which these terms are applicable have a real existence in the adult, and the question for us to-day is whether they are also met with in childhood. Now, seeing that the splenic anaemia of adults is of its essence a very prolonged disease, the final stage of which, when cirrhosis of the liver has supervened (so-called Banti's disease) is only reached after some years, it follows that Banti's disease at least is not likely to be met with whilst the patient is still a child. In spite of this I think the diagnosis "Banti's disease" is sometimes justified in childhood, as in the following case.

A boy of 12 was known to have had an enlarged spleen for five years. The liver was not enlarged. The blood count showed 2,750,000 red cells, 45.1 per cent. of haemoglobin, and 3,400 white cells. Wassermann test negative. Haematemesis supervened, after which the spleen was decidedly smaller for some days. There was no leucocytosis during or after the haemorrhage. Splenectomy was performed, and at the operation the liver "seemed to be the seat of early cirrhosis." His subsequent history is unknown.

The difficulty, of course, is to distinguish such cases from those of idiopathic cirrhosis "with splenic predominance," already referred to. It can only be done if the history shows that the spleen was enlarged for some years (as in the above case) before signs of cirrhosis supervened, for the cases of idiopathic cirrhosis seem to run their whole course in a comparatively short space of time. There is little doubt, too, that cases of splenomegaly due to splenic thrombosis must often have been included under the term "splenic anaemia or Banti's disease," and so, probably, have some syphilitic cases and some of acholuric jaundice.

It is sometimes asserted that the presence of leucopenia puts a case in the category of splenic anaemia rather than of idiopathic cirrhosis, but to this I cannot agree. In the case of idiopathic cirrhosis with splenic predominance which was described earlier in this paper, for instance, leucopenia was present, and my own view is that leucopenia tends to be a feature of most chronic splenomegalies, no matter of what origin, and that little diagnostic value can be assigned to it.

The treatment for splenic anaemia of the adult type, we should all agree, is splenectomy, but whether the operation is worth doing after cirrhosis has supervened—that is, in Banti's disease—is a matter for consideration.

In conclusion, I would suggest as the most important points for us to discuss: (1) the part played by syphilis and rickets in the production of chronic splenomegaly; (2) the nature of idiopathic cirrhosis with "splenic predominance" and its differentiation from Banti's disease; (3) the existence or otherwise of biliary cirrhosis with splenomegaly; (4) the frequency of splenic thrombosis as a cause of enlarged spleen and its diagnosis from other forms of splenomegaly; (5) the occurrence of cases of splenic anaemia of the adult type and its sequel, Banti's disease, in childhood.

As regards treatment, debate must chiefly centre round the question of splenectomy. As to this, I would agree with Dr. Leonard Parsons¹⁴ that the cases suitable for this operation are those which show a negative Wassermann reaction, no enlargement of lymphatic glands, and no characteristic leucocytic picture, but in which there is some degree of anaemia, associated with (1) leucopenia, or (2) increased fragility of the red cells, or (3) haematemesis. There may be difference of opinion, however, as to the advisability of removing the spleen in Gaucher's disease and in cases with cirrhosis of the liver, whether of the idiopathic or Banti variety, even although these fall within the limits of the above criteria.

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AUTOTOXAEMIA AS A FACTOR IN THE CAUSATION OF PSYCHOSES.*

BY

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In psychiatry, as in other spheres of medical science, the history of medicine unveils precursors of many a modern theory. The modern fever therapeutics of psychoses recall memories as far back as Hippocrates and Galenus.

In the course of the past century a great change has taken place in the doctrine of the cause of psychoses. Formerly the psychic cause was represented as the only, or at least the most important, one. As late as 1827 Heinroth disputed the fact that fever might be a cause of mental derangement; he emphasized that even in the case of alcoholism the moral origin of all mental disorders could be recognized, and that even in the case of injuries to the head the spiritual life must not be forgotten as a cause.

With the advances of normal and pathological anatomy of the central nervous system, however, the doctrine became more and more firmly settled that mental derangements are cerebral diseases, and that a morbid influence of the brain represents the cause of mental disorders. But the external causes were frequently overestimated. Forty years ago the cause of paralysis was regarded as lying in sexual excesses, overexertion, congestion, injuries to the skull, overheating of the skull, long-enduring shocks, alcoholism, becoming prematurely aged, the climacterics, interruptions or derangements in menstruation, together with certain psychical influences, such as excitement or grief.

Very gradually the doctrine of syphilis being the cause of paralysis opened up new paths of research, and its correctness was finally proved in 1911 by Noguchi tracing the *Spirochaete pallida* in the brain.

As early as 1889 Kraepelin taught in connexion with paralysis that numerous symptoms must be regarded as a direct consequence of the degeneration of certain trophic nerve tracts. In 1896 he described dementia praecox and general paralysis as metabolic diseases.

The later doctrine was accepted, but for all that derangement of the digestive processes is of material importance among the symptoms of paralysis; in this connexion syphilis of the organs must also be mentioned, as well as an increased tendency of the bones to fracture. As to the pathogeny, it is assumed by numerous authors that not only are the symptoms caused directly by the spirochaete, but that a number of these may also be caused by toxic agents produced by the spirochaetes. I regard the lipomatosis that frequently occurs in advanced stages of paralysis as a secondary metabolic derangement, the region of the hypophysis being disturbed by hydrocephalus internus, and abnormal adiposity being thus induced.

The doctrine that dementia praecox is a metabolic disease or autointoxication was based on corporeal symptoms and relations—for example, on changes in the reflexes, mechanical excitability of the facial nerve, mechanical excitability of the muscles, dermatography, a peculiar change in the skin, and possibly, too, on disorders in the thyroid glands, and the relations as regards puberty, menstruation, pregnancy, etc. Kraepelin also called attention to an hereditary disposition in 70 per cent. of the cases, and also to inherent symptoms of degeneration.

The realization by a large number of alienists that an endogenous cause of the disease must be assumed, above all, the study of nerve disorders based upon disease in the blood glands or the glands of internal secretion, has induced an intensive investigation of these factors for decades past. This biological observation and investigation of mental derangements is the more important because cerebral anatomy has not fulfilled the great hopes that were entertained in regard to it. Psychology, too, has not led to very satisfying results, either as regards experimental study or psycho-analysis.

* A paper read in opening a discussion in the Section of Mental Diseases and Neurology of the Annual Meeting of the British Medical Association, Cardiff, 1926.

If the clinician wishes to investigate the nature or character of a mentally deranged patient he must undertake not only the usual clinical psychological investigation, but also a detailed neurological examination; he must determine all the hereditary factors, and, as far as possible, carry out a microscopical test of the blood, liquid components, and other materials, and even of an extirpated particle of the brain cortex.

A series of biochemical tests are also necessary in order that the effect of external deleterious principles, and also the endogenous deviations in the digestive processes, may be determined. An endless number of investigations have been carried out, the results of which are but to a small extent of lasting value.

Among the clinical autotoxaemic groups I will first discuss the forms of retarded evolution on the basis of endocrine metabolism. In these groups are comprised several forms of uniglandular disorder, the pluriglandular disorders, and, as a group by itself, Mongoloid degeneration. The blood glands are well known to be vegetative organs which are governed by vegetative nerves and influence the excitability of the vegetative system by their hormones. They have mutual relations of co-ordination, promotion, and retardation.

The function of the thyroid gland may be disturbed in early youth, or by a local disease such as inflammation, tumour, tuberculosis, etc., or by operative intervention. The consequences are always the same: retardation of bone growth and of sexual evolution, degeneration of skin such as myxoedema and loss of hair, as well as mental retardation and stupefaction. Complete loss of the thyroid gland results in disturbed function of several organs, such as the sexual glands, the kidneys, the liver, and the adrenal system; the fermenting processes are enfeebled, and also the capacity to produce immune bodies. Albumin metabolism is gravely disturbed, and finally death ensues. These consequences can always be confirmed by experiments on animals. Thyroidectomized animals grow very slowly and their skin degenerates. Without a doubt their intelligence and vivacity are also enfeebled, as I have proved by experiments on goats and pigs. An abnormal function of the thyroid gland can also be proved by Abderhalden's decomposition reaction. That psychical alteration exists was proved by the English Myxoedema Committee—apathy, stupor, and insomnia in 97 per cent., illusions in 18 per cent., hallucinations in 16 per cent., and psychoses in 16 per cent. By removal of the thyroid gland the basal and albumin metabolism are lowered and the tendency to sugar rises.

The possibility of treatment is, theoretically and practically, very important in hypothyroidism. Freshly made preparations of the thyroid gland, liquid or dry, and administered by the mouth or by injection, cause the symptoms to disappear. Good results are obtained in sporadic myxoedema, in cachexia thyreopriva, and in endemic cretinism. A little iodide salt—a few milligrams every week—is also effective in endemic cretinism. Purification of the drinking water is an aid in eradicating this condition, which is on the decline in many countries. Very few cases now occur in southern Germany, and instances continue to grow less frequent in Switzerland, Austria, and in northern Italy.

The case is very different in hyperthyroidism or Graves's disease, with its symptoms of irritability, restlessness, excitement, tachycardia, sweating, tremor, and also exophthalmos. According to Abderhalden the decomposition reaction in Graves's disease can also be shown. In treatment surgical removal of part of the gland is very important, but also thymus and ovarian preparations can be employed, as well as small quantities of iodides.

The parathyroids or epithel bodies form ferments which influence the calcium metabolism. According to Loeb the quotient ClNa to Cl_2Ca is of importance in the function of the nervous system. After surgical removal of the parathyroid glands there follows an increase in nervous excitability. Certainly diminished function of the parathyroids, and probably an effusion of blood into the parathyroid bodies, sometimes due to asphyxia at birth, is the cause of tetany and also of spasmodophilia.

The pituitary gland has its interest for neurologists and

also for psychiatrists. There is no doubt that the anterior or glandular part of the pituitary body, either as the result of disease or diminished function, causes a retardation of the skeletal growth, while its over-activity results in the production of excessive growth in youth as the result of augmentation of the acidophil cells, and in later life acromegaly develops. The action of the pars intermedia and the pars posterior (or pars nervosa) is more difficult to define. A ferment derived from this part influences the blood pressure and unstriated muscles, and its action is also discernible in cases of polyuria and glycosuria.

With regard to the localization of dystrophia adiposogenitalis opinions differ. Some authors consider that this depends on the pars anterior or, as Biedl thinks, on the pars intermedia. According to B. Fischer and to Cushing this condition is caused by disorder of the pars posterior. Other authorities assume morbid processes in the region of the hypophysis, in the infundibulum cerebri, or in the regio subthalamica. As the basis of such degeneration one may consider a birth deformity or the pressure of a tumour or hydrocephalus.

A more recently recognized condition is cachexia hypophyseopriva, or Simmond's disease, which causes bodily decay and death through non-function of this gland, probably of the pars anterior. Sometimes a lipodystrophia can lead to cachexia through progressive pressure.

It is important to realize that giantism in youth and acromegaly can be associated with idiocy and a primary disorder of the cortex cerebri be assumed.

Further, dystrophia adiposogenitalis is often associated with idiocy and imbecility. This form of feeble-mindedness, as I have shown, is often connected with a cheerful mood and motor unrest, which is in odd contrast with the plump and corpulent figure. In rarer cases, also, abstraction, hallucinations, loquacity, depression, and sleeplessness are described.

I shall shortly touch upon the rare cases of premature puberty in disorders of the epiphysis cerebri, mostly caused by tumours (principally teratomata), whereby the physiological retardation caused by this gland disappears. According to A. Fröhlich "apinealism" leads to cachexia, hypopinealism to sexual hypertrophy and premature puberty, but hyperpinealism to general obesity.

Hypofunction of the sexual glands is of importance in relation to physical constitution and neurology, but less so to psychiatry. I have mentioned the retardation of sexual glands in myxoedema and cretinism, and the relations of these to dementia praecox I shall consider later.

The thymus has a relation also to psychical evolution. In the condition of status thymico-lymphaticus in its different forms there is psychically some infantilism—a dependent, anxious, feeble, and dreamy character. Also to be remembered is the persistence of the thymus in megalencephalia with feeble-mindedness.

Klose has recovered thymus in young dogs by operation; the animals became fat, ceased to grow, showed clumsy movements, and were easily fatigued. The reflexes were first increased, then decreased, and the electrical excitability of the muscles was augmented, as in tetany. The animals appeared stupid, tried to eat wood and stones, became dirty in their habits, and finally died. Whereas the functioning thymus gland lessens the phosphoric acid and nucleic acid, this is not so after thymectomy; the organism is overburdened with acid, the brain containing much colloid and becoming swollen.

Heinrich Vogt described a case of thymic idiocy: a 17-year-old dwarf, stupid, with feeble, pulpy muscles and weak, elastic bones; the hands trembled, the reflexes were exaggerated, growth of the sexual organs was retarded, and the skin flabby. Later the bones became fragile. Occasionally fits of tremulousness appeared.

The suprarenal cortex and medulla are very important in relation to the nervous system, but less so to psychiatry. In fish of lower species (sharks and rays) the cortex and medulla are separate glands.

The cortex is the more important structure, constituting an autonomic central organ for certain parts of the sympathetic nervous system. It absorbs lipoids and provides material which is converted into adrenaline in the medulla.

The medulla, consisting of nerve-endings, nerve cells, and

chromaffin cells, forms adrenaline. The medulla also influences the breaking up of carbohydrates in the liver.

Adenoma of the cortex causes hyperfunction and premature puberty, while hypofunction causes retardation of growth. In Addison's disease, dependent upon disorder of the suprarenal gland, headache, depression, fatigue, excitability, sleeplessness, and feeble memory appear. No doubt both portions of the suprarenal gland are concerned, but it is principally the chromaffin tissue which is affected.

Dysgenitalism can be congenital or caused by illness or operation, as in the popular custom of the Scops in Russia. Elongation of the long bones is present in young castrated peoples and also in some cases of juvenile syphilis. Castrated subjects show psychical infantilism, but not actual feeble-mindedness.

Disorders of the pancreas can retard growth in youth. Byrom Bramwell described a case of infantilism of this nature in a lad aged 18, who was no more developed than a boy of 11 years. Fat digestion was disturbed; phosphoric acid in the urine became less on milk diet, and the iodide reaction was absent, when iodine salt in gelatin capsules was taken, since the capsules were not dissolved in pancreas juice. These symptoms disappeared after treatment with pancreatic extract, and physical development was speedily resumed. Mental development was in no way affected.

Often differences are made between uniglandular and pluriglandular and also multiglandular disorders. Strictly speaking, no glandular disorder affects one gland alone, for after the loss of one gland it follows that changes in the other glands will occur. In loss of thyroid gland the gonads are also disturbed; in pregnancy the anterior part of the pituitary gland is augmented. One can, however, distinguish between a disease caused by a single gland and a disease of pluriglandular nature caused by simultaneous disorder of several glands.

In the case of Mongolism, described for the first time by Langdon-Down in England in 1867, there is much to be said for the theory of autotoxaemia. The face formation with epicanthic folds, the microcephaly, hyperbrachycephaly, and the arrest of growth indicate a retardation of development. It is scarcely necessary to mention the weak joints and the indented tongue. It is a well-known fact that cases are often combined with other degeneration of thyrogeogenic and hypophyseogenic type. The simple type of convolution in the brain signifies also a retardation in development. I could show in the formation of the cortical cells embryonic characteristics; but recently a degeneration of the third cortical stratum and also a species of malformation in the cerebellum has been described. I cannot endorse van der Scheer's theory that the cause of Mongolism is a hard constriction by the amnion. The exhaustion theory is deduced principally from the fact that usually the last child of a large family, and especially the children of an elderly mother, become Mongoloid.

But apart from histology the serology can also contribute to elucidation of the matter. In our laboratory Kafka firmly established the fact that the serum in most cases shows a weak but distinct "decomposition" reaction of the hypophysis. The white blood corpuscles are increased, especially the neutrophils and also the eosinophils, the rate of sedimentation is augmented, and the viscosity of plasma is decreased. Distinct syphilitic reactions are absent, and a syphilitic origin, so often expressed, cannot be upheld.

The most important of all problems, however, in psychiatry is the pathogenesis of dementia praecox or schizophrenia, and the greatest problem in the treatment would be its cure or amelioration.

Doubtless there is a recessive heredity, certainly in 70 per cent. of cases. There is also anatomical alteration in the brain, as manifested by Alzheimer, Rosenthal, Josephy, Klarfeld, and Fünfgeld. A transformation in the nervous cells is found in the third stratum, which is very liable to degenerate. The fifth stratum is also changed. Principally an atrophy of nervous cells can be demonstrated, the chromatin disappears, the cell is cloudy, the basic substance shows a wavy design, the nucleus is changed, and its membrane becomes thinner. The sixth stratum shows some swelling in the nervous cells. Von

Monakow claimed to have found changes in the choroid plexus.

The disease is independent of exterior influences, such as psychical and physical, also of exhaustion and head injury.

Several details indicate a relation to auto-toxaemia through internal glands. It is important that doubtlessly some women become ill first or after a remission during pregnancy or childbirth or in lactation.

The contention of Mott and Prudo y Such is not generally admitted, that spermatogenesis ceases and that the Leydig cells degenerate with pigment formation, while the sexual organs in females are small and infantile.

Rudolf Allers emphasizes the initial fall and later increase of the bodily weight. Corpulence in the chronic stage is often a sign of ill omen. Secretion of saliva and perspiration fluctuate. The temperature is sometimes subnormal, especially in stupor.

The establishment of the internal secretory degeneration according to Abderhalden is held in doubt, but in my opinion is extremely important. One must consider the somewhat difficult method of dialysation, the refractometrical research according to Pregl, the interferometrical research according to Hirsch, and the basal metabolism.

The method of Abderhalden, first recommended by Fauser, and very much employed in our clinic by Kafka, shows in the actual dementia praecox degeneration of the cerebral cortex, of the sexual glands, and often of the thyroid and pituitary. The blood shows normal coagulation. Anti-trypsin is somewhat augmented; cholesterol is fairly high (0.3 to 0.5 per cent., as compared with 0.13 to 0.2 per cent. in normal cases).

According to W. Schmidt the physiological augmentation of blood pressure through adrenaline is absent in catatonia and hebephrenia. In many cases no dilatation of the pupil occurs on instillation of adrenaline.

As S. Fischer proved, the specific dynamic albumin effect falls in initial dementia praecox, and later the basal metabolic rate. It is also probable that during convalescence, so long as there are psychical symptoms or disorders of metabolism, especially obesity, first the specific dynamic albumin effect becomes normal and afterwards the basal metabolic rate. In cases of complete recovery both are normal.

The secretion of organic matter in the urine is often diminished. According to Rosenfeld there is a retention of nitrogen to as much as 2 grams a day. Strübing found the secretion of nitrogen less in cases of stupor. Pighini contends that a decomposition of albumin and negative balance of metabolism occurs in the acute stage, but retention of nitrogen in the chronic stage; also he described an increased excretion of sulphur in acute stages; the synthesis of urea is apparently diminished.

According to Strübing the secretion of phosphoric acid is lessened in stupor. Corvicet found considerable indican in the urine in cases of stupor.

Some authors describe glycosuria. Riveno found acetone in 3 of 10 paranoids. Albumin in the urine is found principally in stupor. The function of the kidneys appears slower in the secretion of methylene blue.

According to Pighini the metabolism of salts in the urine is lower; while Lowe describes an increase in the colloids.

Recently Kafka succeeded in demonstrating that a pathological albumin can be found in the cerebro-spinal fluid of dementia praecox less than in general paralysis, but distinctly more than in normal cases. It is an increase of the total albumin of the globulin and the albumin. The albumin quotient is similar to the normal.

Many details, however, are not yet sufficiently confirmed. Some of these refer to changes of secondary importance. It is, however, certain that auto-toxaemia and auto-intoxication are very important in schizophrenia, but do not form the only basis.

Doubtless we are ignorant regarding the relation of cerebral co-operation with the total organism; more especially are the disorders of isotonia, isothermia, and iso-ionia too little known. We are, therefore, only able to form a very incomplete idea of the nature of schizophrenia.

The first condition is the inherited quality of the brain. We must certainly reckon also with an hereditary quality of the glands of internal secretion.

If a disorder of metabolism, principally of the internal secretions, affects an abnormally inclined brain, the condition which we term schizophrenia is present. This can be relieved or may become chronic, according to the lesion of the brain.

Of quite a different character are the basic conditions of cyclothymia or manic depressive psychoses. This disease occurs in persons liable to attacks of opposing symptoms—now of exaltation, now of depression, then of excitement or of retardation, then in flight of ideas or in mental slowness. It is much rarer than schizophrenia. Perhaps the most interesting cases are those which pass off in a slighter degree, do not require treatment in institutions, and sometimes reveal themselves temperamentally.

The hereditary factor is here very important, and can be traced in 90 per cent. of the cases.

There is no question in this condition of an anatomical basis, either macroscopical or microscopical, although occasionally small foci are found in the brain.

There are some interesting physical symptoms. In the mania the bodily state appears excellent, the patients look much younger, and show a "turgor vitalis."

Williams declared that the temperature in mania is increased, and in depression decreased. Toulouse and Marchand reported in mania 0.6 degree increase at night and 0.2 degree in the morning. Other authorities deny this, including Pilez. The pulse in mania is more rapid, in depression slower. The sphygmogram shows in mania steep curves, in depression a slow ascent and flat curves. The blood pressure in mania is low, 110 to 120 mm. Hg, sometimes even less, to 60; in depression it is somewhat higher, 130 up to 170 mm.

The blood contains in mania less haemoglobin and fewer red blood corpuscles. Macphail states that the haemoglobin content runs parallel with the weight of the body. Antitrypsin and cholesterin are normal. Any "decomposition" of internal secretion, according to Abderhalden, is not traceable. The respiration rate is quicker in mania, but slower in depression.

According to Pini the amylolytic effect of the saliva is augmented in mental excitement. In depression the flow of saliva is reduced; sometimes an offensive odour from the mouth is noticeable. In mania the appetite and thirst are active, sometimes even to voracity; in depression there is loss of appetite to refusal of food. In grave depression the free hydrochloric acid in the stomach is reduced. The basal metabolism appears normal (according to Bornstein). The urine may be augmented in mania up to six litres, of a low specific gravity (1001). More uric acid and xanthin is secreted, less phosphoric acid. In depression uric acid and phosphates are less. In mania glycosuria has been found sometimes. Acetonuria in depression is caused by disordered digestion.

Metabolic disorders are generally very slight, and can only be explained as secondary symptoms; digestive troubles especially are caused by depression. It is possible in cyclothymia to find some relation to endocrine processes, but much more seldom than in schizophrenia. There are relations to Graves's disease; in myxoedema states of retardation with depression exist. Vagotonia is not distinct.

In rare cases I have met with a combination of cyclothymia and acromegaly. One can observe the pyknic habitus in real manic patients: the broad face, short neck, deeply vaulted chest, fat abdomen, and somewhat short extremities.

Sometimes manic-depressive disorders appear only as a symptom of illness from other cause, in syphilis of nervous system, in old age, in brain alteration; but in my opinion we cannot attribute great importance to auto-toxaemia in cyclothymia. Generally speaking, it is an instability of affective mind, caused by heredity, and connected with vasomotor fluctuations.

Auto-toxaemia is of the greatest importance in epilepsy, although this is not a disease in a strict sense, but actually a disposition to reactions which show the different limitations of the consciousness, and, as the most conspicuous syndrome, the classical fit. The difference between true and symptomatic epilepsy is absolute. True epilepsy is applicable to those cases which cannot be otherwise

explained. It would be better to term it cryptogenetic epilepsy.

Very different are the forms in symptomatic epilepsy, as, for example, innate brain disorder with microcephaly; quite peculiar is tuberoso sclerosis and the heredito-degenerative processes—pseudo-sclerosis, myoclonus, etc. Further lesions are due to trauma, parasites, and abscesses; syphilis is important, as also are tuberculosis and encephalitis. Important, too, is the group of infantile paralysis. There also occur pre-senile gliosis and multiple sclerosis, and troubles of disarticulation by embolus, thrombosis, endarteritis, and aneurysm; finally, through poisons such as alcohol, absinth, lead, cocaine, and camphor.

So-called secondary epileptic fits occur in uraemia, eclampsia in childhood, etc. We must not forget that in cases of true epilepsy it is possible to find certain alterations of brain through careful research. Alzheimer found gliosis of the cerebral cortex in some cases, and, according to Chaslin, alterations in the cornu ammonis occurred in 60 per cent. of cases. Spielmeyer found a condition approaching leptomeningitis and arachnitis, and also alterations in the circulation and pressure of the cerebro-spinal fluid; sometimes also heterotopias and horizontal cells, according to Cajal.

Certainly heredity is an effective factor—often alcoholism in the father—whereby cerebral resistance is weakened. Before the actual fit the blood vessels are contracted, as Otfried Förster maintains; the brain is anaemic and smaller in volume. The cerebro-spinal fluid pressure is low, according to Colb and Macdonald in experiments on animals.

Then a very strong stasis of the veins follows the fit; the surface of the brain becomes blue-violet, and the volume of the brain and the cerebro-spinal fluid pressure are both increased.

According to de Crinis the quantity of the urine declines before the fit. Retention of nitrogen in the form of circulating albumin follows, and also increase of the acid elements soluble in ether, sometimes also of the uric acid, and increase of the antitryptic qualities. The basal metabolism points to oxidation processes.

After the fit the quantity of urine is increased, as also are the acidity, the uric acid, the ammonia, and the total nitrogen; also creatinine, amino nitrogen, phosphoric acid, and organically fixed phosphorus.

Noticeable, too, is the appearance of lactic acid, acetone, albumin, urine casts, and diazo-reaction. In the blood there is an increase in the residual nitrogen and in antitrypsin, and there is a trace of lactic acid. These alterations appear in consequence of a lack of oxygen and superfluity of carbonic acid in consequence of increased muscular effort. The antitryptic qualities of the blood are enhanced. The secretion of gastric hydrochloric acid is diminished. The most important is retention of the nitrogen, which does not build up the body albumin, but represents albumin in circulation.

The epileptic shows a decreased production of carbonic acid between the fits. Before a fit the oxidation is completely retarded, and after a succession of fits the production of carbonic acid is again somewhat increased.

In the importation of albumin the metabolism of gas is reduced in consequence of retarded oxidation before a fit. The production of carbonic acid is reduced, as the combustion is not extended to the final products. The metabolism of fat shows only slight deflection.

The specific dynamic albumin effect is slighter than with healthy persons. According to Allers the most important fact is that the retention of nitrogen is caused by the augmented circulation of albumin. The ability to form carbonic acid is diminished in epilepsy. Before a fit the albumin is incompletely oxidized, afterwards it is replaced in higher degree. Toxic products of metabolism in consequence of incomplete oxidation before the fit are secreted through the kidney. Normally the central nervous system maintains the equilibrium between acids and bases; this regulation is disturbed in epilepsy. The fit seeks to establish a balance. It alters the metabolism, the exchange of albumin is increased, the white blood corpuscles are diminished, and the toxicity of the urine is intensified.

The irritants by which an attack is induced are different in nature. By far the strongest is faradization of cortex

cerebri; further mechanical, chemical, or toxic irritants can act in the same manner.

Some factors precipitate convulsions—as, for instance, pressure on the carotids, blows on the skull, lumbar insufflation of air, and sometimes lumbar puncture; also sensory irritants, such as pressure on peripheral scars, operative irritants, worms, and affects, especially shock with angiospastic effects.

The liability of the brain to convulsions is augmented by certain secretions. Of these the secretions of the suprarenal gland, of persistent thymus, of the corpus luteum, perhaps even the epiphysis cerebri, increase excitability; on the other hand, the parathyroid glands, the sexual glands, the pituitary, and perhaps the pancreas decrease the tendency to convulsion. The thyroid gland is ambivalent. It is probable that the glands influence the proportion of potassium ions and calcium ions.

It is important that in epilepsy we can also show in the blood serum the “decomposition” of internal secreting glands, especially the thyroid gland, also to some extent the sexual gland and also the suprarenal gland. These reactions are generally less intensive than in schizophrenia, but they are often important in the differential diagnosis from hysteria.

I would mention that the removal of a suprarenal gland by operation has absolutely no effect on recovery. However, many factors can predispose the brain to convulsions; different irritants, among these also auto-toxaemia, can prepare the latent convulsion until finally the convulsion appears by summation or by the addition of a new irritant.

The influence of the liver in mental disorder is still somewhat uncertain. Most probably it is a factor in Wilson's disease—progressive lenticular degeneration. The tissue of these centres in the brain is disintegrated with formation of granular cells, but the process also occurs in the cortex cerebri. According to Alzheimer the giant glial cells may sometimes be found; further, a nodular cirrhosis of the liver is present. According to Hall there is an innate inferiority of the liver and the brain. The differential diagnosis as compared with other diseases of the extra-pyramidal system is not exact.

Kirschbaum examined the central nervous system in three cases of acute yellow atrophy of the liver, and found degeneration in the corpus striatum and in the pallidum, and also in the cortex cerebri. In experiments on animals in our clinic he also found that with elimination of the liver no serious damage in the corpus striatum and in the pallidum occurred.

Formerly great importance was attached to bodily exhaustion as an initial cause of mental disease. A number of disorders were classified as exhaustion psychoses, such as amnesia and inanition delirium. Cases of shipwrecked persons, exposed for a long period to hunger, were described as being delirious. But here probably also psychical causes were at work, principally fear and desperation. Sometimes a mental disorder could be observed as early as the second day.

In speaking of exhaustion we must distinguish between bodily exhaustion (fatigue) and lack of sleep and lack of nourishment. Bodily strain has a more harmful effect on the heart than on the nervous system. Lack of sleep can, of course, cause disorders in a normal mind. Proportionally small is the influence of hunger. I have made experiments myself and established that three days without nourishment caused only a very slight lapse of memory and of the association of ideas, whereas perception is well preserved. On the other hand the mental qualities declined very quickly during a sleepless night.

Also the brain of animals killed by hunger experiments is much less affected than the brain of those dying from lack of sleep. The war furnished a gigantic experiment in respect of exhaustion; also of opportunities of observing the influence of hunger on insane persons, but the result was negative. A paranoid woman, five and a half feet in height, decreased in weight by as much as 24 kg., or 53 lb., without any alteration in the mental condition. Thus exhaustion only has a very slight influence in causation of insanity, and least of all lack of food.

Our summary shows that in psychoses an extraordinary

quantity of biological and chemical changes occur which can be explained by auto-toxaemia. In part these are secondary symptoms of illness due to other causes, as in the case of general paralysis.

In part, however, these disorders must be attributed to causal factors. The cause of a psychosis is not so simple as a chemical reaction. In general, it is a question of a collection of factors. Primarily an innate disposition, especially both in the central nervous system as well as in the vegetative nervous system and in the system of endocrine glands. This is so in cases of idiocy and feeble-mindedness with disorder of the glands, as well as largely in dementia praecox; but if these conditions are present they are often succeeded by external and internal irritants as in epilepsy.

An important question is, Can the treatment utilize this point of view? In some ways this has already been done. Most successful are cases of myxoedema and cretinism. These diseases will soon disappear altogether; but in this the prophylaxis of endemic cretinism will contribute by the purification of water and the application of small quantities of iodine.

Results are possible in pituitary disorder by treatment with x rays, and more by radium and by operation, but sometimes also in diminished function of the glandular part by the administration of organic substances, such as fresh animal glands, prepared glands, or glandular extracts. A number of other “organic” treatments are more important in neurological cases than in psychiatry. Also opportunity of treatment is offered in cases of epilepsy.

Unfortunately the fever treatment with malaria and relapsing fever, which we also employed in our clinic in cases of dementia praecox, epilepsy, multiple sclerosis, etc., has not as yet had positive successes. Also other treatments of dementia praecox with organic substances and blood transfusion yielded no result.

To be sure Wolfgang and von Wieser of Vienna report successes in disorders of the internal secretion by x-ray treatment. First, the ferment reactions of Abderhalden and the basal metabolism must be specified, whereupon irradiation of the endocrine glands with x rays follows. Wieser has already treated 98 cases of idiocy, including Mongolism, and in 94 cases the clinical condition and the quality of serum were improved. Besides these numerous other disorders of psychical, neurological, and endocrine character were treated. The reports thereon are certainly worth following up.

Both diagnosis as well as therapeutics demand that the research of the auto-toxaemic influences in psychoses is to be regarded as one of the most important tasks in psychiatry.

VISUAL EFFICIENCY AND WORKING ABILITY.*

BY

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It would perhaps have been more in consonance with the subject and with the contents of the following contribution had the title of the discussion been “Visual inefficiency and working ability,” for the burden of my story is that much work can be done by persons who suffer from very defective eyesight.

Advancing years, if they have not brought wisdom, have perhaps brought a certain amount of caution. At any rate, I had much rather sit and listen to people nowadays than air my own opinions; still, I think I am not wrong in saying that the origin of this discussion was a communication which I read to the Royal Philosophical Society of Glasgow on October 19th, 1927. In that communication I advanced my reasons for holding that for most forms of manual work visual acuteness, in the strict sense of the term, is scarcely required at all. That paper, by the courtesy of the late Sir Dawson Williams, whose death I much deplore, for I knew him intimately for forty years,

* Read in opening a discussion in the Section of Ophthalmology at the Annual Meeting of the British Medical Association, Cardiff, 1928.