the greater the violence the less the leucocytosis; the greater the resistance the higher the leucocytosis. Thus bearing out generally the observation of Metchnikoff. Scherington Kantack et al. stated negative rhumoric chemistaxis is positive chemistaxis is always more likely to be manifested in the case of an organism of little violence whereas the organism is present in small amount, whereas the white resistance of the tissues of last is great. Negative chemistaxis will be most likely to prevail in the opposite conditions. Redell's conclusion is, however, that he cannot state from the extent of the leucocytosis to give any definite results.

(2) The Leucocytes in Typhoid Fever

As one of the main lessons in Typhoid Fever is a suffusion-like lymphadenitis the question of the condition of the leucocytes is one of-
spherical nature. All observations up to the present appear to show that in this condition the leucocytes are not increased but rather diminished. This may perhaps be accounted for, on the assumption that the main seat of the lesion is in the alimentary canal. This would naturally be an agglomeration of the white-cells in that extensive vascular area of the tract affected, consequent diminution in the blood elsewhere. Probably therefore, if the blood analysis were taken from any mucous or capillaries, a typical & diagnostic leucocyte would be discovered.

In conclusion, one must note that this apparent absence of leucocytes in Typhoid as compared with its marked presence in Pneumonia will probably in many of these dubious cases where the diagnosis between the two conditions is doubtful prove valuable, determining factors in their differential diagnosis.
Leucocytosis in Diphtheria

...the elements increased here as in Pneumonia, appear to be chiefly the polymorphous and epithel... 

The pathological significance of elevations of leucocytes in this condition appears, however, to be somewhat different. According to Haberkern... the leucocytes are almost always greatest in fatal cases, while in non-fatal cases... 

Kapfahl's conclusions broadly speaking are... that a high leucocytic signifies a good reaction...
generally steadily diminishes, the number of its cells decreasing by as much as 50% in three to four days.

These several statements are apparently rather contradictory but I may be allowed to suggest that to a certain extent a possible explanation of the apparent discrepancy of opinion, in the fact that Diphtheria is a disease in which the morbid changes, [in the blood as elsewhere] present some variety. These variations may depend possibly on the ratio of the several causative bacilli present, on the proportion of streptococci as well as of the specific organisms. More constant results would attained, probably be obtained by the examination of the blood if the condition of the white-cell therein revealed, were classified alongside the results of the bacterial examination.

The leucocytes in Cholera

Some interesting observations have been made with regard to cholera in reference to this subject by Lewis Cunningham. They find in the blood a constant excess of leucocytes
& further have seemed have deemed an apparent degeneration in these cells. They become rounded, the granules are more evident. Vacuoles appear in the cell substance. Ultimately the granules contents appear to be discharged only a colorless residue is left. They report further that a great proportion of the solid constituents of the cholera cholera consists of protoplasmic granular material. They regard this as being derived from similar changes in the neighborhood of the alimentary canal, in the white cells that have migrated thence from the blood.

As regards the etiology of this degeneration, there is as far as I am able to determine no conclusive information. Apparently no analogous process has been reported in connection with the white-cell incidence of any of the other acute infective conditions. The naturally think of Karstosch & Hardy's observations on the discharge of the granules from the myelocytes cells in their culture experiments on the frog, & possibly we may have on the trail of such a vital...
organism such as a cholera, a similar extraordinary reaction to meet the force of the microbic attack on the part of the leucocytes, but may be as is much more likely simply the result of the presence in the blood in the alimentary canal of an acute poiso-plasmic poison which has been erected by the bacillus.

[The question of the bacillus increase of the white blood elements in leucocytosis will be more conveniently dealt with in the latter half of the latter, along with the other essential changes which may occur in that disease]] with which it is intimately connected]

General considerations on Leucocytosis

To deal now with the question of leucocytosis as a whole, in regard to its causation, its symptomatic meaning and its relation to the progress and result of a disease, we may observe

1. That the constant result of the presence of any
local irritant, mechanical or chemical. The consequent injury to the tissues is in the higher metabolites followed by the complex phenomena of inflammation, one of the main features of which is an increase in the adjacent areas by diapedesis or stasis of the white cells, so a local leukocytoysis is produced. This leukocytoysis is an intimately connected with probably to some extent causally a self-phagocytic excitation. The exact relation between the specific irritant and the consequent leukocytoysis and excitation is a factor whose value, generally, is not defined and probably never constant.

(2) Similarly where the irritant is a generalized as in the case of the necrotic foci and other products, the necrotic material carried to the centre of leukocytic production in the various parts of the body, but more especially in the region of the determining lesion, causes an increased production of phagocytes to constitute general leukocytoysis. As to the exact connection of this cell formation with the increase of pain in the blood and certain serious effusions and exudations which are so often comitant, there is not sufficient information as to probably...
they are often correlated phenomena. Also no
local leucocyte is in any given case the nature of the
causal incident, that is, say, with any given
incident, say the lesion of pneumonia, the leucocyte
emerging would naturally vary in character &
amount in different individuals.

(3) That the recent method of investigating this
phenomena by blood films, is necessarily an
inexact one, even to many pathologists. Sometimes in
local inflammations we have in the vessel area affected an increase in the normal tendency
of the white cells to aggregate at the periphery
of the vessels, therefore may not the same occur
on a wider scale in general inflammatory
processes? & the natural result would be for
the leucocytes to occur in apparently greater
proportion than they really exist in the vessels
of the circulation. In its second place
this method does not take into account the
proportion & character of the leucocytes in the
linear spaces [apart from the skin surface].
There is no doubt that in many conditions
[Thomas points out that the marginal position of white
cells is often purely a Vaso-motor phenomena alone]
There is a tendency for the leukocytes to migrate
emigrate in this direction, and the extent of the
emigration can be concluded to vary greatly
in different cases. More perfect & valuable results
perhaps might be obtained, if a series of control
experiments could be performed, in the state
of artificially produced corresponding lesions
in certain suitable animals, then examine the
condition of the lesions in regard to the white
cells present; devoting special attention to the
lungs, liver, spleen, bone marrow.

1) What is the effect of leukocytes on the course
& progress of a disease? No one at this time
applies doubt that eventually it is the normal
reaction of the organism to any noxious influence,
in the majority of cases at any rate, that
the function of this reaction is to modify,
neutralize or mitigate the noxious influence
in question. For instance Liezy & Richter found
that rabbits required a much larger dose of such
toxins as diphtheria, chicken cholera,
typhoid, meningococci after leukocytosis
had been artificially produced, in them
under ordinary conditions. Pavlovsky again
produced a local leukocytosis in one re-
of rabbits not that point infected anthrac culture. In another batch of animals he injected the culture without producing any preliminary leucocytes. The result was that while the first set of animals recovered, the latter died with acute anthrac.

From the foregoing considerations it would seem that the more harmful the inoculation of toxins present the greater would be the leucocytic reaction, but as we have seen the fact is often the opposite. If we allow the existence of such a factor as is implied by the term "negative chemotaxis" we would expect this to be less. This difficulty might be got rid of by the theory that the term "negative chemotaxis" implies a condition of affairs which does not exist. The apparent absence of leucocytic aggregation is not real but only apparent. It is explained by the previous destruction of the cells causing it the absence of the tracer present. The leucocytes really having reacted normally to the stimulus.

Another point worthy of notice in this connection is that probably the production of leucocytes is a complex and induced process, with renewal
In many cases at least, it is not a mere question of direct remittent results. For instance, the amount of leucocytes present in the marrow may be modified by other pathological circumstances, either increased or decreased, without any reference to the amount of matter which the marrow of the diseased tisue is capable of producing in abnormal tissue.

An excessive leucocytic may be injurious simply to its indirect result on red cell production. In the bone marrow, the erythrocyte may be carried into the circulation in an abnormal condition. Secondly, the leucocytic stimulus instead of developing into fully functioning cells may be present as undeveloped lymphocytes, which undoubtedly do not possess the characteristics necessary for phagocytosis of the mature lymphatic acidophilic cells.

Finally, if we examine the phenomena of negative chemotaxis as to being due to a leucocytic cell destruction, we have as the result of such a process certain cell products liberated in nucleohistamin bodies which are allied to leucocytes in composition. These being free in the blood will tend to produce intra-vascular
conglutinations, & consequent haemorrhage, thrombo-
us ulcera tions all of which naturally are detrimental to a hopeful prognosis.

To conclude, practically the whole question still remains one of the two common ingropnits of biological
science, & will necessarily remain so until we
have solved some of the more outstanding problems
of cell chemistry, till we understand more
clearly the function of the leukocytes in the
animal economy, especially in regard to its
important part it probably plays in the processes
of nutrition & excretion, till we appreciate the
exact stages & causal factors in that complicated
process which we term leukocytes. Until
then any attempt at formulating a scientific
pathology, not only of the free cells, but of Adami-
tune in general must be more or less futile & imperfect.

Such observations, however, as those already referred to on leukocytes in
general inflammatory processes, if made
systematically & continuously in the progress
of a lesion, may yield sufficiently constant
results in the general diseases, to be, if not at
least a factor in the further knowledge of
questions of etiology & prognosis, at least a
useful aid in differential diagnosis.

B

The pathology of Adenoid Tissue in collected form

We now pass on to the marked changes in the Adenoid elements when they exist in the form of an organized tissue. Here an essential additional element, which modifies essentially characteristic processes comes into play i.e. the presence of the supporting and confining connective tissue reticulum. Taking this tissue strictly as a tissue apart from any functional condition, one recognizes that whenever it is found in all essentials the great pathological processes affect it similarly. Therefore it will tend to largely determine & be more to the nature of this tissue, i.e., instead of dealing with the various lesions usually, as they affect the various lymphoid organs, I discuss the question from a general point of view

1) In acute infective diseases we may have produced —

(a) A direct septic inflammation by means of the lymphatic supply of the follicles
Tissue in relation to the seat of the peculiar lesions produced by the disease, is, in Scarlet fever & Diphtheria, the follicular tissue more particularly, of the throat, pharynx & of the cervical glands. In Typhoid, the follicular tissue of the lower part of the lining of the alveolar glands. In Dysentery, the lymphoid elements in connection with the Rectum. In Hemorrhoids, the glands of the gum. In Syphilis, the amyloid tissue, adjacent to the part affected.

The determining cause of the change is in most cases, probably hereditary or in other words, it is a question of mixed infection. That is, we have the ordinary organisms of suppuration modified probably in a unique & specific manner in each case by the tissue of the special bacteria of the disease. These differences in the form of what appears generally, like an ordinary white adenitis, comparable to that produced by abrasion from a body surface, have not been yet sufficiently worked out. Indications of their existence remain, may sometimes be found especially in the case of Typhoid adenitis.
(a) A general infection of the follicular tissues throughout the body.

(b) We may have a similar direct infection of the neighboring follicular tissues but non-rabic one. This may be often so, but a preliminary stage of the former change, but the condition may remain permanent as a simple adenitis.

(c) A general infection of the follicular tissues throughout the body may ensue. This condition of affairs is typically seen in plague, probably allied to Plague in some pathological factors at least we have the so-called plague minor as referred to by Cantlie. The glandular fever of children as described by Dawson-Williams, German Measles (Kiebela), ... similis follicularis. General glandular enlargement may be met with in either of the specific fevers as already referred to as Diphtheria, Scarlet Fever, Measles, but they are not typhoidal. Here instead of direct lymphatic infection, we have evidently various toxins circulating throughout the tissues causing in the first place an increased vascularity in the blood vessels. Which as in the case of Plague may be
so intense as to cause haemorrhage. ] and consequent increased cell production, Fibrinous exudation. Should hygienic organisms gain entrance the condition may go on to suppuration, or in the other hand a chronic fibrous hypertrophy may ensue.

(2) Other acute diseases not necessarily infectious which seem to have special relation with the disease, may be exemplified by the meningitis appendicitis which appears to have in many cases at least as one of its main lesions an acute inflammation of the lymphoid tissue of the appendix. Appendicitis may be regarded as a similar probably in many respects an allied condition affecting the intestinal follicles.

(3) Subacute & Chronic affections of Follicular Tissue. It may take the effects of Tubercle Syphillis is one of the most important characteristics in regard to Syphillis as in most conditions no very definite specific pathological changes have been described. We appear to have simply an increased proliferation of cells in the early stages with a typical hardness of the gland, due to the intracapsular effusion of plastic.
material. In the latter stages we may have a florid hyperplasia, or if by any means which
fattens slowly, hypogenic organisms gain entrance
suffocation.

In tuberculosis we may have (1) the formation of
the typical tuberculosis patches in the follicles &
the consequent degenerative changes (2) or a
diffuse hypoplastic infiltration of the whole
 gland with no definite formation of Tubules
nor any tendency to necrosis.

As regards the question of the specific general disease
of adenoid tissue, as, Lymph Adenoma &
Hodgkin Lymphoeythymia are generally regarded
to he. It is probable that these are in many
cases but the results manifestations of several
varied pathological processes whose real
nature is often unknown or overlooked.

By the very nature of this tissue, suffered
primary lesions, with the exception of conditions
whose etiology could be proven as allied to
that of tumourous growth, must be regarded
with suspicion, & in all probability they may
in course of time be no more diseases of
adenoid tissue more than Tubercul is what-
we really have is just the old story of change due to the exercise of the normal function of the tissues. We can only say at present that there are certain chronic or sub-acute symptoms of adrenal time in various situations, sometimes localised, sometimes more general whose causations are indefinite or not satisfactorily established, which may be accompanied by no particular general phenomenon or may on the other hand affect radically the animal economy in various directions, & may, & that one the most important of these general symptoms may be present in certain cases of a typical well marked & progressive leucocytosis. This leucocytosis may generally be distinguished from the other varieties already discussed by the following facts:

(1) It is as noted above generally progressive.
(2) Certain definite areas of leucocytic production appear to furnish the increase, while other areas are not affected, or definite centres only, of white-cell production alone may be affected or more than one, therefore one may. They as the essential idea of this leucocytosis we have so far stated, a local hyperplasia
of the adenoid element, as opposed to the general kidneification of ordinary tuberculous as met with in Feneur rothe morbid process. Further, as a natural result, we are able to recognize in the blood the presence of increased number of the specific cells which are typical of the part or parts affected. For example, we find in some cases the blood full of roundly acidophile cell [or eosinophile], in other a great increase of large uninnucleated or hyaline cells, yet may be the lymphocytes which are increased or they be naturally various cases combination.

One might detail several specific instances of chronic adenitis of both local & general & refer also to the affections of adenoid tissue in such organs as the Thymus or bone marrow, but as we have already dealt with all the essential facts of lymphadenoid pathology such further considerations would only extend the thesis unnecessarily & would involve needless repetition repetition.

I will conclude this portion of the subject with it this thesis, by the enumeration of certain points...
For instance note the special affinity for mucous membranes manifested by the lymph follicles of the ileum. Thus tubercle. Contrary to the ordinary tuberculous process, all tend to lose upon these glands in reference to those of the stomach, duodenum, or colon.
in regard to the pathology and meaning of these several reactions of glandular tissue.

1. They appear to be generally check by the natural results and accompaniments of the functional efforts of the tissue to combat noxious influences and prevent them doing further damage to the organism.

2. They may be due to the peculiar effects of consequent damage done to the cellular tissue by the concentration within of cells, their products or both combined.

3. Possibly the tissue reacts specially to certain toxins, while in most cases of others the reaction is slight or imperfect. We may as to speak have a positive and negative chemotactic here, as well as in the case of the free cells.

4. It is certain for one thing that the molecular elements have a more potent action on certain microorganisms than to others, so in the case of tubercle it is often a formidable obstacle to the general spread of the disease, against the molecular element of the tissue to act as a barrier to the continuous growth of Malarial. While on the other hand it seems in regard to the organism of Sylvaticus affect...
A point which requires further investigation is the nature of the modification, if any, which the secretion of the cells of the gland tissue exerts on the leucocytes; may the difference in the effects, say of a deftined culture invading the richer, has been under lymph gland influence, to what it returned before.

Another query might be, what is the chemical difference in the lymph before and after passing through a gland, and reference to the nature variety themes of the presence of various parts.

James Kirk

[Signature]
Literature and References

I have tabulated the sources from which I have obtained information, according to the sections into which I have divided them, these have referred to the references by number.

Section I
General Development of Adrenal Tissues

The Comparative Study of Adrenal Tissues

1. Mitchinson. The Comparative Path of Inflammation. London 1873
4. Cohn. Sur les glandes lymphatique. quoted by 6

Section II

The Development of Adrenal Tissues

7. Quain's Anatomy Vol I Pt II (Schales) 1891 Page 376 21-24
Section III. The Leucocytes

(9) Kantack Hardy - The wandering cell of the Mammalia. Jour. Physiology London 1874


Section IV

The Functions of Leucocytes

(18) Woodhead. Lectures on Recent progress in Biological Science etc.

(19) Kimmelstiel. Pathology, Volume I Page 447 between 676 also 1899.


(23) Macal Dunlap. Mechanism of Reaction to Peritoneal injection Jour. Pathology March 1897.
(24) Histoinrtis. Ueber. Reaktion und Ausdünnung der Wärmeliege (quoted by 6)

(25) Halbanulin. Blood extravasation (Foehnle Reinink)

(26) Thomas. Pathology. Translated by Bruce
Vol 1 Page 43, 45

(27) Kandack on Eucinophile Leucocytes

(28) Helme. Ulcere Involution.

(29) Peterschmann. Epitheliales
Jour. Path Vol 111 1896 Page 118


Section E

The Pathology of Adenoid Tissue

Page 701 791 837

British Med. Journal Vol. 1196, Pages 836

(34) Bruce. On the disappearance of the Leucocytes from the Blood after 

Leipzig 1892, Lehmann. Page 111 et seq.

Page 244 et seq.

(37) Rosting. On the increase in the number of white corpuscles during inflammation. 

(38) Buchanan on Inhaemia. 
Jour. of Pathology. Dec 1896.


(41) Luear's Dict. of Medicine. 1894. Articles on Lukaemia & Lymphadenoma by Comus.


(46) [Reference to a medical journal]  
Volume II 1896  P 1077

(46) Hamilton's Pathology  
Vol II  P5 1872  London 1896

Note a number in the text may mean that a certain statement is quoted by the author referred to. In that case, I have mentioned the name of the original source author or investigator in the text.