tion and the discussion which had taken place were very important, and had cer-
tainly been to him an eye-opener, and when he felt in that position he always
thought there must be others who felt the same. Personally he was not pre-
pared for this important criticism with regard to the stereotyped ideas in
connection with the infectious diseases, and yet member after member of the
Society had got up and indicated that various of the older conceptions regard-
ing the infectivity of these diseases were definitely wrong, and from Mr. Ferard
they had had a strong expression of feeling with regard to certain school
regulations. Now, if that was really the expression of the views of the Society,
it seemed a pity that they should separate without taking a still further step;
and he suggested that the Society should send instructions to the Council to
nominate a committee, comprising Dr. Ker and others, who would take up
this whole question and consider the periods of infectivity of these diseases,
and also the regulations at present in vogue in the various schools in Edin-
burgh with regard to the management of infective maladies. (This was
agreed to.)

THE ASSOCIATION OF ACUTELY FATAL ILLNESS IN
INFANTS AND CHILDREN WITH ABNORMAL
CONSTITUTION (STATUS LYMPHATICUS).

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The subject of this paper is a discussion from several points of
view of those mysterious cases of sudden death which to-day
are usually termed cases of status lymphaticus. They are not
common, but their unexpected occurrence in individuals in
apparently sound health has drawn great attention to them,
and in the last hundred years a vast literature has gathered
round the subject.

The clinical features are instantaneous, or almost instantane-
ous, death of an individual in robust health; while, after death,
the most scrupulous examination may fail to reveal disease evident
to the eye. These cases of sudden death fall into several fairly
defined groups—(1) little infants found dead in bed overnight,
in some cases raising suspicion of overlaying or criminal suffoca-
tion; (2) older children or young adults succumbing during
anaesthesia, or shortly afterwards; (3) young adults dying sud-
denly during bathing. There are other cases of the same nature,
but the present paper will be mainly concerned with the first
group, and a series of cases apparently allied to them.

Many explanations of these tragic deaths have been offered;
but numerous as they are, the hypotheses as to causation can be
separated into two essentially different groups—the mechanical
hypothesis of pressure exerted by the enlarged thymus on adjacent
vital structures, and the non-mechanical view of an altered constitution of body; that is to say, of a morbid diathesis.

The first or mechanical view is much the older, and held the field until Friedleben, dealing with the closely allied subject of thymic asthma, pronounced his famous conclusion, "Thymic asthma does not exist." With that epigrammatic sentence the mechanical view disappeared for a few years, but it was revived under the authority of Virchow and others. This injurious pressure of the thymus was held to operate in different ways—on the trachea, on the great nerves and blood-vessels of the anterior mediastinum, and on the heart itself. The sudden death was sometimes assumed to be due to a sudden swelling of the enlarged gland with blood—the "turgescence" theory. This "mechanical" doctrine is well expressed in the term "thymus-death."

The hypothesis of a morbid constitution or diathesis is due to A. Paltauf,* who in 1889 published in a much-quoted paper the view that the enlarged thymus did not produce death, but that it and the enlargement of other lymphatic tissues and organs—the tonsils, the lymph-follicles at the base of the tongue and in the pharynx, the spleen, together with narrowing of the aorta and degenerative changes in the heart—were marks of a widespread alteration of the body, which he termed a "chloroto-lymphatic constitution." This "constitutional" hypothesis is indicated in the phrase "Status lymphaticus," which is the commonest description given to the condition in the literature since 1889. According to Paltauf, death is due to a sudden heart-failure, which is easily induced in this diathesis by stimuli from the central nervous system.

This hypothesis of Paltauf has effected a complete revolution in the attitude of clinicians and pathologists to the subject. His post-mortem findings have been confirmed by many subsequent autopsies. His thesis of a lymphatic constitution has been widely accepted, and has indeed been amplified by such authorities as Escherich, Bartel, and Wiesel. And where different views of the pathology of the condition have been expressed, they generally rest upon the supposition of some general constitutional change, some intoxication, and so forth. Thus Hart would restore to the thymus its former predominant rôle in the condition, no longer, however, that of mechanical pressure, but as the source of a

* In older medical literature the hypothesis of a peculiar constitution is not unknown. Rokitansky and others had propounded such a view, but the strong revival of the constitutional theory is entirely due to Paltauf.
morbid and excessive secretion, producing among the other widespread changes those of the general lymphoid hyperplasia; he propounds, in fact, the hypothesis of a thymus toxæmia.

Yet careful observations by several writers (Hart, Warthin, Jackson, etc.) seem to establish the fact that in a very few cases of sudden death, and more frequently in thymic asthma, the morbid condition is due to mechanical pressure of the thymus. But with these exceptions, which most agree are very few, the mechanical hypothesis of thymus death has taken a secondary place in current medical literature, and has been replaced either by one of a constitutional diathesis, or by one of chronic intoxication of the body.

Clinical Characters—Age-Incidence.—Sudden death from status lymphaticus is a phenomenon almost confined to infancy, childhood, and adolescence. This age-incidence is shown in the analysis of 101 cases collected from the literature by Ssokolow.

| Age Group          | Cases |
|--------------------|-------|
| Newly born         | 29    |
| Under 1 year       | 42    |
| 1 to 5 years       | 12    |
| 5 to 10 years      | 3     |
| Above 10 years     | 15    |

In the last group (above 10 years) the majority were about 20 years, and the oldest was 29 years.

Sex-Incidence.—There seems to be no preponderance of one sex in infants and younger children; but in older children and young adults the majority of cases is said by Ssokolow to be in males.

General Configuration and Appearance of Body.—With regard to this it is impossible to give any statement that will cover all cases. In young infants the appearance is often of excellent development and of ruddy health, as will be seen later in the present paper. In young children (1 to 5 years) Paltauf, Wiesel, and others describe a type of body with a pale pasty skin, a thick deposit of fat, enlargement of tonsils and other superficial lymphatic glands, and the frequent but not constant presence of rickety changes in the bones. In young adults the development is often notably powerful and muscular, and the length of the body is often above the average (Bartel). But there are many deviations from these types, and cases occur in many varying conditions of nutrition and development.

The one distinguishing clinical characteristic of these cases is that death occurs suddenly and without warning in the midst of apparently sound health.
Morbid Anatomy—Thymo-Lymph-Glandular Organs.—Here the determination of the normal standard of size is very important, and also very difficult, because of the variation of the standard at different ages. This difficulty is greatest in the case of the thymus. Thus Dudgeon gives the average weight of the healthy thymus from birth to 2 years as 7 to 10 grammes, the weight remaining stationary till puberty and then steadily diminishing. But Hammar gives much higher figures of weight, as follows:—

| Age       | Weight  |
|-----------|---------|
| At birth  | 13.2 g  |
| 1 to 5 yrs| 22.9 g  |
| 6 ,, 10   | 26.1 g  |
| 11 ,, 15  | 37.5 g  |
| 16 ,, 20  | 25.5 g  |
| 21 ,, 25  | 24.7 g  |

Hammar's figures have been much criticised, but his material was selected with great care. His work has thrown suspicion on the numerous statements of "enlarged thymus" scattered through the literature of thymus-death and status lymphaticus, where these statements are not supported by actual figures of weight.

But the actual size of the thymus has ceased to be so important, with the recession of the hypothesis of mechanical pressure exerted by the gland.

As to the microscopic anatomy of the thymus, the accounts are very conflicting. Hyperplasia is always present, and may affect both the cortex of lymphocytes and the medulla containing the larger epithelial cells, which probably contain the internal secretion of the gland, or one of these alone. Hassall's corpuscles are generally enlarged, and show degeneration, sometimes hyaline, sometimes caseous, sometimes calcareous.

Lymph Glands and Tissues.—The lymphoid tissue embedded in the walls of the alimentary tract shows a remarkable overgrowth in typical cases, and areas, where in the healthy condition it is invisible to the naked eye, become studded with coarse lymph-granulations, as, for example, in the oesophagus, stomach, duodenum, jejunum, and greater part of the colon. Enlarged tonsils and adenoids are often present, but are not infrequently absent. As they occur in many conditions distinct from status lymphaticus, they are of no diagnostic value. The enlargement of the lymphoid tissue at the base of the tongue is much more significant, and Schridde in a recent paper attaches great importance to it.

Enlargement and increase of Peyer's patches and of the soli-
tary glands at the lower end of the ileum is also a notable mark of the condition.

Enlargement of the mesenteric glands is also described, and also of the superficial glands in groin, axilla, and neck, though here any essential connection of such enlargement with the morbid entity, status lymphaticus, is not definitely established.

This thymo-lymph-glandular apparatus may be affected in different degrees in different parts. Thus the thymus alone may be enlarged when the term status thymicus is used. More common is a pure enlargement of the lymph-glandular system—status lymphaticus. While in the majority of cases the whole apparatus shows enlargement—status thymico-lymphaticus.

In childhood the haemopoietic system is unusually active, and a degree of enlargement which is quite normal for this period would be abnormal in adult life.

The spleen very frequently shows a moderately firm enlargement; its lymph follicles (Malpighian corpuscles) are almost constantly increased in number and size.

Microscopically the lymphatic glands show the changes of simple hyperplasia, exactly like those produced by various chronic irritants and bacterial infections. In older children and adults the fibrous stroma is described as thickened by Bartel and Stein, who attach importance to this fact.

Glands with Internal Secretion—The Suprarenals (Medulla).—
The statement by Wiesel that in a case of status lymphaticus with sudden death the adrenal medulla showed almost complete absence of chromaffin staining (with bichromate salts), has been confirmed by the observations of Hedinger, Hart, Bartel, Warthin, etc. It is an important addition to the pathological findings as described by Paltauf; and Wiesel has founded on it the interpretation that the sudden death in status lymphaticus is an adrenal death, and is due to a sudden fall in blood-pressure produced by a temporary exhaustion of the deficient adrenal secretion. Suprarenal hypoplasia has now established a place in the pathology of status lymphaticus.

The Thyroid.—Paltauf, in describing his three adult cases of status lymphaticus, mentions that one of them showed a microscopic enlargement of the thyroid. Similar observations are scattered through the literature, but only here and there. Wynn, however, has carefully investigated its condition in twenty cases, in all of which there was a reduction of the colloid and a proliferation of the epithelial cells.

In the present investigation special attention has been devoted
to the thyroid, and in all cases examined marked changes of the character of a chronic hyperplasia have been found. Some new views as to the pathogenesis of status lymphaticus, to be put forward in a later paper, depend upon the interpretation of this thyroid hyperplasia.

The Pituitary.—The only observation I have found is that of Warthin, who found hyperplasia of the gland in a case of status lymphaticus combined with acromegaly.

Ovary, Testicle, and Genital Apparatus.—The changes found here are generally confined to those past the age of puberty. Various anomalies of the sexual apparatus, such as small penis, infantile vagina, absence of one testis, arcuate uterus, hypospadias, hetero-sexual growth of hair, have been described by Bartel, Wiesel, Warthin, etc.

Bartel and Herrmann have specially examined the ovaries in the older female cases, and have found in many fibrosis of the cortical layer, with cyst formation and atrophy of the parenchyma. Kyrle has found similar changes of fibrous overgrowth and epithelial atrophy in the testicles of male cases.

This widespread affection of the glands of internal secretion in status lymphaticus has led Biedl to sum up the present position with regard to the condition as follows:—“It perhaps has its origin during foetal life in flaws of structure and in defective development of a series of hormone-producing organs, which later leads to polyglandular insufficiency and disturbance of the balance of internal secretions.”

Changes in Other Tissues and Organs.—The narrowing of the aorta noted by Virchow in chlorosis in young women was incorporated by Paltauf in the group of pathological changes constituting status lymphaticus in adolescents. His observation has been thoroughly confirmed by many others. This condition is only found, or is only apparent, in adolescent and young adult cases; it is sometimes accompanied by smallness of the branches of the aorta and by hypoplasia of the heart.

Other abnormalities occasionally found are horse-shoe kidney, double ureters, split pelvis, etc. Bartel has especially insisted on the significance of these widespread changes, and in a series of papers has taught the doctrine that the status lymphaticus is only a part of a pathological condition which may affect every organ and tissue, and which he calls the status hypoplasticus. It is he also who has noted the over average length of the skeleton, unusual length of the appendix, a frequent free meso-colon, hyper-
trophy of the brain. This large catalogue of abnormalities is seldom or never found complete in a single case; but apparently when only a few or even one is present, he labels the case status hypoplasticus. Thus in a series of over 500 autopsies at Vienna he found status lymphaticus (according to Paltauf's definition) in 8.6 per cent.; while 23 per cent. showed status hypoplasticus.

The present paper deals mainly with two groups of cases: one of infants found dead in bed; the other a special group of older boys aged from ten to sixteen years, dying in most cases after less than a day's illness, and in whom the pathological appearances showed a curious resemblance to those of the first group.

**Thirteen Cases of Sudden Death in Infants.**—The following account is derived from thirteen cases of sudden death in very young infants. For the records and post-mortem material of twelve of these I am indebted to the kindness of Professor Harvey Littlejohn.

**Age, General Condition, and Circumstances of Death.**—The ages ranged from twenty-five days to four months, the great majority being from two to four months. Without exception all were plump and well nourished, and in many cases it was evident that much care had been bestowed on the personal and general hygiene of the infant. In eleven, the baby was found dead in bed during the night; of the remaining two, one died suddenly during a fit of coughing, and the other showed some cyanosis with dyspnoea at 4 a.m., this continuing until death took place suddenly at 6 a.m.

We have in this series of cases a very well-defined group of sudden deaths in very young infants, presenting the appearance of perfect development and robust health. In one or two cases, for some days or weeks before death, some slight attacks of laryngeal spasm ("gasing") had occurred from time to time. Whether these were of the nature of thymic asthma it is not possible to say; but the records are clear that they did not interfere with the general health and vigour of the baby.

**Post-mortem Appearances—Thymo-Lymph-Glandular System.**—The thymus was weighed in four cases; in three being 20 grammes, and in the fourth 51 grammes. These figures exceed Hammar's standard (which, remember, is not yet beyond dispute, and may be too high). In the remainder it was in the majority noted as "enlarged," and in a minority as not enlarged. Whatever the significance of this enlargement may be, the condition of the thymus in this series goes to support the fact, now really strongly
established, that in a majority of infants dying suddenly in the midst of perfect health, "thymus-hypertrophy" is present.

Only in a minority of this series was hypertrophy of the lymphoid tissues of the alimentary tract noted. In two, enlargement of the solitary glands of the duodenum and colon was described.

Using the term "status lymphaticus" in its strict sense, this group of cases of sudden death in infants does not show the frequent, much less the necessary, coincidence of this condition. But "thymus-hypertrophy" or "status thymicus" may be described as a regular post-mortem finding in the group. This entirely agrees with Paltauf's autopsies in 127 cases of sudden death in children up to 4 years in which "an enlarged thymus" was always present; it is of course probable that some of these may have been within the range of Hammar's normal standard. But it would be an easy matter to collect from the literature a large number of cases of sudden death in infants where the thymus, carefully measured, far exceeded the standard (whatever that is). And, on the contrary, I do not know of any large number of observations when in infantile sudden death the thymus, duly weighed, was normal and subnormal. That being so, the very frequent association of enlargement of the thymus with sudden death in infants is a well-established fact. The interpretation of the fact is another and much more difficult matter. It will not be considered meantime.

The Lungs.—The lungs showed to the eye, in a majority of cases, congestion, often with small subpleural hemorrhages; in one or two cases no morbid charge was appreciable to the eye.

Microscopically, they were examined in 8 cases; and in all showed marked changes which, considering the previous record of good health and the very brief duration of the fatal illness, are really astonishing. These changes were intense congestion of capillaries and arterioles, commencing catarrh of the epithelium of the smaller bronchi, exudation of fluid and cells into the alveoli, the separation of the interalveolar tissue by fluid and proliferated cells, the frequent presence of hemorrhage in the alveolar spaces; in fact, the changes of commencing bronchitis and broncho-pneumonia (see Fig. 9).

Now Paltauf found in his 127 cases of sudden deaths in young children (the great majority of which were probably in young infants under 1 year) "a capillary bronchitis" in every one; and he quotes an investigation of Schlemmer on 158 cases of death from bronchitis, in 18 of which the death was sudden
and without previous symptoms. He uses the last observation of Schlemmer in support of the view that in young children a bronchitis may be latent and suddenly fatal; and therefore boldly cuts out all such cases from the category of "lymphatic constitution." In this ruthless purging of the records of status lymphaticus he is followed by nearly every subsequent writer of importance—Hart, Kolisko, Wiesel, Ssokolow, etc. If it be remembered that probably 75 per cent. of cases of sudden death occur in the first year of life, it will be seen how few cases will be left.

The main facts concerning these cases of sudden death in infants are two; and neither seems to be disputed. Bronchitis, or commencing broncho-pneumonia, is almost always present; the thymus gland (and possibly some other lymphatic structures) is nearly always enlarged. But the common interpretation of these facts is unconvincing and does not seem consistent; for in sudden death in older children and adolescents this thymo-lymphatic enlargement is assumed to play a decisive part in the fatal issue, while in the acutely fatal broncho-pneumonias of infants, though equally often present, it is regarded as inoperative. We are told that these are cases of fulminant broncho-pneumonia; but if we ask, "Why are they fulminant?" it is obvious that the old difficulty of explaining these cases of sudden death has only been raised in another form and it is an equally reasonable hypothesis that an abnormal constitution of which the status lymphaticus is a part, is a contributory factor in the one kind of sudden death as in the other. For the moment, however, it is convenient to call them cases of fulminant broncho-pneumonia and to note that they are accompanied by thymo-lymphatic hypertrophy. That is only an accurate description of the facts, without an attempt to explain their association.

Fulminant Broncho-Pneumonia in Older Children: Institutional Pneumonia.—In certain industrial schools throughout Great Britain, cases of acutely fatal illness have occurred from time to time for many years past. The fatal cases have been accompanied by cases of non-fatal but severe febrile illness of similar clinical type.

In one of these schools (for boys) near Edinburgh in which the outbreaks of illness had been unusually severe, Dr. J. P. McGowan and I conducted an investigation which is reported at length in a blue-book published by the Scottish Office, and of which an abstract appeared in a recent number of the Edinburgh Medical Journal.
Our conclusions were, firstly, that all the cases of illness were of a peculiar distorted pneumonia, assuming three clinical types:—fulminant in the acutely fatal group; irregular, and apparently lobular, in a non-fatal group labelled pneumonia because of the presence of physical signs of consolidation of the lung; and latent or abortive pneumonia in another large group in which the physical signs of pneumonia were absent, but the clinical symptoms were unmistakably those of the other two groups. And in the group of fatal cases, not only did previous careful post-mortem examinations support the view that pneumonia, either early or established, was present, and that the pneumonia was pneumococcal, but they also showed in a high proportion of cases the classical marks of status lymphaticus, enlargement of the post-lingual lymph follicles, and of the solitary follicles of stomach, duodenum, and ileum; and thymus-hypertrophy. These facts led us to our second conclusion that the fulminant pneumonias owed their rapidly fatal character to this morbid constitution usually termed status lymphaticus, and the irregular features of the non-fatal pneumonias were also due to the presence of the same diathesis, presumably in a less marked form.

So that in these cases of rapidly fatal illness occurring in certain schools (chiefly in boys, but also in girls) and at age-periods ranging from 10 to 16 years—for the sake of brevity they will be afterwards described as "institutional pneumonias"—we get a curiously similar association of clinical and pathological features, as in the cases of sudden deaths in infants we have just been discussing. In both groups the illness was truly fulminant, death occurring apparently during sleep, or after a few hours' illness. In both groups post-mortem examination revealed either intense congestion, or established pneumonia of broncho-pneumonic type; and in addition the well-known marks of thymo-lymphatic hyperplasia.

Since our investigation was completed, two more deaths have occurred at this school. The results of the post-mortem examination in both strongly confirm the two main facts of our previous findings, the existence side by side of marked changes in the lung of the nature of broncho-pneumonia, and of marked hypertrophy of the alimentary lymphatic tissues. It will be useful to give a brief account of the illness and of the post-mortem findings of the first of these, a case which presents in an unusually complete degree the typical features of these institutional pneumonias.

J. W., aet. 11½ years. Seemed a strong, healthy boy and had
good colour. On 29th April 1913 rose at 6 A.M., feeling quite well. At 7.40 A.M. complained of headache, and vomited; but on getting some tea and bread and butter, recovered and joined his companions at play. Shortly after 9 A.M. headache and nausea returned, and on being put to bed his temperature was 102° F. He vomited “some yellow and green stuff.” He was in a half-stupid condition, and though he answered questions did so slowly and with effort; he seemed as if he wanted to sleep. This sleepy condition gradually deepened into unconsciousness and he died at 11 A.M., only three hours after the first onset of his symptoms.

The post-mortem examination (by M'Gowan and myself, with the kind assistance of Professor Ritchie) may be summarised as follows. The lungs showed general intense congestion; but only at the roots, and that doubtfully, did their consistence suggest pneumonia. Microscopically, however, evidence of congestion, bronchitis and bronchialitis, pulmonary catarrh, and in one area very definite pneumatic consolidation was obtained. The other marked abnormal feature of the internal organs was an extreme hyperplasia of the lymphoid tissues throughout the alimentary tract, which is illustrated in the photographs (Figs. 1 to 3) of the base of the tongue, stomach and duodenum, and lower end of ileum. The spleen also showed a moderate firm enlargement, with apparent increase in number and size of the Malpighian corpuscles on the cut surface. In other organs there was no evident macroscopic change. The brain only showed an engorgement of the vessels of the pia arachnoid; bacteriological examination of the brain surface and substance and of the cerebro-spinal fluid showed in this case, as in all others in which this examination was made, an absence of the specific organisms of acute meningitis.

A few particulars may be added of the second case, sufficient merely to confirm the main points shown by the first.

P. M'G., æt. 13. Duration of illness, 29 hours. Pain in left side, and feverishness. No cough or rapid breathing. There was no anticipation of a fatal issue until 1½ hours before death, when he rapidly became unconscious.

Post-mortem examination showed a thymus of 21 grammes, enlargement of the lymphoid tissue at the back of the tongue and in the lower end of the ileum; and in the lungs, general intense congestion with consolidation, definite in the left lower lobe at the root, and commencing in the middle and lower lobes of the right lung.

Photographs of the thymo-lymphatic hyperplasia and of the
l lung inflammation are shown in Figs. 4, 5, and 8. Fig. 8 clearly shows not a fibrinous lobar pneumonia but a catarrhal broncho-pneumonia, which is much less common at this age, and which is the regular feature of pneumonia in earlier childhood and infancy.

The points of correspondence between these two groups of acutely fatal illness—fulminant bronchitis and broncho-pneumonia in early infancy and institutional pneumonias in children (mainly boys) from 10 to 16 years—may be summed up as follows:

**Duration of Illness and Clinical Features.**—In the infants nearly all were found dead in bed, the illness having commenced apparently during sleep and having caused death without waking. In the older children, out of 22 acutely fatal illnesses at the East Lothian school since 1900, two occurred in sleep exactly as in the first group, these two boys having gone to bed apparently quite well, and being found dead in the morning with blood-stained froth about the mouth and nostrils. These remarkable cases of boys found dead in bed have occurred in other industrial schools of this class. Of the remaining 20 cases, 11 died within 24 hours from the onset of symptoms and 9 within 48 hours, so that the word "fulminant" is well fitted to describe them. Moreover, the early character of the illness was often trivial, and in the great majority it only assumed the grave character of stupor deepening into coma an hour or two before death. It is further very interesting, as a point of connection between the cases of infants found dead in bed, that in these fatal institutional pneumonias the great majority of the boys became ill during the night or in the early morning.

**The Chief Morbid Changes on Post-mortem Examination.**—In both groups there was acute congestion of the lungs, with commencing broncho-pneumonia and the presence of thymo-lymphatic hyperplasia (status lymphaticus), this being present in some of the older boys in a very complete and extreme degree.

The parallel between the two groups in regard to clinical and pathological conditions seems, therefore, a true one. Must we, then, apply the same rule to these acutely fatal pneumonias in older children as Paltauf, Hart, and others have done in infants, and say that they are cases of fulminant pneumonia, and neglect the associated status lymphaticus, the clear evidence of morbid constitution? It seems unreasonable to do so; but in the meantime it is enough to set the facts in the foreground—the association of thymo-lymphatic hyperplasia with acutely fatal bronchitis and broncho-pneumonia, both in young infants and also in this very special group of institutional pneumonias. The interpretation of
Fatal Illness in Infants and Children

this association or coincidence is a more difficult problem, and must be reserved to a later paper.

These fulminant pneumonias, occurring in this epidemic and endemic form, seem to be confined to these institutions. Sporadic cases are described in the text-books. Thus in the article on "Pneumonia" in Clifford Allbutt's System of Medicine (vol. v. p. 231) it is stated that patients with pneumonia may die "even in less than one day and so rapidly that the lungs at the necropsy may appear perfectly normal to the naked eye, but on microscopical examination the earliest stages of inflammatory reaction are seen." Clifford Allbutt also describes a non-fatal case of what he calls "fractional pneumonia" in a young girl, the symptoms of which closely resemble those in the institutional pneumonias above described. Lamb further details four cases of what he terms "cerebral status lymphaticus" in young men aged 17, 17, 18, and 23 years, which in their symptoms and post-mortem findings seem to belong to the same group. But these sporadic cases are either very uncommon, or from the indefinite morbid changes in the lungs are not classed as pneumonias. And indeed these epidemic cases must be still rarer; but a sufficient number has now been collected and described, both in this and other schools of the kind, to justify their separation as a special clinical group. And as a group they seemed to present similar clinical and pathological features to the cases of young infants found dead in bed. Their careful comparison in regard to symptomatology and pathology may possibly throw some light on the obscure problems which underlie their common or closely allied morbid condition.

Condition of the Ductless Glands in these two Groups of Fulminant Broncho-Pneumonia—Suprarenal Hypoplasia.—It has already been mentioned that Wiesel has described hypoplasia of the medulla of the suprarenals in cases of status lymphaticus, and this observation has been confirmed by other observers. The test for such hypoplasia is the absence or reduction of brown staining material or chromaffin substance in the medulla previously soaked for 24 hours in a solution of potassium bichromate. This test was carried out in four cases in the infant group. In one the amount seemed normal or only slightly reduced. In another it was greatly reduced, and in the remaining two was absent; but in these cases the autopsy was more than 24 hours after death, and therefore it is possible that this was a post-mortem change.

The same test was performed in the last two cases of the
second group of older boys. In them the sectio was performed 5 and 19 hours after death respectively, and in both the chromaffin substance was still visible but greatly reduced in amount.

These observations of my own are therefore very incomplete; to a certain extent they support Wiesel's statement as to the occurrence of suprarenal hypoplasia in cases of sudden death (status lymphaticus).

Thyroid Hyperplasia.—This ductless gland finds a very small place in the literature of status lymphaticus. There are occasional references to a macroscopic enlargement, but a microscopic examination has seldom been systematically carried out. Bartel has done so, however, in a series of cases of status hypoplasticus, which is a still more shadowy entity than status lymphaticus, and in about half the number found "colloidal degeneration" of the gland. Wynn, however, has made a careful histological examination of the thyroid in twenty cases of status lymphaticus (that is, cases of sudden death associated with lymphatic hyperplasia), and in all has found great reduction or absence of the colloid substance and proliferation of the secretory epithelium.

Among the cases of fulminant broncho-pneumonia in older boys (the second group in this paper), in the first that came into our hands the thyroid was found by McGowan to show extreme hyperplasia. This observation has been confirmed by us in five other cases of the same group. So far as we know, there is no record of the microscopic condition of the thyroid in the remaining cases of this group. The presence of hyperplasia in every specimen examined is presumptive evidence that this condition is typical of the whole group (Figs. 12 to 14).

In the first group of infants found dead in bed the thyroid was microscopically examined in twelve out of thirteen cases, and in all showed unequivocally the appearances of marked hyperplasia.

Photographs illustrative of this condition of the thyroid are shown in Figs. 11 to 15. The microscopic picture is not uniform in all, since there are many degrees of hyperplasia, but a verbal description that will cover all the cases may be given as follows:— Alteration and variation in the size and shape of the vesicles; cubical and columnar shape of the lining epithelium, with proliferation and frequently catarrh; reduction or absence of the colloid contents of the vesicles, at least as regards staining reaction; vascular dilatation, both of larger and smaller vessels; thickening of the fibrous stroma.
The use of the term hyperplasia is, in the sense given it by Marine and Lenhart, who have studied the histology of the gland from a great wealth of material, both normal and pathological, and not only in man but in many other animals. The word does not imply any view as to function, whether merely excessive or morbid; it is only used in a morphological sense. These writers state that the thyroid in hyperplasia always tends to return to a colloid condition; and though it often does so, it always shows traces of the previous activity, in the larger size and slight irregularity of contour of the vesicles, in thickening of the fibrous stroma, and perhaps also in a cubical or columnar type of lining epithelium. The same gland may show in some vesicles this colloid condition, and in others active hyperplasia—a mixture of appearances which is illustrated in Figs. 13 and 14. Whether such a gland is returning from hyperplasia to a colloid condition, or receding from a previous colloid condition which itself is the result of an antecedent hyperplasia, it is sometimes not possible to say. But it serves to illustrate their view that the thyroid may often be in unstable equilibrium, swinging to and fro as a pendulum does, sometimes towards hyperplasia, sometimes back to the colloid condition.

Fig. 10 is given to illustrate respectively a fairly normal thyroid gland (showing indeed a slight commencing hyperplasia). The exhibition of this standard serves to emphasise the marked degree of hyperplasia present in all these eighteen cases examined of acutely fatal illness. The thickening of the fibrous stroma is very considerable in nearly every case; this point alone seems sufficient to establish the important fact that the abnormal condition of the gland has existed for some time before death, and is separate from the pneumonia that has caused death. In short, we are almost certainly dealing with pre-existent thyroid hyperplasia in these cases of fulminant pneumonia; and in the case of a gland so important to the general metabolism, this fact lends support to the theory of some morbid constitution. But in the meantime the fact of thyroid hyperplasia* may be set alongside the fact of thymo-lymphatic hyperplasia, as accompanying with great regularity fulminant forms of bronchitis and broncho-pneumonia in infancy and childhood.

Other Glands with Internal Secretion.—The ovaries and testicles

* Although it seems highly probable that thyroid hyperplasia is abnormal, it would be desirable to examine microscopically the thyroids from healthy children killed by an accident. An attempt will be made to procure material of this kind.
were examined in one or two cases from both groups. No special changes were observed, but the observations were too few to have even a negative value.

The pituitary and parathyroid glands were not examined in any case.

Fulminant or Malignant Types of other Acute Infections—Malignant Scarlet Fever.—Dr. Claude Ker kindly provided the thymus and thyroid glands from a boy (D. M'C., æt. 10) who died in 24 hours from the onset of scarlet fever, with complete suppression of the rash. The thyroid showed marked hyperplasia, and especially that great thickening of the fibrous stroma already alluded to (see Fig. 15). The thymus weighed 19 grammes, a figure within Hammar's standard, but well above that of Dudgeon. Whether the lymphoid tissues along the alimentary tract were enlarged is not known. The case has already been described in a previous paper in this Journal by M'Gowan and myself. We have thus in it the suggestion of thymo-lymphatic hyperplasia, definite thyroid hyperplasia, and an acutely fatal type of the disease. Further observations on cases of scarlatina maligna may not confirm the incomplete but suggestive evidence of this one case, but in the meantime it seems to harmonise with the cases of fulminant institutional pneumonia described in this paper.

Diphtheria.—Daut has described twelve severe and rapidly fatal cases of diphtheria, eleven dying within 48 hours of their admission to hospital, and all showing post mortem very pronounced appearance of status lymphaticus. The thyroid was not examined.

Other forms of fulminant infection are well known, for example, malignant or toxic types of measles, smallpox, etc. I have been unable to discover any observations on these as to the association of status lymphaticus.

The introduction of acute infections other than pneumonia, which forms the basis of this paper, widens the question greatly. But if it is possible to show that in fulminant pneumonia the presence of hyperplasia in the lymph-glandular system and in the thyroid is a regular accompaniment, and that this associated condition is a mark of some morbid condition of body which expresses itself in an unnaturally violent and atypical reaction to one morbid agent such as the pneumococcus, then it seems reasonable to expect that other morbid agents working in the same unnatural soil might also provoke an unusually violent reaction.
Fig. 1.—Status lymphaticus. J. W., at. 11½ years. Institutional pneumonia. Duration of illness, 3 hours. Great enlargement of lymphoid tissue at base of tongue, forming two tonsillar masses.

Fig. 2.—Status lymphaticus. J. W., at. 11½ years. Enlargement and increase of lymphoid tissues (solitary follicles) in stomach and duodenum. The solitary follicles in the duodenum appear as white granulations, single or in clusters, lying between the rugae, and are specially prominent in the first part within two inches from the pylorus. They are indicated in places by arrows.

Fig. 3.—Status lymphaticus. J. W., at. 11½ years. Enlargement and increase of lymphoid tissue (solitary follicles) at lower end of ileum and in cecum and colon. See arrow-marks.

Fig. 4.—Status lymphaticus. P. M'G., at. 13 years. Institutional pneumonia. Duration of illness, 20 hours. Enlargement of lymphoid tissue at base of tongue. Note also enlarged lobes of thyroid gland.
Fig. 5.—Status lymphaticus. P. M'G., set. 13 years. Increase of lymphoid tissue (solitary follicles) at lower end of ileum and cecum. See arrow-marks.

Fig. 6.—Lung, L.P. Institutional pneumonia. T. H., set. 12 years. Duration of illness, a few hours. Shows capillary bronchitis and peribronchial exudate and cell proliferation.

Fig. 7.—Lung, L.P. Institutional pneumonia. F. B., set. 12 years. Duration of illness, 6 hours. Intense capillary bronchitis and commencing broncho-pneumonia; cell proliferation between alveoli.

Fig. 8.—Lung, H.P. Institutional pneumonia. P. M'G. (see Figs. 4 and 5). Area of consolidation; intense catarrhal bronchitis, with catarrhal pneumonia; i.e., broncho-pneumonia. Note vascular engorgement.

Fig. 9.—Lung, L.P. Infant, set. 9 weeks. Found dead. Catarrhal bronchitis, catarrhal pneumonia, and interalveolar cell proliferation and exudation. Compare with Figs. 6 and 7.

Fig. 10.—Thyroid, L.P. S. H. Death from diphtheria. Early hyperplasia, with only slight changes from the normal gland.
Fig. 11.—Thyroid, L.P. Infant, aet. 3 months. Found dead in bed. Advanced chronic hyperplasia of gland; absence of colloid; irregularity in shape and size of acini; cubical change in acinar epithelium; thickening of fibrous stroma.

Fig. 12.—Thyroid, L.P. Institutional pneumonia. W.B., aet. 11 years. Duration of illness, 12 hours. Advanced chronic hyperplasia. Appearances very similar to those of Fig. 11.

Fig. 13.—Thyroid, L.P. Institutional pneumonia. J.W., aet. 11 years (see Figs. 1-3). Showing mixture of a colloid and a hyperplastic condition; some vesicles very large and well filled with colloid; others small, irregular, with proliferated epithelium, and reduced or absent colloid.

Fig. 14.—Thyroid, L.P. Institutional pneumonia. J.W. (see Fig. 13). Similar appearance to Fig. 13, but the smaller size of acini predominates, and the thickening of the fibrous stroma is better marked.

Fig. 15.—Thyroid, L.P. Fulminant scarlet fever. D.M'C., aet. 10 years. Duration of illness, 24 hours. Great thickening of fibrous stroma; great reduction of colloid; irregularity in shape and size of acini. Compare the lobular structure of the gland with Figs. 11 and 12.

Fig. 16.—Thyroid of P. M'C. Institutional pneumonia (see Fig. 4). Anterior view, showing microscopic enlargement. Microscopically, the appearance was a mixed colloid hyperplasia, as in Figs. 13 and 14.
In the meantime, however, nothing more is claimed in the present paper than that the association of thyroid and thymo-lymphatic hyperplasia with fulminant bronchitis and broncho-pneumonia in little infants, and with the same condition in a very special group of older children, demands a further close examination. This will be done in a subsequent paper.

Summary.—1. In a group of thirteen infants from two to four months old, nearly all found dead in bed, and all apparently well-developed and nourished, the lungs in every case examined (eight) showed marked congestion, bronchitis, and broncho-pneumonia.

2. This was associated in most cases with hyperplasia, general or partial, of the thymo-lymphatic system.

3. These cases of sudden death in infants may therefore be described as cases of fulminant bronchitis and broncho-pneumonia, associated with status lymphaticus.

4. The same pathological grouping was found in all cases examined of a very unusual series of fulminant broncho-pneumonia in boys from ten to sixteen years old.

5. The regularity of this association raises the question whether the fulminant nature of the illness in both groups may not have been due in some way to the influence of the morbid constitution usually termed status lymphaticus, the signs of which were unequivocally present in both groups.

6. There is some evidence that fulminant types of other bacterial infections—scarlet fever and diphtheria—are also accompanied by thymo-lymphatic hyperplasia or status lymphaticus.

7. In the two groups of fulminant pneumonia, thyroid hyperplasia in a marked degree was present in every case examined (eighteen).

8. This thyroid hyperplasia seems to have existed for some time before death.

9. The regular association of thyroid hyperplasia with thymo-lymphatic hyperplasia suggests that it (the former) may also be a mark of the same abnormal constitution or diathesis.

In conclusion, I wish to express my warm thanks to Professor Harvey Littlejohn and Professor James Ritchie for the interest they have shown in the above investigation, and for the generous help they have given me in the way of advice, material, and records.

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THE SPINAL CHANGES IN PSEUDO-HYPERTROPHIC PARALYSIS.

By A. NINIAN BRUCE.

The muscular dystrophies are now mostly regarded as primary muscle diseases, in which the changes in the central nervous system are either slight or absent altogether. They are thus to be contrasted with the myelopathic atrophies, where the primary lesion is in the nervous system and the changes in the muscles are secondary. But, on the other hand, there is scarcely a symptom of the one which is not occasionally met with in the other, and several writers have taken up the view that we are really dealing merely with different manifestations of the same disease.

I was fortunate enough, a few years ago, to obtain the necessary material for a complete investigation of the muscular and nervous systems in a very typical case of pseudo-hypertrophic paralysis, and it occurred to me that a careful investigation of these would prove of value.

The patient was a boy, aged 15 years, who was admitted to Professor Greenfield’s wards in the Royal Infirmary, Edinburgh, suffering from pneumonia of four days’ duration. The family history is interesting on account of the fact that the patient had a brother two years older than himself who suffered from the same condition, and an uncle who had apparently developed it at a later stage of life. His parents stated that the condition was first noticed at the age of seven, when it appears to have developed gradually. There was marked scoliosis, with prominence of the posterior aspect of the left side of the chest, of the lower ribs and lumbar region, and corresponding hollowing on the right side.