A Study of the Chemistry of Nerve Degeneration.

by

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A Study Of
The Chemistry of Nerve Degeneration.

It has been pointed out by a number of experimentors, that after section of a nerve, certain chemical changes are demonstrable. A notable example is the presence of fat, formed by degenerative processes and shown by Marchi's osmic stain. Dr. Barratt (1) in making quantitative analyses of the brain and cord in General Paralysis of the insane, which condition is somewhat comparable to nerve section; so far as function is concerned, found also that there is a decrease in the percentage of phosphorus and an increase in percentage of water. Other, apparently degenerative, changes have been demonstrated by Dr. Bolton (2), who, in examining the prefrontal cortex of individuals who have suffered from various mental diseases, found, that in cases of severe Amentia the cells of the pyramidal layer could be distinguished by an experienced observer, but that the layer is only fairly well developed and very much more irregularly arranged than normally. It is not thicker, appreciably, than in the cortex of a still-born infant, and less than half as thick as in the normal adult brain. In severe Dementia the cells show normal characteristics, but all layers are decreased in thickness and the pyramidal layer is very much decreased.

In general, no farther work has been done on chemical changes in the brain and cord (except in regard to phosphorus and water) possibly on account of the difficulty of obtaining material and, more especially, the lack of sufficiently accurate methods.

The publication of a "Method for Quantitative Chemical Analysis of the Brain and Cord" by Koch (3), made possible a more thorough investigation of the chemical constituents of the Brain and Cord, and even of peripheral nerves, in pathologic-

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1. Barratt, Wakelin, Archives of Neurology Vol. I. page 207.
2. Bolton, Joseph Shaw, Archives of Neurology, Vol. II. Histological Basis of Amentia and Dementia.
3. Koch, W. Journal of Physiology (Am.) Vol. XI. No. III.

al as well as, normal conditions.

With the knowledge of histological changes in various mental diseases and in sectioned nerves, a method of chemical analysis determined; this research was undertaken to discover if there are chemical changes corresponding to the changes in structure.

Method.

The method used was, essentially, that described by Koch (3), though details of method were revised to such an extent that, to prevent confusion, I shall describe the entire procedure. This method is not perfect, as will be seen from discussion of the various determinations, and from results.

Collection of Material.

No changes have been made in the method of collecting material.

White Matter. The Corpus Callosum representing the largest amount of pure white matter is taken. After removal of as much of the blood and blood vessels as is possible the material is cut into pieces about the size of a pea and placed in weighed glass stoppered bottles. Samples of approximately twelve to fourteen grams are collected and the bottle reweighed. This material is then covered with sufficient alcohol to leave a clear supernatant layer. The water determination is made at the same time, and in order that there may be uniformity in the two samples, pieces smaller than those used for chemical analysis are placed in a weighed watch glass clip. For this determination samples of from one to two grams or less are taken.

Grey Matter. The purest grey matter is found spread over the surface of the brain as the cortex, though this contains many medullated nerve fibres it can be separated almost completely from the white matter by the method suggested by Dr. Watson. Sections about 4mm. thick are cut across the convolution and placed on a clean glass surface. The line of separation between the grey and white layers is quite distinct. Separate the two, along this line with a sharp knife, noticing if

(3) Koch, W, Journal of Physiology (Am.) Vol. XI. No. III.

there are any adhering pieces of white matter; remove these if there are. Collect the sample for chemical analysis and for water determination in the same manner as described for white matter.

On account of the fact that the cortex changes are demonstrable in the prefrontal area, and that motor disturbances point to changes in the motor area in certain pathological conditions, samples were collected from these areas in each case.

Prefrontal area, including, approximately, the anterior two-thirds of the first frontal convolution and its corresponding median surface, the anterior two-thirds of the second frontal, and the anterior third of the third frontal, is taken.

Motor area, includes ascending frontal, and extends into the inferior (Broca's) frontal convolution.

Spinal Cord. The spinal cord from dogs was taken for examination. Normal material was collected without operation.

The dog is anaesthetized and about five litres of warmed Ringers solution transfused (4) through a cannula placed in the femoral vein. Another placed in the femoral artery acts as an outlet. The dog dies under this treatment. Incision is now made through the skin of the back from base of the skull to the tail, and the spinal column freed from muscles. The pedicles of the vertebrae are now cut through with a chisel and the vertebral canal opened. The spinal nerves are cut at the inter-vertebral forameni and the cord and membranes removed. After placing it on a clean glass surface, a median incision is made through the dura and the spinal nerves again cut separating the cord from the dura mater. Samples for chemical analysis and water determination are obtained as from the brain. Pieces from 5-10mm. long, from above the cut and below it, are placed in Muller's formal for microscopic examination.

4. Care must be taken in the transfusion not to use too much pressure.

Degenerated material. This was obtained as result of operation, which consisted in entering the vertebral canal between the third and fourth dorsal vertebrae and severing the cord. After the operation, which results in complete paralysis of the posterior parts, the animal is cared for for twenty one days (5) and material is collected as in the normal case, except that two samples are taken, one above the point where the cut is made, the other below it.

Histological examination.

After leaving in Muller-formol for about ten days, changing the solution once or twice in that time, the material is cut into slices about 1mm. or less thick, so that staining fluid may thoroughly penetrate, and placed in Marchi's osmic acid stain (1% osmic acid) and left for a few days. The material is then run up through the alcohols to absolute. The alcohol is removed with xylol, the material is embedded in paraffine and sectioned in the usual way.

Water Determination.

The clips with material are placed in a vacuum oven with water jacket, over calcium chloride, and kept at a temperature of from 40°-45° C for a week, when dessication is usually complete, and it is only necessary to check the weighing by another twenty-four hours in the oven, with good vacuum. Sometimes a gain in weight is observed, though it is not usual in the water determinations, for the material is not directly exposed to air during the weighing. After the first weighing the error introduced by the absorption of moisture is reduced to a minimum by speed in weighing.

Determination of Proteids. (Including Extraction of Other Constituents).

The fact that all constituents of nervous tissue, except the proteids, some of the inorganic salts and possibly the small amount of the albumoses and peptones that may be present, are soluble in alcohol, or ether or both, is taken ad-

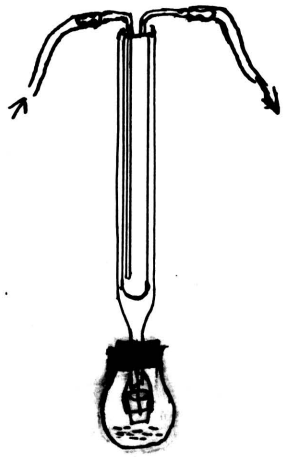
5. Halliburton, W. D., Croonian Lectures, 1901, says that Marchi reaction is best shown about the thirteenth day, and that phosphorus disappears after the twenty-ninth day.

vantage of in this determination. The various proteids are distinguished as follows: the neurokeratin is insoluble in ferments and sodium hydrate; the nucleoproteid is characterized by phosphorus; and the simple proteids may be determined by difference. The simple proteids and neurokeratin are considered together in this work.

The extraction of the alcohol-ether-soluble and the water-soluble portions is accomplished as follows:

The extractions are carried on in sets of three each. Gooch crucibles of 2.5 cm. diameter (6) are numbered dried and weighed with a filter paper which fits the bottom. Since the material is preserved in alcohol and much of the alcohol soluble portion is in suspension (in the cold alcohol) it is necessary, in order to hasten the transferring, to filter with everything hot. To this end the crucibles with the sample bottles are placed on the water bath for a thorough heating. After this, filtration is easy, unless it cools too rapidly, precipitating the material in the pores of the filter. Before heating, the material should be minced in the sample bottle (use a knife or spatula) to insure a more thorough extraction.

The filtrate is collected in an ordinary carbondioxide flask. When filtration is complete, the material transferred; hot alcohol having been used in cleansing the flask, a perforated porcelain plate is placed over the material. Three Soxhlet condensers fitted with corks which fit the carbondioxide flasks; and wire baskets to hold the Gooch crucibles (7), are set up in series. (See figure) The crucibles are then placed in the baskets, and the apparatus closed. A galvanized iron pan (8) is



The Apparatus Used

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6. These will hold 15-18 gm. of the preserved material.
7. Baskets are made by making three holes in the lower end of the condenser and passing a copper wire through.
8. The pan is 4" x 5" x 18".

placed under the flasks and nearly filled with water, full enough to almost immerse the flasks, and the top made as tight as possible.

For the alcohol extraction, the full heat of an ordinary burner will not be too high; but for the ether extraction the flame must be regulated. Extraction with alcohol is continued for approximately eighteen hours, when the flasks are removed, alcohol evaporated and ether added. Ether extraction is continued for another eighteen hours, after which the material is ground to a powder in a motar and replaced. It is possible that the last alcohol extraction is not necessary, but in order to insure removal of the last traces of the alcohol-ether-soluble portions, the ether is evaporated and another portion of alcohol is added. This extraction is also continued for eighteen hours.

Upon completion of the alcohol-ether extraction, the insoluble residue in the crucibles is transferred, without the porcelain plate, to the oven and dried, in vacuo, at 40°C, to nearly constant weight (9). The material is then extracted several (10) times with chloroform water to remove the remaining inorganic salts and organic extractions. "The amount extracted, as described under the determination of extractives, is subtracted from the above weighing. The result represents the <u>total proteids</u>. The <u>neurokeratin</u> may then be determined according to the method of Kühne and Chittenden in one sample." After the water extraction, five cc of concentrated sulphuric acid are added to the material, then from a funnel fuming nitric acid is dropped, heating slowly the while, until the material no longer chars at high temperature and has a clear yellow or white color. After cooling, this is diluted and filtered to a 300 cc flask, where it is neutralized with ammonium

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9. Material is left for a week, before the first weighing. Danger of error from absorbtion of moisture is much greater here than in case of the water determination on account of surface exposed. It is next to impossible to get constant weight.

10. Four times of twenty-four hours each, is sufficient.

hydroxide, and about two cubic centimeters in excess, of concentrated nitric acid added. Fifteen grams of ammonic nitrate are added and the whole heated to 65°C. After addition of 25 cc of a nitric acid solution of Ammonium Molybdate, the solution is kept at a temperature of from 50°C to 65°C for about five hours, when precipitation should be complete. After the solution is cooled, it is filtered and washed twice with a 0.2% ammonic nitrate solution. The precipitate is dissolved in ammonium hydroxide in the usual way and phosphorus determined as magnesium pyrophosphate. The nucleoproteids are determined, approximately, by multiplying the phosphorus found by the factor 175.4. "The remainder, after subtracting the nucleoproteids and neurokeratin from the total proteids, represents the simple proteids, or globulins of Halliburton."

Determination of Extractives (Water Soluble)

Inoragnic Salts and Sulphur in Extractives.

Ordinary methods are not available in brain work for reasons given by Koch, so the following method was used:

a. In alcohol-ether-soluble portions.

All of the alcohol-ether-soluble portion is taken and, after evaporation of the alcohol used in the last extraction, is emulsified with 40 cc of water, and transferred to a 100 cc graduated flask. 1 cc of concentrated hydrochlonic acid (in case of grey matter 3 cc) is added and the solution shaken for a moment. An excess (2 or 3 cc) of chloroform is dropped in and the solution shaken vigorously for two minutes; made up to the mark and let stand. In six hours it will filter clear and should not be left longer than is necessary to obtain a clear filtrate before filtering. This is now filtered through a dry filter, and the filtrate divided into three portions of 25 cc each.

One portion is evaporated in a weighed platinum dish on the water bath, dried at 105°C for one half hour and reweighed, thus giving one-fourth of the total

extractives and inorganic salts. This dish is now placed in a larger platinum dish (resting, however, on a platinum ring) and ignited until a clear white ash remains, cooled and weighed. Subtracting this weighing from the one just made, we obtain the weight of the organic extractives.

To a second portion is added barium chloride in the cold for determination of inorganic sulphates.

The third portion is evaporated in a dish, taken up with fusion mixture, ignited, and sulphur determined as (11) described for determining the sulphur in the lead acetate precipitate and filtrate. This determination was made necessary on account of loss of sulphur on ignition of extractives. (e. g. case IX. motor left and prefrontal right, See Record sheet page 61 + 62).

b. In the alcohol-ether-insoluble (water-soluble) portion.

All the filtrate from the water extractions is evaporated in a platinum dish, dried at 105°C and weighed. (Total extractives and inorganic salts in the water soluble portion). This is ignited as described above and inorganic salts determined. The ash remaining is dissolved in hot water, acid with hydrachloric acid and sulphur determined. The sulphur thus determined is probably inorganic, and is so considered in the calculations of parts of sulphur per million in the filtrate.

Determination of the Lecithans.

The method described by Koch, of determining the lecithans by methyl determinations, was abandoned after a few unsatisfactory trials and a provisional method worked out by Woods, in this laboratory, substituted.

The lipoids precipitated by the addition of chloroform to the emulsion (see determination of extractives in alcohol-ether-soluble portion) are dissolved

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11. Described under, "Determination of the Lecithans."

in hot alcohol (12) and made up to 100 cc while hot. This solution is divided into two portions by means of a hot 50 cc pipette. One portion is placed in a glass evaporating dish for determination of the lecithans; the other in a 300 cc flask for cerebrim determination. (See following) To the portion in the dish 10 cc (an excess) of a saturated alcoholic solution of lead acetate is added. This precipitates the kephalin, leaving lecithin in solution. The separation is, however, not complete, so that results can be only approximate. Through experimentation it was found that the Sulphur Compound is not completely precipitated by this method (13) which fact made it necessary to determine sulphur in both precipitate and filtrate. The solution (after twenty-fourhours) is filtered to a second glass dish, and filtrate evaporated almost to dryness on the water bath. The kephalin is washed from the filter back to the first dish with hot alcohol and this is also evaporated. From this point the processes are identical for the Kephalin and Lecithin. The material is mixed thoroughly with fusion mixture (14) and transferred to a porcelain crucible. This is heated gently over an alcohol flame until it is thoroughly charred, when the whole is ground to a fine powder and again heated over alcohol flame (15) until there are no remaining black specks. When it has cooled, hot water is added to the crucible and it is placed upon the water bath to digest for a few minutes, when it is filtered into a tall beaker. The process of washing with hot water is continued until the filtrate contains no carbonates. The filtrate is made slightly acid with hydrochloric acid and while hot Barium chloride is added. Sulphur is determined as Barium Sulphate.

The filtrate from this sulphur determination is neutralized with ammonium hydroxide and two cc of nitric acid in excess are added. From this, phosphorus is

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12. This must not be allowed to cool before division. An insoluble precipitate forms, introducing an error.
13. Separation in this ratio; 18.4 mg Barium Sulphate in the precipitate to 6.5 mg in the filtrate.
14. Fusion mixture consists of 1 part KNO_3 to 7 parts Na_2CO_3 ~~at a gentle boil~~
15. Fusion was first done over gas flame, but sulphur in gas introduced considerable error. To be on the safe side alcohol was used.

determined by the method described for the nucleoproteid phosphorus (which see.) The phosphorus thus determined represents that of the sulphur compound as well as of the lecithin or kephalin. Correction is made for this by considering that the sulphur compound contains one half as much phosphorus as sulphur*, and subtracting one half of the amount of sulphur determined in each case from the phosphorus determined. The remaining phosphorus represents the Lecithin or Kephalin phosphorus as the case may be.

Determination of Cerebrims.

The half of the alcohol-ether-soluble portion which is placed in the 300 cc flask, is evaporated to dryness, and 75 cc of a 1% hydrochloric acid solution added. This is digested over a low flame (16) with reflex condenser for twenty hours, and transferred to a 100 cc graduated flask. Fifteen cubic centimeters of a saturated water solution of sodium sulphate is added, the whole shaken vigorously and made up to the mark. After standing some time (17), this is filtered. Ninety cc of the filtrate is taken; neutralized with 10% water solution of sodium hydroxide, and 30 cc of Fehlings solution added. After digestion on the water bath for two hours, it is filtered through a platinum Gooch with asbestos filter, which has been previously weighed with cap and lid, and washed with hot water. It is then ignited and weighed. Phrenosin and Kerasin are determined from the copper oxide values as worked out by Dr. Koch.

Determination of Cholesterin.

No cholesterin determinations were made, Cholesterin being assumed to remain constant.

Determination of Sulphur Compound.

"In the absence of more definite knowledge of the chemical structure of

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16. At a gentle boil.
17. Twelve hours is usually sufficient to get a clear filtrate.

*. Koch, W. Loc. cit.

of this compound, it must be determined by the amount of sulphur found." The method by which the sulphur is determined has been described in connection with "Determination of the Lecithans." The sulphur found in these two determinations multiplied by twenty-five gives approximately the amount of sulphur compound, assuming that 4% of the compound is sulphur*. For corrections on lecithin and kephalin phosphorus the phosphorus in this compound may be assumed as being 2%. The nitrogen as 5%.

Sources of Material.

Cases number I, II, III, IV, VI, and VII were collected by Dr. W. Koch in the pathological laboratory of the Claybury County Asylum, in London. References made to Autopsy record in these cases are to the records of that asylum. Cases number VIII and IX were obtained from autopsies at the Parker Memorial Hospital, University of Missouri. The remaining cases; numbers X, XI and XII were obtained from operations in this laboratory.

Summary of Cases.

Case I. Epilepsy, little dementia.

Female. Age 38. Page in Post Mortem book, 96.

Died, October 18, 1903 at 12:30 P M. Autopsy twenty-three hours after death. Weight of brain unstripped, 1335 gms.

History. Had been in the asylum ten years; averaged five or six epileptic fits per month. At times was unmanageable, indicating little dementia. Died during a fit; probably on account of a piece of food found at bifurcation of trachea, although the body did not show marked effects of asphyxia. Body well nourished, and all organs healthy.

Case II. Melancholia, dementia.

Male. Age 27. Page in Post Mortem book, 24.

Died, October 19, 1903 at 12:30 P.M. Autopsy twenty-four hours after death.

Brain. Weight of brain unstripped, 1215 gms.

* Koch. W Loc cit.

membranes not easily removed; general wasting, much in prefrontal region.

History. Symptoms showed melancholia with late dementia, probably beginning general paralysis. Clinical note of October 14, says; Is now an automaton, worked by medulla only.

Cause of death. Heart failure and consequent hypostatic congestion of lungs.

Case III. Melancholia, (a little amentia), very little dementia.

Male. Age 38. Page in Post Mortem book, 32.

Died, November 1, 1903, 7:00 P M. Autopsy sixteen hours after death.

History. Six weeks in asylum. Melancholia, six months old; probably very little dementia.

Cause of death. Chronic nephritis, associated with grave anaemia.

Brain. Weight, 1330 grams. Convolutions simple. Material firm; not congested.

Case IV. General Paralysis, considerable dementia.

Male. Age 36. Page in Post Mortem book, 38.

Died. November 14, 1903, 7:00 A M. Autopsy four hours after death.

History. Syphilis, insanity and general paralysis. Considerable dementia.

Cause of death. Broncho-pneumonia.

Brain. Strips easily; convolutional complexity, considerable; much general wasting. Layer of grey matter in prefrontal region very thin and gelatinous.

Case VI. Normal.

Female. Age 28. Page in Post Mortem book, ?

Died. December 10, 1903, 11:00 P M. Autopsy sixteen hours after death.

History. Chronic gastric trouble. Operated on for intestinal obstruction.

Cause of death. Shock.

Brain. Weight, 1150 gms; membranes thin; slightly oedematous; the white more than the grey matter. Convolutional complexity good.

Case VII. General Paralysis, much dementia.

Male. Age 33. Page in Post Mortem book, 42.

Died. December 6, 1903, 10:00 P M. Autopsy thirteen hours after death.

History. Insanity (syphilis suspected). General paralysis with much dementia.

Cause of death.. -----not given.

Brain. Weight, 1180 gms.

Case VIII. Normal.

Negro. Male. Age 20.

Died. December 11, 1904 at 4:00 P M. Autopsy twenty hours after death.

History. Entered hospital on account of gunshot wound in scapular region on the left side. There was considerable hemorrhage, and patient dilerious at times. Previous history gives no mental symptoms. Was in hospital six days.

Cause of death. Infection, Bacillus Capsulatus Aerogenes.

Brain. Firm; strips easily; no congestion, and of about normal complexity.

Case IX. Normal.

Male. Age 35.

Died. January 20, 1905, 12:30 P M. Autopsy three hours after death.

History. Entered hospital on account of pain in the back. (lumbar region) Had strained his back while working at his trade, carpentering. Case diagnosed as Lumbago. Patient said he felt as well as anyone as long as he was quiet. On fifty-first day in the hospital at 12:30 P M he was writing a letter; suddenly threw back his hands and before the physician could get there, he was dead.

Cause of death. Autopsy findings absolutely negative.

Brain. Weight, 1425 gms. Some slight adhesions between membranes in region of Pacchionian bodies. Convolutional complexity good; strips easily; and not congested.

Case X. Dog. Operated.

Hound of about 16 Kilos weight.

Operated on December 6, 1904. Operation not entirely successful, as paralysis was not complete. The right leg was paralysed as was also the tail. There was control of the left leg. Killed the dog January 20, 1905, thirty-five days after operation. The right leg was completely paralysed, the left however, was well controlled.

Case XI. Dog. Normal.

Brown cur. Material collected as described November 17, 1904.

Case XII. Dog. Operated.

Black cur. Weight, 15 kilos.

Operated on December 1, 1904. Complete paralysis of hind limbs. In ten days some reflexes could be obtained. Wound of operation healed without event.

Killed the animal December 19, 1904, on the nineteenth day after operation.

Discussion of Analyses.

An inspection of tables nos. I, II, and III, which give a summary of the analyses made, shows that there is considerable variation in the percentages of the various constituents of the brain. A comparison of these variations, however, will show some interesting facts.

Table number IV gives the average value for the analyses of the prefrontal areas from each normal case, usually two analyses. It also gives the average value for the determinations from all normal prefrontal areas analysed. An inspection of this part of the table does not give much idea as to the narrow limit of the variations. To show this better, in the same table the percentage (+ or −) of variation of each constituent of each analysis, from the average value, is given. From this table of variations it will be seen that in no case does the variation from this mean value reach one percent of the total, except as we consider the difference between the limits of variation, when it is 1.01% in case of the Sulphur Compound and 1.07% in that of the Phrenosin. On account of the difficulty of separating the lecithin and kephalin, i. e., the unreliability of the lead acetate method, though these two have been determined separately, in this table they are consideredt as total lecithans. There is no reason for assuming a loss of phosphorus so this total should be practically constant. It is seen that in the normal cases they vary only from -0.33% to +0.2%, which is within the limits of the water determination. As we would expect, the table shows that the least variation is in the inorganic salt determinations. A variation of -0.16% or +0.11% is almost negligible. The extractives vary very slightly, -0.25% to +0. 28%. The simple proteid and the nucleoproteid have been separated by difference and the extreme variations in the values obtained have thrown suspicion on the nucleoproteid determinations. I have, therefore, considered the total proteid rather than the

simple and the nucleo-proteid. The total proteid, also, varies less than one percent; considering, even, the difference between the limits of variation we have a value of only 0.7%.

In marked contrast to these variations in the analyses of normal brain tissue, are the variations in the analyses of the prefrontal cortex from pathological cases as shown in table IVb. In this table, as in table IV, only the analyses of the prefrontal cortex are considered. In the first column, the average value for each constituent as determined from all analyses of normal tissue is given. In the other columns are given the variations of each constituent from the normal ~~or~~ average value for each case.

The most marked variation, and one which has been observed in all degenerative processes in nervous tissue, is the increase in the percentage of water. Where, in the analyses of the normal material, there are variations of -0.22% to +0.33% there are in these analyses variations from +1.70% to +2.60%. These variations are found in analyses of cases IV and II respectively, both of which are dements. A variation in the same direction, i. e. increase, is noted in the total proteid. The limits of variation for the extractives has increased, yet an inspection of these limits shows that the negative variation is about six times as great as the positive, indicating a decrease in the amount of the extractives. By the same process we conclude that the inorganic salts have increased. This is in accord with the assumption that during the degenerative processes the larger molecules are broken down.

The Lecithans have markedly decreased in cases II and IV, both of which show considerable dementia, and general wasting; less marked decrease in case VII, which, according to the clinical history, has as much dementia as case II. A decrease of 50% of the Lecithans 2%, as in case II, I think is sufficient to warrant the assertion that in the degenerative process the lecithans have been split up into smaller molecules

which may have been carried away by the blood and lymphatics. Dr. Mott (18) has demonstrated cholin (a splitting product of lecithin) normally present in the blood, but finds that it is increased quantitatively in pathological cases. Since the lecithans are calculated from the phosphorus obtained in the lipoid precipitate we may say that the phosphorus has been decreased as a result of the degenerative process.

Large variations in the percentage of phrenosin may be expected on account of the varying amount of white fibres in the samples as collected. The considerable decrease, -0.27% in case II, is explained when one considers a note made when the material was collected. This shows that in this case there was much general wasting with the prefrontal area markedly degenerated. The brain was so soft that the usual method of collecting material was abandoned and the area scraped with the scalpel down to the white matter. This probably accounts for the decrease in the amount of Phrenosin in this case. The variations in cases III and VII may be explained by assuming them to be normal variations caused by the method of collecting material, as they are not distinct enough to suggest a pathological variation.

So little is known about the sulphur compound that we can only conjecture as to its probable relation to the degenerative processes. The limits of variation of the analyses of the normal material is considerably greater than of the pathological material, but there seems to be no direct relation between the amount of dementia and the decrease of the percentage of sulphur compound. From the values obtained for the other constituents we might assume that case II is the most degenerated, though from clinical history case VII was supposed to be the best example of degeneration. If the latter case be the most degenerated, then there is considerable decrease in this compound, -0.36%, which is 33% of sulphur compound, but if the first, or case II, be considered as the most degenerated there is not

18. Mott, F. W., F. R. S. "Note Upon the Cholin Test." Archives for Neurology vol. II.

so much evidence of a connection between the Sulphur Compound and the degenerative processes. In general there is, however, a decrease in the percentage of sulphur compound in the pathological material.

The Prefrontal cortex, then, in which the histological changes are demonstrated, does show some evidence of chemical changes

The percentages of extractives, lecithans and sulphur compound have decreased; while the percentage of water and inorganic salts has increased. The simple proteid seems to have remained unaltered, and though phrenosin has decreased, I think the decrease may be explained by the varying amount of white matter, as before stated.

Tables V and Vb are similar to IV and IVb, except that they are for the comparison of analyses of the motor area.

On account of the two months the lipoid precipitates of the two samples of motor area of case IX were left standing in the acid chloroform solution, and the consequent breaking down of the precipitates, I have deemed it advisable to omit them from this discussion. There is not a sufficient number of complete analyses of the motor area to more than indicate chemical conditions there.

We note, in comparing the average percentage of constituents in the analyses of the motor (normal) areas with the percentage in the prefrontal (normal) areas, that there is very little difference.

Comparison of the average of the analyses of the prefrontal cortex with the analyses of the motor cortex.

	Prefrontal	Motor	Diff. from prefrontal
Water	82.63	82.00	-.63
Total proteid	8.53	8.69	+.16
Extractives	1.92	1.87	-.05
Inorg. Salts	1.19	1.03	-.16
Lecithans	4.19	3.09	-1.10
Phrenosin	1.25	1.56	+.31
Sulph. Comp.	1.04	1.08	+.04

The differences in composition, as this comparison shows, is not very great, except in case of the Lecithans. The value of the figure for the Lecithans in the Motor area, however, was obtained from only two analyses, one at least of which is unreliable, and it is therefore probable that the figure is too low. The fact that in the pathological cases the percentage ~~of variation~~ is much higher than this average supports this conclusion.

It is difficult to explain why there is a difference in the chemical composition of these two areas. If we could know just which of the constituents had to do with mental processes and which with the purely motor we might venture an explanation. However, until more analyses are made and the question of composition settled beyond all reasonable doubt we can say nothing as to chemical variations.

Comparison of analyses of motor areas in pathological cases with the average of the normal cases.

It has been pointed out, in discussing the relation between the prefrontal areas in normal and in pathological cases, that the greatest increase in the percentage of water is in cases II and IV. In the motor area of case II there is an increase in the percentage of water corresponding to the increase in the prefrontal area. Case IV, however, shows a decrease of 1.3%. An explanation for this is not apparent.

The simple proteids vary between wide limits, but as has been stated there is not a sufficient number of analyses available to offer an explanation.

The extractives seem to have decreased, as was found in the prefrontal cortex, though the decrease is not so marked as there; the inorganic salts have increased.

As noted above, the figure for the lecithans in the normal material is probably too low, hence I do not feel justified in any statement in regard to the

apparent increase. Phrenosin shows an uniform increase varying from 0.08% to 1.02%. This however on account of varying relation between the grey and white matter does not necessarily represent a pathological change.

In regard to the Sulphur compound, nothing definite can be said; the limits of variation are much greater than in the normal, but there is as much increase as there is decrease from the average.

In the analyses of the motor area, then, there is not such constancy in the variations as there is in the analyses of the prefrontal area. The limits of variation are greater for each constituent, except extractives and inorganic salts.

Corpus Callosum.

There were no pathological samples of Corpus Callosum analysed, so that no ~~pathological~~ comparison with pathological samples can be made. A comparison, however, between the average of the analyses of the corpus callosum and the analysis of the sciatic nerve of case VI, both anatomically nerve fibres, shows some very interesting facts.

	Corp. Call.	Sciatic Nerve	Difference
Water	70.02	64.18	-5.84
Total Proteids	8.31	17.00	+8.69
Extractives	1.75	1.76	+0.01
Inorg. Salts	.82	1.30	+0.48
Lecithans	7.66	5.29	-2.37
Phrenosin	5.30	2.59	-2.71
S. Comp.	2.18	3.59	+1.41

From the above comparison, we note a decrease in the water content by 5.85%, which is 6.3% of the total water. This considerable decrease is counterbalanced by the great increase in the percentage of total proteids. It must be remembered, at this point, that the nerve trunks are made up of a considerable amount of con-

1-

nective tissue, which is necessary to bind the several bundles of fibres together. This connective tissue is insoluble in alcohol and ether and water hence according to the method of analysis would appear as part of the total proteids.

The extractives and inorganic salts vary very slightly, while the lecithans and phrenosin show decreases averaging 2.5%. A very notable result is the extremely large percentage of Sulphur Compound in the white matter and the still larger amount in the sciatic nerve. A comparison will show that there is almost as great a percentage in the spinal cord. The significance of this is not quite clear.

Tables number VI to XII inclusive are given to show in a more condensed formthe variations of the different constituents, in normal and in pathological cases, and at the same time afford a possibility of quick comparison of the prefrontal area and the motor area.

A comparison of the differences between the limits of variations in the prefrontal area of the normal and of the pathological cases for each constituent, shows a greater value in the pathological samples than in the normal, except in the phrenosin and sulphur compound, where the opposite is the case.

A similar comparison for the motor area shows a greater difference between the limits of variation for the pathological cases in the percentages of water, total proteid, phrenosin and sulphur compound, and a smaller difference between the limits of variation in the extractives, inorganic salt and lecithans determined.

A comparison of the analyses of the spinal cord, such as is given in table XIII, brings up several questions. Histological examination of the cord in case X shows very little degeneration; the analysis shows only a slight increase in the percentage of lecithans. Case XII, which shows very much degeneration, by histological examination, shows also an increase in the percentage of water coupled with

an apparent decrease in the lecithan content. A closer examination, however, shows that the percentage of lecithan, taken in percentage of the total solids, is in one case greater than the value obtained for the normal, and in the other practically unchanged. This brings up the question as to whether the loss of phosphorus usually considered as accompanying degenerative processes is actual or only apparent. Halliburton (19) has shown that the phosphorus actually diaappears twenty-nine days after section of a nerve.

Summary.

The most satisfactory results have been obtained in the study of the prefrontal area, where in the pathological cases the percentage of water and inorganic salts has increased, and the extractives, lecithans and sulphur compound have decreased. The motor area does not show any marked changes. Corpus callosum and sciatic nerve show a considerable increase in the solid content; in the latter case this is probably due to the presence of connective tissue; in the former case, however, this is not so. The analyses of degenerated spinal cords shows an undoubted increase in the percentage of water, but not such a clear cut loss in the percentage of lecithans.

Record Sheets.

For convenience in redording the results of analyses, the printed forms which follow were arranged. With one exception, they explain themselves. The "Lipoid ppt---cc total---parts---cc each," has reference to the solution of the lipoid precipitate in hot alcohol, which solution is divided for the different analyses.

In conclusion I desire to express my appreciation of the many suggestions given by Dr. Koch, also for the use of material collected by him at the Claybury County Asylum, London. I am indebted to Dr. W. McN. Miller for placing at my disposal two normal human brains. The funds for carrying on this work were derived from a grant by the Rockefeller Institute for Medical Research.

19. Halliburton, W. D. "Chemical Side of Nervous Activity." Page 87.

Table I.

CASE NO.	I.	II		IV			VII		III			XI	X	XII	
	Epileptic	Dement.		Dement.			Dement.		Melancholia			Normal dog.	Operated dog.	Operated dog.	
AREA	Motor	Prefrontal right	Motor right	Prefrontal	Prefrontal	Motor	Prefrontal	Motor	Prefrontal	Prefrontal	Motor.			above cut	below cut.
CONSTITUENTS in per cent															
Water	82.51	85.20	84.50	84.3	84.3	80.6	—	—	84.74	84.74	81.76	68.15	72.8	75.35	71.6
Simple Proteid	2.91	5.67	1.87	0.32	2.86	3.68	2.5	0.75	3.91	3.31	4.75	5.71	6.3	5.14	4.21
Nucleo Proteid	5.41	2.97	4.76	8.35	6.28	6.31	5.35	7.35	5.46	4.72	3.75	2.10	2.0	2.97	3.65
~~Neurokeratin~~ Total Proteid	8.32	8.64	6.63	8.67	9.14	9.99	7.85	8.10	9.37	8.03	8.50	7.81	8.3	8.11	7.86
Extractives		1.12	1.72	2.00	1.8		1.69			1.48	1.75	1.17	1.13	1.20	0.98
Inorganic Salts		0.79	1.03	1.93	1.2		1.05			1.22	1.25	0.70	0.89	0.56	0.58
Lecithins		1.31	3.35	1.75	1.35	1.61	3.07	(1) 2.42 (2) 3.10	2.87	(4.14?)	2.57	4.05	3.17	2.6	2.56
Kephalin and Myelin		0.88	2.83	2.16	1.15	1.89	1.01	(1) 2.93 (2) 2.97	1.76	2.01	2.01	4.27	5.85	3.76	4.91
Total ~~Amido~~ Lecithans		2.19	6.18	3.91	2.50	3.50	4.08	(1) 5.35 (2) 5.90	4.63	(6.15?)	4.58	8.32	9.02	6.36	7.47
Phrenosin		0.98	1.64			2.4	1.36	2.2	1.11	1.82	2.58		2.81	5.33	4.29
Cerebrin Acids															
Cholesterin															
Sulphur Compound		0.93	0.81	0.68	1.1	1.52	0.68	(1) 0.74 (2) 1.16	0.63		0.93	1.66	3.04	2.10	1.82
Inorganic S. ~~TOTAL~~ parts per million		140	120	128	150	121	30		119	299	97	152	136	225	157
Extractive S. " " "				92	90	180	15		384	338	85	209		235	153

Table # II

CASE NO. VIII Normal.

AREA	Prefrontal right	Prefrontal left	Motor right	Motor left	Corpus Callosum	Corpus Callosum
CONSTITUENTS in per cent						
Water	82.96	82.96	81.5	81.8	69.6	69.6
Simple Proteid	5.23	2.80	5.33	7.19	8.04	8.12
Nucleo Proteid	3.29	5.50	3.65	1.80		
~~Neurokeratin~~ Total proteid	8.52	8.30	8.98	8.99	8.04	8.12
Extractives		1.67	1.95	1.26	3.06	1.40
Inorganic Salts		1.03	1.03	0.88	0.73	0.77
Lecithins	3.22	2.51		2.05	3.99	4.74
Kephalin and Myelin	1.1	1.34		1.54	3.54	1.0
~~Amido~~ Total Lecithans	4.32	3.85		3.59	7.53	5.74
Phrenosin	0.70		1.37	2.0	3.76	6.00
Cerebrin Acids						
Cholesterin						
Sulphur Compound	0.63	1.00		1.06	2.27	1.90 ~~6.00~~
Inorganic S. ~~TOTAL~~ parts per million		97	177	322		78
Extractive S. " " "		89				22

Table # III

CASE NO. VI Normal.									IX Normal.			
AREA	Prefrontal	Motor	Motor	Sciatic Nerve	Corpus Callosum	Corpus Callosum	Corpus Callosum	Visuo-Sensory	Prefrontal left	Prefrontal right	Motor left	Motor right
CONSTITUENTS in per cent												
Water	82.21	82.34	82.07	64.18	70.31	70.31	70.31	82.74	84.14	84.18	80.18	80.18
Simple Proteid	4.58	5.58	3.75	4.50	4.71	5.32	5.06	5.54	5.79	4.19	4.25	3.81
Nucleo Proteid	4.24	2.01	5.44	12.5	3.75	3.26	3.30	2.65	3.07	3.97	5.03	5.21
~~Neurokeratin~~ Total proteid	8.82	7.59	9.19	17.0	8.46	8.58	8.36	8.19	8.86	8.16	9.28	9.02
Extractives	2.20	2.72	1.57	1.76	1.01	1.94	1.34	2.17	1.91	1.89	2.27	
Inorganic Salts	1.23	1.14	1.08	1.30	0.72	1.04	0.86	1.32	1.30	1.22	1.18	
Lecithins		~~2.59~~		2.52	1.13	9.71		~~2.75~~		2.11	1.84	2.98
Kephalin and Myelin				2.77	?					2.28	1.83	2.71
Total ~~Amido~~ Lecithans		2.59		5.29		9.71		2.75		4.39	3.67	5.69
Phrenosin	1.29	1.31		2.59	4.85	5.62	6.28			1.77	1.82	1.54
Cerebrin Acids												
Cholesterin												
Sulphur Compound	1.61	0.97	1.26	3.59	?		2.39	1.36		0.92	0.42	0.41
Inorganic S. ~~TOTAL~~ pts per million	195	391	256	199				364	50	29	41	1.60
Extractive S. " " "	72	164		12				114	6	75	2.19	

Table IV. Variation Of Each Analysis Of The Prefrontal Area (Normal) From The Average Value As Determined From All Cases

Case →	VI One Sample	IX Two Samples	VIII Two Samples	average of all Cases	VI	IX left	IX right	VIII left	VIII right	Limits of Variation
Water	82.21%	82.20%	82.96	82.63	-0.22	-0.21	-0.23	+0.33	-0.33	.33, -.22
Total Proteid	8.82%	8.56	8.41	8.53	+0.29	+0.33	-0.37	-0.23	-0.01	.33, -.37
Extractives	2.20	1.90	1.67	1.92	+0.28	-0.01	-0.03	-0.25	—	.28, -.25
Inorganic Salts	1.23	1.26	1.03	1.19	+0.04	+0.11	+0.03	-0.16	—	.11, -.16
Total Lecithans		4.39	4.09	4.19			+0.20	-0.34	+0.13	.20, -.34
Phrenosin	1.29	1.77	0.70	1.25	+0.04		+0.52		-0.55	.52 -.55
Sulphur Compound	1.61	0.92	0.81	1.04	+0.57		-0.12	-0.04	-0.44	.57-.44

Table IV b. Variation Of Each Analysis Of The Prefrontal Area (Pathological) From The Average Value As Determined From All Cases.

In %.

	Average of all, normal Cases	Case II Dement	Case IV Dement	Case VI Dement	Case VII Dement	Case III Melancholia	Limits of Variation Pathology	Limits of Variation Normal	Dr. Koch's Analysis Epileptic	
Water	82.63	+2.60	+1.70	+1.70	—	+1.88	2.60 -0.63	.33, -.22	+1.55	
Total Proteid	8.53	+0.11	+0.14	+0.61	-0.68	+0.84	.84 -0.68	.33 -.37	-0.41	
Extractives	1.92	-0.80	+0.08	+0.12	-0.28		.12, -.80	.28, -.25	-0.34	
Inorganic Salts	1.19	-0.40	+0.74	+0.01	-0.14		.74, -.40	.11, -.16	-0.32	
Total Lecithans	4.19	-2.0	-0.21	-1.69	-0.11	+0.44	.44 -2.0	.20, -.34	-0.31	
Phrenosin	1.25	-0.27			+0.11	-0.14	.11, -.27	.52-.55	+0.30	
Sulphur Compound	1.04	-0.11	-0.36	+0.06	-0.36	-0.41	.06, -.41	.57, -.44	+0.41	

Table V. Variation Of Each Analysis Of The Motor Area(Normal) From The Average Value, As Determined From All Cases.

In %

	Case VI	Case VIII	average of all cases (Mean)	Case VI (1)	Case VI (2)	Case VIII Left ~~Right~~	Case VIII right ~~Left~~	Limits of Variation		
Water	82.21	81.8	82.00	+0.34	+0.07	-0.20	-0.20	.34, -.20		
Total Proteid	8.39	8.98	8.69	-1.10	+0.50	+0.20	+0.19	.50, -1.10		
Extractives	2.14	1.61	1.87	+0.85	-0.30	-0.61	+0.08	.85, -.61		
Inorganic Salts	1.18	0.95	1.03	+0.11	+0.05	-0.15	0	.11, -.15		
Total Lecithans	2.59	3.59	3.09	-0.50		+0.50	—	.50, -.50		
Phrenosin	1.31	1.68	1.56	-0.45		+0.44	-0.19	.44, -.45		
Sulphur Compound	1.11	1.06	1.08	-0.11	+0.18	+0.02		.18, -.11		

Table Vb. Variation Of Each Analysis Of The Motor Area(Pathological) From The Average Value As Determined From All Cases.

In %

	average of all cases	Case I Dement	Case II Dement	Case IV Dement	Case III Melancholia	Case VII Dement	Limits of Variation (Pathological)	Limits of Variation (Normal)		
Water	82.00	+0.51	+2.50	-1.40	-0.24		2.50, -1.40	.34, -.20		
Total Proteid	8.69	-0.37	-2.06	+1.30	-0.19	-0.59	1.30, -2.06	.50, -1.10		
Extractives	1.87		-0.15		-0.12		0, -.15	.85, -.61		
Inorganic Salts	1.03		0		+0.22		0, +.22	.11, -.15		
Total Lecithans	3.09		+3.09	+0.41	+1.48	+2.26	0, +3.09	.50, -.50		
Phrenosin	1.56		+0.08	+0.84	+1.02	+0.64	.08 & 1.02	.44, -.45		
Sulphur Comp.	1.08		-0.27	+0.44	-0.15	-0.34	.44, -.34	.18, -.11		

Table XIII. Variations, in per cent, of the Analyses of the Degenerated Cords from the Analysis of the Normal Cord.

	Normal Case XI	Case X	above cut Case XII	below cut. Case XII						
Water	68.5	+4.3	+6.85	+3.1						
Total Proteid	7.81	+0.5	+0.30	+0.02						
Extractives	1.17	-0.4	+.03	-0.19						
Inorganic Salts	0.70	+0.19	-0.14	-0.12						
Total Lecithans	8.32	+0.88	-1.96	-0.85						
Phrenosin			?	?						
Sulphur Compounds	1.66	+1.38	+0.44	+0.16						
Relation of Lecithans to the total Solids, in per cent	2.64	331	3.17	2.63						

Table VI. **Variations in Water Determination.**

In %

Prefrontal 82.29				Motor 82.00				Corpus Callosum 70.02%			
Normal		Path		Normal		Path		Normal			
VI	−0.22	II	+2.60	VI	+1.65	I	+1.92	VI	+0.29		
IX	−0.21	II	−0.09	"	+0.96	II	+3.83	VIII	−0.42		
IX	−0.23	IV	+1.70	IX	−0.51	IV	−0.09				
VIII	+0.33	III	+1.88	VIII	+1.11	III	+1.07				
	0.55		2.69		2.26		3.92		−0.71		

Table VII. **Variations in Total Proteid.**

In %

Prefrontal 8.53				Motor 8.69				Corpus Callosum 8.31			
Normal		Patho-		Normal		Patholog.		Normal			
VI	+0.29	I	−0.21	VI	−1.10	I	−0.37	VI	+0.15		
IX	+0.33	II	+0.11	IX	+0.60	II	−2.06	VI	+0.27		
"	−0.37	IV	+0.14	IX	+0.33	IV	+1.30	VI	+0.05		
VIII	−0.23	IV	+0.68	VIII	+0.29	VII	−0.59	VIII	−0.27		
VIII	−0.01	III	+0.84	VIII	+0.30	III	−0.19	VIII	−0.19		
	0.70		1.52		1.70		3.36		.54		

Table VIII. **Variations in Extractives.**

In %

Prefrontal 1.92				Motor 1.87				Corpus Callosum 1.75			
Normal		Patholog.		Normal		Patholog		Normal			
VI	+0.28	II	−0.80	VI	+0.85	II	−0.15	VI	−0.74		
IX	−0.01	IV	+0.08	VI	−0.30	III	−0.12	VI	+0.19		
IX	−0.03	IV	+0.12	IX	+0.40			VI	−0.41		
VIII	−0.25	VII	−0.23	VIII	+0.24			VIII	+1.31		
				VIII	+0.25			"	−0.35		
	0.53		0.92		1.15		0.15		2.05		

Table IX. **Variations in Inorganic Salts.**

In %

Prefrontal 1.19				Motor 1.03				Corpus Callosum 0.82			
	Normal		Patholog.		Normal		Patholog		Normal		
VI	+0.04	II	−0.40	VI	+0.11	II	0	VI	−0.10		
IX	+0.11	IV	+0.74	VI	+0.05	III	0	VI	+0.22		
IX	+0.03	IV	+0.01	IX	+0.15			VI	+0.04		
VIII	−0.16	VII	−0.14	VIII	0.0			VIII	−0.09		
				VIII	−0.1			VIII	−0.05		
	0.27		1.14		0.25				0.32		

Table #X. Variations in Total Lecithans.

In %.

Prefrontal 4.19				Motor 3.09 (?)				Corpus Callosum 7.66			
Normal		Patholog		Normal		Patholog		Normal			
IX	+0.20	II	−0.2	VI	−0.50	IV	+3.09	VI	+2.05		
VIII	−0.34	IV	−0.21	IX	+0.58	IV	+0.51	VII	−0.13		
VIII	+0.13	IV	−1.69	IX	+2.60	VII	+2.51	VIII	−1.92		
		VII	−0.11			III	+1.49				
		III	+0.44								
54		2.13		3.10		3.09		3.97			

Table XI. Variations in Phrenosin.

In %.

Prefrontal 1.25				Motor 1.56				Corpus Callosum 5.30			
Normal		Patholog		Normal		Patholog		Normal			
VI	+0.04	II	−0.27	VI	−0.25	II	+0.08	VI	−0.55		
IX	+0.52	VII	+0.11	IX	+0.26	IV	+0.77	VI	+0.32		
VIII	−0.55	III	−0.14	IX	+0.12	VII	+0.65	VI	+0.98		
				VIII	+0.44	III	+1.02	VIII	−1.54		
								VIII	+0.90		
1.07		0.38		0.69		1.02					

Table XII. Variations in Sulphur Compound.

In %.

Prefrontal 1.04				Motor 1.09				Corpus Callosum 2.18			
Normal		Patholog.		Normal		Patholog.		Normal			
VI	+0.57	II	−0.11	VI	−0.11	IV	+0.44	VI	+0.19		
IX	−0.12	IV	−0.36	VI	+0.18		−0.27	VII	+0.09		
VIII	−0.04	IV	+0.06	VIII	−0.08		+0.37	VIII	−0.28		
VIII	−0.44	VII	−0.36				−0.15				
		III	−0.41								
1.01		0.47		.29		0.71		0.47			

CASE NO. I

AREA Motor

CONSTITUENTS
in per cent

Water	82.51
Simple Proteid	2.91
Nucleo Proteid	5.41
Neurokeratin	
Extractives	
Inorganic Salts	
Lecithins	
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	
TOTAL	

Weight of Sample 8.1974

Alcohol-Ether insoluble part .6932

Soluble in Water .0109

.6823

ALCOHOL-ETHER, SOLUBLE PORTION

Lost

Lipoid ppt. ..... cc total

..... parts ..... cc each

1. Lipoid S.

ppt. ..... $BaSO_4$

filt. ..... "

2. Lec. P.

mg. ..... $Mg_2P_2O_7$

Kep P

mg ..... "

3. Cerebrins

100 cc total ..... 90 cc taken

Wt. of CuO. ..... mg

4.

Filtrate ..... cc total

..... parts ..... cc each

1. Residue on evap. ..... mg

Inorganic Salts ..... mg

S. det ..... $BaSO_4$

2. Inorganic S.

in cold. ..... $BaSO_4$

3. Total Extractive S.

by fusion ..... $BaSO_4$

4.

Weight of Residue Sol. in Water 10.9 mg

on ignition 6.9 mg

S. det. ..... $BaSO_4$

Weight of Nuclein Phosphorus, mg 9.1 $Mg_2P_2O_7$

CASE NO. II

AREA Prefrontal, right

CONSTITUENTS
in per cent

Water	85.20
Simple Proteid	5.67
Nucleo Proteid	2.97
Neurokeratin	
Extractives	1.12
Inorganic Salts	0.79
Lecithins	1.31
Kephalin and Myelin	0.88
Amido Lecithans	
Phrenosin	0.98
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.93
TOTAL	

Inorganic S. 140 pts per million

Weight of Sample 8.7088

Alcohol-Ether insoluble part .7688

Soluble in Water .0160

.7528

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 5.6 $BaSO_4$
   filt. 6.2 "
2. Lec. P.
   mg. 9.5 $Mg_2P_2O_7$
   Kep P
   mg 6.7 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 15.0 mg
4.

Filtrate 100 cc total
3 parts 25 cc each

	I	II
1. Residue on evap.	39.6 mg	33.0
Inorganic Salts	17.6 mg	13.8
S. det	1.9 $BaSO_4$	?

2. Inorganic S.
   in cold. 1.9 $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 16.0 mg
on ignition 6.2 mg
S. det. 1.3 $BaSO_4$
Weight of Nuclein Phosphorus, mg 6.1 $Mg_2P_2O_7$

CASE NO. II

AREA Motor right

CONSTITUENTS
in per cent

Water	84.50
Simple Proteid	1.87
Nucleo Proteid	4.76
Neurokeratin	—
Extractives	1.72
Inorganic Salts	1.03
Lecithins	3.35
Kephalin and Myelin	2.83
Amido Lecithans	
Phrenosin	1.64
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.81
TOTAL	

inorganic S. 120 parts per million

Weight of Sample 6.0335

Alcohol-Ether insoluble part 0.4112

Soluble in Water .0120

.3992

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total

2 parts 50 cc each

1. Lipoid S.

ppt. 3.3 $BaSO_4$

filt. 3.9 "

2. Lec. P.

mg, 15.0 $Mg_2P_2O_7$

Kep P

mg 12.7 "

3. Cerebrins

100 cc total 90 cc taken

Wt. of CuO. 18.0 mg

4.

Filtrate 100 cc total

3 parts 25 cc each

1. Residue on evap. I 40.0 mg II 30.2

Inorganic Salts 14.8 mg 13.6

S. det 1.1 $BaSO_4$ 0.7

2. Inorganic S.

in cold. 1.1 $BaSO_4$

3. Total Extractive S.

by fusion $BaSO_4$

4.

Weight of Residue Sol. in Water 12.0 mg

on ignition 5.4 mg

S. det. 1.3 $BaSO_4$

Weight of Nuclein Phosphorus, mg 5.9 $Mg_2P_2O_7$

CASE NO. IV

AREA Prefrontal

CONSTITUENTS
in per cent

Water	84.3
Simple Proteid	0.32
Nucleo Proteid	8.35
Neurokeratin	
Extractives	2.00
Inorganic Salts	1.93
Lecithins	1.75
Kephalin and Myelin	2.16
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.68
TOTAL	

Inorganic S. 128 parts per million
Extractive S 92 " " "

Weight of Sample 4.4894
Alcohol-Ether insoluble part .4346
Soluble in Water .0452
.3894

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
1 parts 100 cc each

1. Lipoid S.
   ppt. 3.3 $BaSO_4$
   filt. 5.6 "
2. Lec. P.
   mg. 12.3 $Mg_2P_2O_7$
   Kep P
   mg 14.3 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. — mg
4.

Filtrate 100 cc total
2 parts 40 cc each

1. Residue on evap. 52.6 mg
   Inorganic Salts 22.8 mg
   S. det 1.7 $BaSO_4$
2. Inorganic S.
   in cold. 0.5 $BaSO_4$
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 45.2 mg
on ignition 30.0 mg
S. det. 2.6 $BaSO_4$

Weight of Nuclein Phosphorus, mg 7.7 $Mg_2P_2O_7$

10

CASE NO. IV

AREA Prefrontal

CONSTITUENTS
in per cent

Water	84.3
Simple Proteid	2.86
Nucleo Proteid	6.28
Neurokeratin	
Extractives	1.8
Inorganic Salts	1.2
Lecithins	1.35
Kephalin and Myelin	1.15
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.1
TOTAL	

Inorganic S 150 parts per million
Extractive S 90 " " "

Weight of Sample 4.8776

Alcohol-Ether insoluble part .4590

Soluble in Water .0124
.4466

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
1 parts 100 cc each

1. Lipoid S.
   ppt. 5.2 $BaSO_4$
   filt. 10.3 "
2. Lec. P.
   mg. 11.5 $Mg_2P_2O_7$
   Kep P
   mg 9.1 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. — mg
4.

Filtrate 100 cc total
3 parts 25 cc each

	I	II
1. Residue on evap.	34.4 mg	34.4
Inorganic Salts	14.4 mg	12.6
S. det	0.9 $BaSO_4$	1.5

2. Inorganic S.
   in cold. 0.7 $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 12.4 mg
on ignition 5.0 mg
S. det. 2.5 $BaSO_4$

Weight of Nuclein Phosphorus, mg 6.3 $Mg_2P_2O_7$

CASE NO. IV

AREA Motor.

CONSTITUENTS
in per cent

Water	80.8
Simple Proteid	3.68
Nucleo Proteid	6.31
Neurokeratin	
Extractives	
Inorganic Salts	
Lecithins	1.61
Kephalin and Myelin	1.89
Amido Lecithans	
Phrenosin	2.4
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.52
TOTAL	

Inorganic S 121 parts per million
Extractive S 180 " " "

Weight of Sample 6.8571

Alcohol-Ether insoluble part .6996

Soluble in Water .0150

.6846

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 1.9 $BaSO_4$
   filt. 13.3 "
2. Lec. P.
   mg. 10.9 $Mg_2P_2O_7$
   Kep P
   mg 9.7 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 31.2 mg
4.

Filtrate 100 cc total
2 parts 40 cc each

1. Residue on evap. mg
   Inorganic Salts mg
   S. det $BaSO_4$
2. Inorganic S.
   in cold. 1.9 $BaSO_4$
3. Total Extractive S.
   by fusion 5.5 $BaSO_4$
4.

Weight of Residue Sol. in Water 15.0 mg
on ignition 6.6 mg
S. det. 1.3 $BaSO_4$

Weight of Nuclein Phosphorus, mg 8.7 $Mg_2P_2O_7$

CASE NO. VII

AREA Prefrontal, right

CONSTITUENTS
in per cent

Water	—
Simple Proteid	2.5
Nucleo Proteid	5.35
Neurokeratin	
Extractives	1.69
Inorganic Salts	1.05
Lecithins	3.70
Kephalin and Myelin	1.01
Amido Lecithans	
Phrenosin	1.36
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.68
TOTAL	

Inorganic S 30 parts per million
Extractive S. 15 " " "

Weight of Sample 13.6836

Alcohol-Ether insoluble part 1.6860

Soluble in Water .0177

1.0683

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 6.1 $BaSO_4$
   filt. 2.9 "
2. Lec. P.
   mg. 24.6 $Mg_2P_2O_7$
   Kep P
   mg 7.9 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 23.0 mg
4. 2" det = 15. mg CuO.

Filtrate 100 cc total
2 parts 40 cc each

1. Residue on evap. 1422 mg
   Inorganic Salts 5574 mg
   S. det 1.5 $BaSO_4$
2. Inorganic S.
   in cold. 0.9 $BaSO_4$
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 17.7 mg
on ignition 6.0 mg
S. det. 0.5 $BaSO_4$

Weight of Nuclein Phosphorus, mg 14.9 $Mg_2P_2O_7$

CASE NO. VII

AREA Motor

CONSTITUENTS
in per cent

Water		
Simple Proteid		8.1
Nucleo Proteid		
Neurokeratin		
Extractives		
Inorganic Salts		
Lecithins	I 2.42	II 3.10
Kephalin and Myelin	2.93	2.97
Amido Lecithans		
Phrenosin	2.2	
Cerebrin Acids		
Cholesterin		
Sulphur Compound	0.74	1.16
TOTAL		

Weight of Sample 11.1952

Alcohol-Ether insoluble part .9312

Soluble in Water .0238

.9074

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
I 2.4 ppt. 5.4 $BaSO_4$
4.1 filt. 7.3 "

2. Lec. P.
13.3 mg, 17.9 $Mg_2P_2O_7$
1 Kep P
15.9 mg 16.7 "

3. Cerebrins
100 cc total 90 cc taken
Wt. of CuO. 33.4 mg

4.

Filtrate 100 cc total
1 parts 75 cc each

1. Residue on evap. mg
Inorganic Salts mg
S. det $BaSO_4$

2. Inorganic S.
in cold. BaSO

3. Total Extractive S.
by fusion 13.10 $BaSO_4$

4.

Weight of Residue Sol. in Water 23.8 mg
on ignition 13.0 mg
S. det. 3.3 $BaSO_4$

Weight of Nuclein Phosphorus, mg 16.9 $Mg_2P_2O_7$

CASE NO. III

AREA Prefrontal

CONSTITUENTS
in per cent

Water	84.74
Simple Proteid	3.91
Nucleo Proteid	5.46
Neurokeratin	
Extractives	
Inorganic Salts	
Lecithins	2.87
Kephalin and Myelin	1.76
Amido Lecithans	
Phrenosin	1.11
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.63
TOTAL	

Inorganic S. 119 parts per million
Extractive S. 384 " " "

Weight of Sample 6.5143
Alcohol-Ether insoluble part 0.6196
Soluble in Water .0093
.6103

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 5.5 $BaSO_4$
   filt. 0.5 "
2. Lec. P.
   mg. 13.1 $Mg_2P_2O_7$
   Kep P
   mg 9.2 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 12.8 mg
4.

Filtrate 100 cc total
2 parts 40 cc each

1. Residue on evap. mg
   Inorganic Salts mg
   S. det $BaSO_4$
2. Inorganic S.
   in cold. 1.5 BaSO
3. Total Extractive S.
   by fusion 9.8 $BaSO_4$
4.

Weight of Residue Sol. in Water 9.3 mg
on ignition 2.6 mg
S. det. 1.9 $BaSO_4$

Weight of Nuclein Phosphorus, mg 7.3 $Mg_2P_2O_7$

CASE NO. III

AREA Prefrontal

CONSTITUENTS
in per cent

Water	84.74
Simple Proteid	3.31
Nucleo Proteid	4.72
Neurokeratin	—
Extractives	1.48
Inorganic Salts	1.22
Lecithins	(4.14 ?)
Kephalin and Myelin	2.01
Amido Lecithans	—
Phrenosin	1.82
Cerebrin Acids	—
Cholesterin	—
Sulphur Compound	—
TOTAL	

Inorganic S. 299 parts per million
Extractive S. 338 " " "

Weight of Sample 6.0820

Alcohol-Ether insoluble part .4998

Soluble in Water .0120

.4878

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 3.3 $BaSO_4$
   filt. lost "
2. Lec. P.
   mg. 17.5 $Mg_2P_2O_7$
   Kep P
   mg 9.3 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 20.4 mg
4.

Filtrate 100 cc total
3 parts 25 cc each

	I	II
1. Residue on evap.	34.8 mg	38.4
Inorganic Salts	18.0 mg	18.2
S. det	5.8 $BaSO_4$	6.2

2. Inorganic S.
   in cold. 41 BaSO
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 12.0 mg
on ignition 4.2 mg
S. det. 3.0 $BaSO_4$

Weight of Nuclein Phosphorus, mg 5.9 $Mg_2P_2O_7$

CASE NO. III

AREA Motor

CONSTITUENTS
in per cent

Water	81.76
Simple Proteid	4.75
Nucleo Proteid	3.75
Neurokeratin	
Extractives	1.75
Inorganic Salts	1.25
Lecithins	2.57
Kephalin and Myelin	2.01
Amido Lecithans	
Phrenosin	2.58
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.93
TOTAL	

Inorganic S. 97 parts per million
Extractive S. 85 " " "

Weight of Sample 7.1033

Alcohol-Ether insoluble part .6142

Soluble in Water .0106

.6036

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 3.5 $BaSO_4$
   filt. 6.1 "
2. Lec. P.
   mg. 14.2 $Mg_2P_2O_7$
   Kep P
   mg 10.8 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 35.0 mg
4.

Filtrate 100 cc total
2 parts 40 cc each

1. Residue on evap. 81.2 mg
   Inorganic Salts 32.4 mg
   S. det 0.9 $BaSO_4$
2. Inorganic S.
   in cold. 1.1 BaSO
3. Total Extractive S.
   by fusion 5.5 $BaSO_4$

} deter. for same sample

4.

Weight of Residue Sol. in Water 10.6 mg
on ignition 7.9 mg
S. det. 2.3 $BaSO_4$

Weight of Nuclein Phosphorus, mg 7.7 $Mg_2P_2O_7$

CASE NO. XI

AREA Spinal Cord, (dog) Normal

CONSTITUENTS
in per cent

Water	68.5
Simple Proteid	5.71
Nucleo Proteid	2.10
Neurokeratin	—
Extractives	1.17
Inorganic Salts	0.70
Lecithins	4.05
Kephalin and Myelin	4.27
Amido Lecithans	—
Phrenosin	—
Cerebrin Acids	—
Cholesterin	—
Sulphur Compound	1.66
TOTAL	

Weight of Sample 4.9328

Alcohol-Ether insoluble part .3927

Soluble in Water .0076

.3851

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. — cc total
not divided
— parts — cc each

1. Lipoid S.
   ppt. 17.7 $BaSO_4$
   filt. 6.3 "
2. Lec. P.
   mg. 29.3 $Mg_2P_2O_7$
   Kep P
   mg 33.6 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. mg
4.

Filtrate 150 cc total
3 parts 40 cc each

	I	II
1. Residue on evap.	22.6 mg	22.6
Inorganic Salts	8.6 mg	8.4
S. det	2.9 $BaSO_4$	2.9

2. Inorganic S.
   in cold. 0.9 BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Inorganic S. 152. parts per million
Extractive S. 209. " " "

Weight of Residue Sol. in Water 7.6 mg
on ignition 2.8 mg
S. det. 2.1 $BaSO_4$

Weight of Nuclein Phosphorus, mg 4.3 $Mg_2P_2O_7$

#1

CASE NO. X

AREA Spinal Cord (dog) below cut

CONSTITUENTS
in per cent

Water	72.8
Simple Proteid	6.3
Nucleo Proteid	2.0
Neurokeratin	—
Extractives	1.13
Inorganic Salts	0.89
Lecithins	3.17
Kephalin and Myelin	5.85
Amido Lecithans	—
Phrenosin	2.81
Cerebrin Acids	—
Cholesterin	—
Sulphur Compound	3.04
TOTAL	

Inorganic S. 136. parts per Million

Weight of Sample 6.5344

Alcohol-Ether insoluble part .5578

Soluble in Water .0152

.5426

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 21.5 $BaSO_4$
   filt. 7.5 "
2. Lec. P.
   mg. 12.9 $Mg_2P_2O_7$
   Kep P
   mg 31.9 "
3. Cerebrins
   100 cc total — 90 cc taken
   Wt. of CuO. 54.6 mg
4.

Filtrate 100 cc total
3 parts 25 cc each

	I	II
1. Residue on evap. mg	26.4	26.6
Inorganic Salts mg	10.4	10.6
S. det $BaSO_4$	1.1	0.7

2. Inorganic S.
   in cold. 1.1 BaSO
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 15.2 mg
on ignition 5.4 mg
S. det. 2.1 $BaSO_4$
Weight of Nuclein Phosphorus, mg 4.1 $Mg_2P_2O_7$

CASE NO. XII

AREA Spinal Cord (dog) (below cut)

CONSTITUENTS
in per cent

Water	71.6	
Simple Proteid	4.21	
Nucleo Proteid	3.65	
Neurokeratin		
Extractives	0.98	
Inorganic Salts	0.58	
Lecithins	3.63	2.56
Kephalin and Myelin	4.91	4.91
Amido Lecithans		
Phrenosin	4.29	
Cerebrin Acids		
Cholesterin		
Sulphur Compound	1.82	
TOTAL		

Inorganic S. 151 parts per million
Extractive S. 453 " " "

Weight of Sample 7.9024
Alcohol-Ether insoluble part .6324
Soluble in Water .0112
.6212

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
ppt. 15.5 $BaSO_4$
filt. 5.5 "
2. Lec. P.
mg. 21.3 $Mg_2P_2O_7$ by titration 4.3 mg. of P.
Kep P
mg 46.5 " by titration 4.3 mg of P.
3. Cerebrins
100 cc total x 90 cc taken
Wt. of CuO. 66.2 mg
4.

Filtrate 100 cc total
3 parts 25 cc each

	I	II
1. Residue on evap. mg	29.0	27.2
Inorganic Salts mg	10.2	10.6
S. det $BaSO_4$	3.7	0.9

2. Inorganic S.
in cold. 15 BaSO
3. Total Extractive S.
by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 11.2 mg
on ignition 4.2 mg
S. det. 2.7 $BaSO_4$
Weight of Nuclein Phosphorus, mg 7.5 $Mg_2P_2O_7$

CASE NO. XII

AREA Spinal Cord (dog) above cut.

CONSTITUENTS
in per cent

Water	75.35
Simple Proteid	5.14
Nucleo Proteid	2.97
Neurokeratin	
Extractives	1.20
Inorganic Salts	0.56
Lecithins	2.6
Kephalin and Myelin	3.76
Amido Lecithans	
Phrenosin	5.53
Cerebrin Acids	
Cholesterin	
Sulphur Compound	2.10
TOTAL	

Inorganic S. 225 parts per million
Extractive S 235 " " "

Weight of Sample 5.6117
Alcohol-Ether insoluble part 14.654
Soluble in Water .0104
.4550

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 12.5 $BaSO_4$
   filt. 4.7 "
2. Lec. P.
   mg. 11.3 $Mg_2P_2O_7$
   Kep P
   mg 29.3 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 61.0 mg
4.

Filtrate 100 cc total
3 parts 25 cc each

	I	II
1. Residue on evap.	21.4 mg	22.4
Inorganic Salts	6.4 mg	7.0
S. det	4.1 $BaSO_4$	3.1

2. Inorganic S.
   in cold. 1.7 BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 10.4 mg
on ignition 4.0 mg
S. det. 2.4 $BaSO_4$
Weight of Nuclein Phosphorus, mg 6.1 $Mg_2P_2O_7$

CASE NO. VIII

AREA Prefrontal, right.

CONSTITUENTS
in per cent

Water	82.96
Simple Proteid	5.23
Nucleo Proteid	3.29
Neurokeratin	
Extractives	
Inorganic Salts	
Lecithins	3.22
Kephalin and Myelin	1.10
Amido Lecithans	
Phrenosin	0.70
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.63
TOTAL	

Weight of Sample 14.3551

Alcohol-Ether insoluble part 1.2442

Soluble in Water .0212

1.2230

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
3 parts 30 cc each

1. Lipoid S.
   ppt. 2.8 $BaSO_4$
   filt. 2.9 "
2. Lec. P.
   mg. 13.8 $Mg_2P_2O_7$
   Kep P
   mg 7.4 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 10.2 mg
4.

Filtrate cc total
parts cc each

1. Residue on evap. mg
   Inorganic Salts mg
   S. det $BaSO_4$
2. Inorganic S.
   in cold. BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 21.2 mg
on ignition 8.8 mg
S. det. 1.9 $BaSO_4$

Weight of Nuclein Phosphorus, mg 9.7 $Mg_2P_2O_7$

CASE NO. VIII

AREA Prefrontal, left

CONSTITUENTS
in per cent

Water	82.96
Simple Proteid	2.80
Nucleo Proteid	5.50
Neurokeratin	
Extractives	1.67
Inorganic Salts	1.03
Lecithins	2.51
Kephalin and Myelin	1.34
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.00
TOTAL	

Inorganic S. 97 parts per million
Extractive S 89 " " "

Weight of Sample 10.2514
Alcohol-Ether insoluble part .8706
Soluble in Water .0198
.8508

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 5.3 $BaSO_4$
   filt. 4.7 "
2. Lec. P.
   ck 12.5 mg, 13.9 $Mg_2P_2O_7$
   Kep P
   ck 7.9 mg 7.5 "
3. Cerebrins
   100 cc total Lost 90 cc taken
   Wt. of CuO. mg
4.

Filtrate 250 cc total
3 parts 75 cc each

1. Residue on evap. I 76.6 mg II 78.0
   Inorganic Salts 29.0 mg 29.6
   S. det 3.5 $BaSO_4$ 2.5
2. Inorganic S.
   in cold. 1.5 BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 19.8 mg
on ignition 8.2 mg
S. det. 2.3 $BaSO_4$

Weight of Nuclein Phosphorus, mg 11.3 $Mg_2P_2O_7$

CASE NO. VIII

AREA Motor, right.

CONSTITUENTS
in per cent

Water	81.8
Simple Proteid	5.33
Nucleo Proteid	3.65
Neurokeratin	0.00
Extractives	1.95
Inorganic Salts	
Lecithins	
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	1.37
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.05
TOTAL	

Inorganic S. 177 parts per million.

Weight of Sample 12.1412

Alcohol-Ether insoluble part 1.1076

Soluble in Water .0174

1.0902

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 4.3 $BaSO_4$
   filt. 8.1 "
2. Lec. P.
   mg. [illegible] $Mg_2P_2O_7$
   Kep P
   mg ..... "
3. Cerebrins
   100 cc total ..... 90 cc taken
   Wt. of CuO. 20.4 mg
4.

Filtrate 150 cc total
3 parts 40 cc each

1. Residue on evap. I 93.2 mg II 91.2
   Inorganic Salts 31.6 mg 31.4
   S. det 3.7 $BaSO_4$ 3.1
2. Inorganic S.
   in cold. 3.7 $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 17.4 mg
on ignition 7.4 mg
S. det. 2.2 $BaSO_4$
Weight of Nuclein Phosphorus, mg 7.5 $Mg_2P_2O_7$

CASE NO. VIII

AREA Motor, left.

CONSTITUENTS
in per cent

Water	81.8
Simple Proteid	7.19
Nucleo Proteid	1.80
Neurokeratin	
Extractives	1.26
Inorganic Salts	0.88
Lecithins	2.05
Kephalin and Myelin	1.54
Amido Lecithans	
Phrenosin	2.0
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.06
TOTAL	

Inorganic S
Extractives S } 322 pts per million

Weight of Sample 7.6209

Alcohol-Ether insoluble part .6994

Soluble in Water .0120

.6854

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 4.4 $BaSO_4$
   filt. 3.5 "
2. Lec. P.
   mg. 8.1 $Mg_2P_2O_7$
   Kep P
   mg 6.5 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 19.6 mg
4.

Filtrate 250 cc total
3 parts 75 cc each

1. Residue on evap. I 46.2 mg II 48.6
   Inorganic Salts 18.7 mg 19.2
   S. det 1.7 $BaSO_4$ 1.7
2. Inorganic S.
   in cold. 4.9 $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 12.0 mg
on ignition 4.0 mg
S. det. 1.9 $BaSO_4$

Weight of Nuclein Phosphorus, mg 3.7 $Mg_2P_2O_7$

CASE NO. VIII

AREA Corpus Callosum

CONSTITUENTS
in per cent

Water	69.6
Simple Proteid	~~12~~ 8.04
Nucleo Proteid	
Neurokeratin	—
Extractives	3.06
Inorganic Salts	0.73
Lecithins	3.99
Kephalin and Myelin	3.54
Amido Lecithans	
Phrenosin	3.76
Cerebrin Acids	
Cholesterin	
Sulphur Compound	2.27
TOTAL	

Weight of Sample 9.9356

Alcohol-Ether insoluble part .8178

Soluble in Water .0192

.7986

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 15.2 $BaSO_4$
   filt. 6.7 "
2. Lec. P.
   mg. 20.1 $Mg_2P_2O_7$
   Kep P
   mg 20.1 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 48.2 mg
4.

Filtrate 150 cc total
3 parts 40 cc each

1. Residue on evap. I 89.2 mg II 95.6
   Inorganic Salts 18.0 mg 17.8
   S. det 2.5 $BaSO_4$ 2.5
2. Inorganic S.
   in cold. 0.7 $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

→ on drying, this was heated to 115°C

Weight of Residue Sol. in Water 19.2 mg
on ignition 6.0 mg
S. det. 5.9 $BaSO_4$?

Weight of Nuclein Phosphorus, mg 26.5 $Mg_2P_2O_7$?

CASE NO. VIII

AREA Corpus Callosum

CONSTITUENTS
in per cent

Water	69.6
Simple Proteid	8.12
Nucleo Proteid	
Neurokeratin	
Extractives	1.40
Inorganic Salts	0.77
Lecithins	4.74
Kephalin and Myelin	1.00
Amido Lecithans	
Phrenosin	6.00
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.90
TOTAL	

Inorganic S. 78. parts per million
Extractive S. 22. " " "

Weight of Sample 9.4505
Alcohol-Ether insoluble part .7894
Soluble in Water .0216
.7678

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 11.1 $BaSO_4$
   filt. 6.3 "
2. Lec. P.
   mg. 22.4 $Mg_2P_2O_7$
   Kep P
   mg 8.3 "
3. Cerebrins
   100 cc total ..... 90 cc taken
   Wt. of CuO. 74.4 mg
4.

Filtrate 150 cc total
3 parts 40 cc each

1. Residue on evap. I 51.0 mg II 51.2
   Inorganic Salts 19.0 mg 19.8
   S. det 1.3 $BaSO_4$ 1.9
2. Inorganic S.
   in cold. 0.9 $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 21.6 mg
on ignition 8.4 mg
S. det. 2.0 $BaSO_4$

Weight of Nuclein Phosphorus, mg 19.9 $Mg_2P_2O_7$
Ck 5.4 of P. by titration

CASE NO. VI

AREA Prefrontal

CONSTITUENTS
in per cent

Water	82.21
Simple Proteid	4.58
Nucleo Proteid	4.24
Neurokeratin	
Extractives	2.20
Inorganic Salts	1.23
Lecithins	0.75
Kephalin and Myelin	0.86
Amido Lecithans	
Phrenosin	1.29
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.61
TOTAL	

Weight of Sample 8.5013

Alcohol-Ether insoluble part 0.7746

Soluble in Water 0.0244

0.7502

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
4 parts 25 cc each

1. Lipoid S.
   ppt. 3.9 $BaSO_4$
   filt. 6.1 "
2. Lec. P.
   mg. 3.7 $Mg_2P_2O_7$
   Kep P
   mg 3.5 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 6.8 mg
4.

Filtrate 400 cc total
4 parts 80 cc each

1. Residue on evap. 53.2 mg
   Inorganic Salts 17.6 mg
   S. det 18.6(?) $BaSO_4$
2. Inorganic S.
   in cold. 31.0 BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 24.4 mg
on ignition 15.2 mg
S. det. 9.7(?) $BaSO_4$
Weight of Nuclein Phosphorus, mg 7.4 $Mg_2P_2O_7$

CASE NO. VI

AREA Motor.

CONSTITUENTS
in per cent

Water	82.34
Simple Proteid	5.58
Nucleo Proteid	2.01
Neurokeratin	
Extractives	2.71
Inorganic Salts	1.14
Lecithins	2.59
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	1.31
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.97
TOTAL	

Inorganic S. 195 parts per million
Extractive S 72 " " "

Weight of Sample 11.8058

Alcohol-Ether insoluble part 1.0078

Soluble in Water .0326

.9752

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
4 parts 25 cc each

1. Lipoid S.
   ppt. } 9.1 $BaSO_4$
   filt. } " "
2. Lec. P.
   mg. 10.0 $Mg_2P_2O_7$
   Kep P
   mg 3.6 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 15.0 mg
4.

Filtrate 400 cc total
4 parts 80 cc each

1. Residue on evap. 92.8 mg
   Inorganic Salts 25.78 mg
   S. det 3.1 $BaSO_4$
2. Inorganic S.
   in cold. 2.6 BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 32.6 mg
on ignition 16.8 mg
S. det. 4.0 $BaSO_4$

Weight of Nuclein Phosphorus, mg 5.3 $Mg_2P_2O_7$

CASE NO. VI

AREA Motor.

CONSTITUENTS
in per cent

Water	82.07
Simple Proteid	3.75
Nucleo Proteid	5.44
Neurokeratin	
Extractives	1.57
Inorganic Salts	1.08
Lecithins	3.53
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.26
TOTAL	

Weight of Sample 4.8133

Alcohol-Ether insoluble part 0.4556

Soluble in Water 0.0145 / .4411

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 50 cc total
2 parts 20 cc each

1. Lipoid S.
   ppt. } 7.1 BaSO$_4$
   filt } 7.1 "
2. Lec. P.
   mg. Mg$_2$P$_2$O$_7$
   Kep P
   mg "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. mg
4. Total Phos. 11.2 mg. Mg$_2$P$_2$O$_7$

Filtrate 200 cc total
2 parts 80 cc each

1. Residue on evap. 457.4 mg
   Inorganic Salts 18.0 mg
   S. det 4.7 BaSO$_4$
2. Inorganic S.
   in cold. 2.4 BaSO
3. Total Extractive S.
   by fusion BaSO$_4$
4.

Inorganic S. 391 pts per million
Extractive S. 164 " " "

Weight of Residue Sol. in Water 14.5 mg
on ignition 7.3 mg
S. det. 7.7 BaSO$_4$

Weight of Nuclein Phosphorus, mg 5.5 Mg$_2$P$_2$O$_7$

CASE NO. VI

AREA Sciatic Nerve.

CONSTITUENTS
in per cent

Water	64.18
Simple Proteid	4.5
Nucleo Proteid	12.5
Neurokeratin	
Extractives	1.76
Inorganic Salts	1.30
Lecithins	2.52
Kephalin and Myelin	2.77
Amido Lecithans	
Phrenosin	2.59
Cerebrin Acids	
Cholesterin	
Sulphur Compound	3.59
TOTAL	

Inorganic S. 256 pts. per million

Weight of Sample 3.3794

Alcohol-Ether insoluble part .5874

Soluble in Water .0109

.5765

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 6.4 $BaSO_4$
   filt. 11.3 "
2. Lec. P.
   mg. 8.7 $Mg_2P_2O_7$
   Kep P
   mg 7.9 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 15.6 mg
4.

Filtrate 100 cc total
2 parts 40 cc each

1. Residue on evap. 34.0 mg
   Inorganic Salts 15.2 mg
   S. det 0.8 $BaSO_4$
2. Inorganic S.
   in cold. 1.3 BaSO
3. ~~Total Extractive~~ S.
   Filt from 2
   by fusion 0.2 $BaSO_4$
4.

Weight of Residue Sol. in Water 10.9 mg
on ignition 5.9 mg
S. det. 3.3 $BaSO_4$
Weight of Nuclein Phosphorus, mg 8.7 $Mg_2P_2O_7$

CASE NO. VI

AREA Corpus Callosum

CONSTITUENTS
in per cent

Water	70.31
Simple Proteid	4.71
Nucleo Proteid	3.75
Neurokeratin	—
Extractives	1.01
Inorganic Salts	0.72
Lecithins	1.13
Kephalin and Myelin	?
Amido Lecithans	
Phrenosin	4.85
Cerebrin Acids	
Cholesterin	
Sulphur Compound	?
TOTAL	

Weight of Sample 9.1712

Alcohol-Ether insoluble part .8032

Soluble in Water .0270

.7762

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total

4 parts 25 cc each

1. Lipoid S.

125 ppt. 27.0 $BaSO_4$ } these two were heated over gas flame

4.5 filt. 38.6 "

2. Lec. P.

mg. 51.0 $Mg_2P_2O_7$

Kep P

mg 1.3 "

3. Cerebrins

100 cc total 90 cc taken

Wt. of CuO. 43.0 mg

4.

Filtrate 400 cc total

4 parts 80 cc each

1. Residue on evap. I 26.2 mg II 27.0

Inorganic Salts 11.4 mg 9.4

P-S. det 1.7 mg P_2O_7 ~~$BaSO_4$~~ S. det 1.9

2. Inorganic S.

in cold. $BaSO_4$

3. Total Extractive S.

by fusion $BaSO_4$

4.

Inorganic S. 199 parts per million

Extractive S 12 " " "

Weight of Residue Sol. in Water 27.0 mg

on ignition 13.6 mg

S. det. 6.5 $BaSO_4$

Weight of Nuclein Phosphorus, mg 7.7 $Mg_2P_2O_7$

CASE NO. VI

AREA Corpus Callosum

CONSTITUENTS
in per cent

Water	70.31
Simple Proteid	5.32
Nucleo Proteid	3.26
Neurokeratin	
Extractives	1.94
Inorganic Salts	1.04
Lecithins	calculating total P as L + K = 10.7 %
"	" " para P
Kephalin and Myelin	g. S. comp out = 9.7/%
Amido Lecithans	
Phrenosin	5.62
Cerebrin Acids	
Cholesterin	
Sulphur Compound	
TOTAL	

Weight of Sample 7.6660

Alcohol-Ether insoluble part .6784

Soluble in Water .0204

.6580

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 40 cc each

1. Lipoid S.
   ppt. ..... $BaSO_4$
   filt. ..... "
2. Lec. P.
   mg. 22.6 $Mg_2P_2O_7$
   Kep P
   mg 23.2 "
3. Cerebrins
   100 cc total ..... 90 cc taken
   Wt. of CuO. 67.2 mg
4.

Filtrate 200 cc total
2 parts 80 cc each

1. Residue on evap. 74.2 mg
   Inorganic Salts 27.2 mg
   S. det 2.5 $BaSO_4$
2. Inorganic S.
   in cold. ..... $BaSO_4$
3. Total Extractive S.
   by fusion ..... $BaSO_4$
4.

Weight of Residue Sol. in Water 20.4 mg
on ignition 12.0 mg
S. det. 4.6 $BaSO_4$

Weight of Nuclein Phosphorus, mg 5.1 $Mg_2P_2O_7$

CASE NO. VI

AREA Corpus Callosum

CONSTITUENTS
in per cent

Water	70.31
Simple Proteid	5.06
Nucleo Proteid	3.30
Neurokeratin	
Extractives	1.34
Inorganic Salts	0.86
Lecithins	
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	6.28
Cerebrin Acids	
Cholesterin	
Sulphur Compound	2.39
TOTAL	

Weight of Sample 10.3318

Alcohol-Ether insoluble part .8964

Soluble in Water .0324

.8640

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total

4 parts 25 cc each

1. Lipoid S.

ppt. ..... $BaSO_4$

filt. 18 mg "

2. Lec. P.

mg. ..... $Mg_2P_2O_7$

Kep P

mg ..... "

3. Cerebrins

100 cc total ..... 90 cc taken

Wt. of CuO. 63.4 mg

4.

Filtrate 400 cc total

4 parts 80 cc each

1. Residue on evap. 39.0 mg

Inorganic Salts 16.4 mg

S. det 8.3 $BaSO_4$

2. Inorganic S.

in cold. ..... $BaSO_4$

3. Total Extractive S.

by fusion ..... $BaSO_4$

4.

Weight of Residue Sol. in Water 32.4 mg

on ignition 7.0 mg

S. det. ..... $BaSO_4$

Weight of Nuclein Phosphorus, mg 7.0 $Mg_2P_2O_7$

CASE NO. VI

AREA Visuo-Sensory

CONSTITUENTS
in per cent

Water	82.74
Simple Proteid	5.54
Nucleo Proteid	2.65
Neurokeratin	
Extractives	2.17
Inorganic Salts	1.32
Lecithins	2.75
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	1.36
TOTAL	

Inorganic S. 364 pts per million
Extractive S. 114 " " "

Weight of Sample 7.1786
Alcohol-Ether insoluble part 0.6160
Soluble in Water .0210
.5950

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
4 parts 25 cc each

1. Lipoid S.
   ppt. } BaSO$_4$
   filt. } 7.1 "
2. Lec. P.
   mg. 6.1 $Mg_2P_2O_7$
   Kep P
   mg 2.5 "
3. Cerebrins
   100 cc total ~~[illegible]~~ 90 cc taken
   Wt. of CuO. mg
4.

Filtrate 400 cc total
4 parts 80 cc each

1. Residue on evap. 46.6 mg
   Inorganic Salts 17.0 mg
   S. det 4.0 BaSO$_4$
2. Inorganic S.
   in cold. 2.8 BaSO
3. Total Extractive S.
   by fusion BaSO$_4$
4.

Weight of Residue Sol. in Water 21.0 mg
on ignition 10.0 mg
S. det. 5.0 BaSO$_4$
Weight of Nuclein Phosphorus, mg 3.9 $Mg_2P_2O_7$

CASE NO. IX

AREA Prefrontal, left.

CONSTITUENTS
in per cent

Water	82.2
Simple Proteid	5.79
Nucleo Proteid	3.07
Neurokeratin	
Extractives	1.91
Inorganic Salts	1.30
Lecithins	
Kephalin and Myelin	
Amido Lecithans	
Phrenosin	
Cerebrin Acids	
Cholesterin	
Sulphur Compound	
TOTAL	

Inorganic S. 50 parts per million
Extractive S 6 " " "

Weight of Sample 12.5456
Alcohol-Ether insoluble part 1.1296
Soluble in Water .0156
1.1140

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 2 Last cc total
parts cc each

1. Lipoid S.
   ppt. $BaSO_4$
   filt. "
2. Lec. P.
   mg. $Mg_2P_2O_7$
   Kep P
   mg "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. mg
4.

Filtrate 150 cc total
2 parts 50 cc each

1. Residue on evap. 129.0 mg
   Inorganic Salts 52.4 mg
   S. det 1.7 $BaSO_4$
2. Inorganic S.
   in cold. 1.5 BaSO
3. Total Extractive S.
   by fusion $BaSO_4$
4.

Weight of Residue Sol. in Water 15.6 mg
on ignition 5.2 mg
S. det. 1.1 $BaSO_4$
Weight of Nuclein Phosphorus, mg 6.3 $Mg_2P_2O_7$

CASE NO. IX

AREA Prefrontal, right,

CONSTITUENTS
in per cent

Water	82.2
Simple Proteid	4.19
Nucleo Proteid	3.97
Neurokeratin	
Extractives	1.89
Inorganic Salts	1.22
Lecithins	2.11
Kephalin and Myelin	2.28
Amido Lecithans	
Phrenosin	1.77
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.92
TOTAL	

Inorganic S. 29 pts per million
Extractive S. 75 " " "

Weight of Sample 13.6126

Alcohol-Ether insoluble part 1.1428

Soluble in Water .0266

1.1162

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 150 cc total
3 parts 50 cc each

1. Lipoid S.
   ppt. 6.4 $BaSO_4$
   filt. 6.1 "
2. Lec. P.
   mg. 16.0 $Mg_2P_2O_7$
   Kep P
   mg 16.1 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 28.8 mg
4.

Filtrate 150 cc total
3 parts 40 cc each

1. Residue on evap. 106.4 mg
   Inorganic Salts 41.4 mg
   S. det 2.5 $BaSO_4$
2. Inorganic S.
   in cold. 0.5 BaSO
3. Total Extractive S.
   by fusion 3.0 $BaSO_4$
4.

Weight of Residue Sol. in Water 26.6 mg
on ignition 11.2 mg
S. det. 0.9 $BaSO_4$

Weight of Nuclein Phosphorus, mg 11.1 $Mg_2P_2O_7$

CASE NO. IX

AREA Motor, left.

CONSTITUENTS
in per cent

Water	80.18
Simple Proteid	4.25
Nucleo Proteid	5.03
Neurokeratin	
Extractives	2.27
Inorganic Salts	1.18
Lecithins	1.84
Kephalin and Myelin	1.83
Amido Lecithans	
Phrenosin	1.82
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.42
TOTAL	

Inorganic S. 41 pts per million
Extractive S. 219 " " "

Weight of Sample 15.0036
Alcohol-Ether insoluble part 1.4248
Soluble in Water .0322
1.3926

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 1.9 $BaSO_4$
   filt. 7.3 "
2. Lec. P.
   mg. 21.1 $Mg_2P_2O_7$
   Kep P
   mg 19.5 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 53.4 mg
4.

Filtrate 100 cc total
2 parts 35 cc each

1. Residue on evap. 170.6 mg
   Inorganic Salts 57.8 mg
   S. det 1.3 $BaSO_4$
2. Inorganic S.
   in cold. 0.9 BaSO
3. Total Extractive S. — Inorg. S #2
   by fusion 9.3 $BaSO_4$
4.

Weight of Residue Sol. in Water 32.2 mg
on ignition 12.8 mg
S. det. 1.9 $BaSO_4$
Weight of Nuclein Phosphorus, mg 15.5 $Mg_2P_2O_7$

CASE NO. IX

AREA Motor, right

CONSTITUENTS
in per cent

Water	80.18
Simple Proteid	3.81
Nucleo Proteid	5.21
Neurokeratin	
Extractives	
Inorganic Salts	
Lecithins	2.98
Kephalin and Myelin	2.71
Amido Lecithans	
Phrenosin	1.54
Cerebrin Acids	
Cholesterin	
Sulphur Compound	0.41
TOTAL	

Inorganic S } 160 pts per million
Extractive S }

Weight of Sample 12.8607

Alcohol-Ether insoluble part 1.1754

Soluble in Water .0156

1.1598

ALCOHOL-ETHER, SOLUBLE PORTION

Lipoid ppt. 100 cc total
2 parts 50 cc each

1. Lipoid S.
   ppt. 5.7 $BaSO_4$
   filt. 2.1 "
2. Lec. P.
   mg. 27.2 $Mg_2P_2O_7$
   Kep P
   mg 25.6 "
3. Cerebrins
   100 cc total 90 cc taken
   Wt. of CuO. 3.8 mg
4.

Filtrate 100 cc total
1 parts 70 cc each

1. Residue on evap. mg
   Inorganic Salts mg
   S. det $BaSO_4$
2. Inorganic S.
   in cold. BaSO
3. Total Extractive S.
   by fusion 10.4 $BaSO_4$
4.

Weight of Residue Sol. in Water 15.6 mg
on ignition 7.6 mg
S. det. 0.9 $BaSO_4$

Weight of Nuclein Phosphorus, mg 10.7 $Mg_2P_2O_7$

~~This thesis is never to leave this room.~~

~~Neither is it to be checked out overnight.~~