

Citation:

Pekelharing, C.A., On the proteids of the glandula thymus, in:
KNAW, Proceedings, 3, 1900-1901, Amsterdam, 1901, pp. 383-386

Physiology. — Prof. C. A. PEKELHARING "*On the proteids of the glandula thymus*".

Some time ago I have in this place given an account of certain researches concerning the fibrin ferment, which led me to the conclusion that this enzym should be looked upon as a nucleoproteid, in this sense, that nucleoproteids of different origin, are capable of inducing the formation of fibrin out of fibrinogen, nucleoproteids from the thymusgland and the testis, as well as from the cells that are suspended in the blood

These substances however only become an active fibrin ferment, when they have had the opportunity to form a combination with lime.

On various grounds I supposed that the fibrin ferment should yield lime to the fibrinogen for the formation of fibrin. I can however no longer hold this view, since HAMMARSTEN has proved, that fibrin, when it is prepared in the highest possible degree of purity, contains so little lime, that this substance cannot be considered to be a lime-combination. Moreover I have convinced myself of the accuracy of HAMMARSTEN's criticism by my own experiments. It cannot be said that fibrin is a lime combination and originates by the fact of lime passing from the ferment into the fibrinogen.

Meanwhile this does not alter my opinion about the nature of the ferment. This opinion is yet further confirmed by a research by Mr. HUISKAMP about the proteids of the glandula thymus, of which the full description will soon appear.

It is well-known, that out of thymus, by extraction with water, two nucleoproteids can be obtained of which one has been specially studied by LILIENFELD, who has given to it the name of nucleohiston.

Mr. HUISKAMP now found that the nucleohiston as well as the other nucleoproteid can form compounds with calcium, of which the solubility in water depends upon the greater or smaller quantity of salts of alkali or alkalic-earths, which it contains. Nucleohiston is quite insoluble, the other nucleoproteid incompletely soluble in water, which contains 0.1 to 0.5 pCt. chloride of calcium, but by increasing the amount of lime-salt of the fluid, or by adding other neutral salts, both proteids dissolve easily.

The substances that are precipitated from an extract of the thymus by the addition of the necessary quantity of chloride of calcium are to be considered as salts of calcium, in which the nucleoproteid

plays the part of an acid. They can be decomposed by acetic acid; then the proteid is left behind as a substance insoluble in water.

By treatment of these compounds of proteid and lime with oxalate of kalium, oxalate of calcium and the kalium-compound of the nucleoproteid is formed. The latter is like the natrium- and ammonium-compound easily soluble in water. The magnesium and the baryum compound however are just as the calcium-compound hardly soluble in pure water, but they *do* dissolve in water, to which a very small quantity of ammonia is added. The alkali- as well as the alcalic earths compounds of the nucleohiston are precipitated from the neutral or extremely weak alkalic solution by the addition of so much salt, that the fluid e. g. for Na Cl contains 0.9 pCt., for K Cl 1.13 pCt., for Ca Cl₂ and for Ca Cl₂ 0.1 pCt., for Mg SO₄ 0.2 pCt. The other nucleoproteid can be precipitated, always incompletely however, by the salts of alkalic earths, namely by the addition of salts so that the concentration is the same as for the precipitation of the nucleohiston; by alkalisalts it is not precipitated.

Mr. HUISKAMP succeeded in preparing both proteids each separately, with great purity. The results of the elementary analysis of the different preparations, which very well agreed, proved this.

The composition of the lime-compounds appeared to be thus:

	C.	H.	N.	P.	S.	Ca.
Ca-nucleohiston	45.3	6.5	17.1	3.75	0.51	1.34
Ca-nucleoproteid	49.8	7.3	15.9	0.95	1.19	1.34

Either lime-compound now can act as a fibrin ferment. The investigation on this point brought to light that this ferment action is influenced by the amount of lime salt of the fluid, in which the fibrinogen and the ferment are dissolved and in such a way, that the action is most powerful, when the solution contains 0.1 à 0.5 pCt. Ca Cl₂, namely with such a concentration, by which either nucleoproteid is least soluble in fluids, which contain hardly any other salt. When the precipitate, obtained by adding to a pure solution of one of the nucleoproteids, which contains little salt, so much Ca Cl₂, that the fluid contains 0.1 pCt. of this salt, is mixed with a solution of fibrinogen in chloride of natrium, it is dissolved readily. This solution coagulates in the quickest and most complete way, whenever so much chloride of calcium is added to it, that the amount of that substance is again brought to 0.1 pCt.

When the amount of Ca Cl₂ reaches 0.5 pCt., the coagulation is

already incomplete, when it comes near to 1 pCt., the coagulation does not take place.

A few years ago HORNE¹⁾ has found, that the coagulation of blood can be interfered with or quite prevented, by mixing it with a solution of calcium-, strontium- or baryumchloride, in such a way, that the mixture contains 0.5 pCt. of the added salt.

Mr. HUISKAMP, before he was acquainted with HORNE's result, had come to the same conclusion, at least with regard to chloride of calcium and baryum. He has investigated, whether also the nucleoproteid of the bloodserum, the fibrin ferment *sensu strictiori*, just as the nucleoproteids of the thymus, depends in its action on fibrinogen upon the amount of lime-salt contained in the fluid and he has received an affirmative answer to that question.

The substance was prepared in the way, before described by me, by treatment of the diluted bloodserum with acetic acid and, dissolved in water, with the aid of very little ammonia. Now it appeared, that out of this solution this nucleoproteid could also be precipitated by chloride of calcium and here also in the most satisfactory way, when the amount was brought to 0.1 pCt.

Now 900 cc. oxblood fresh from the animal were mixed with 100 cc. 10 pCt. CaCl_2 . The blood, which now contained 1 pCt. CaCl_2 (apart from the salts already present in it) did not coagulate and was centrifugated. The plasma showed a slight beginning of coagulation, when it was diluted with $\frac{2}{3}$ of its volume of water, but coagulated completely in a quarter of an hour's time, when it was diluted with 3 parts of water, by which the amount of CaCl_2 was reduced to 0.25 pCt., a concentration, which causes the lime-compound of the nucleoproteid to be insoluble, at least when no other salts are present in a quantity worth mentioning.

Some time ago I have communicated in this meeting, that magnesium-sulphate can prevent the coagulation of the blood by interfering with the combination of nucleoproteids with lime. Mr. HUISKAMP now found that chloride of baryum acts in the same way but yet more strongly. When blood is added to a solution of BaCl_2 , the baryum combines with the nucleoproteid; in consequence of this the coagulation is prevented and the plasma, separated by means of the centrifuge, does not coagulate spontaneously, not even after being diluted with water, but it does so, when not only the amount of BaCl_2 is reduced by diluting with water but also the amount of lime is increased by the addition of CaCl_2 . This plasma again

¹⁾ Journal of Physiol., Vol. XIX, p. 356.

coagulates in the quickest and most complete way, when after dilution with water, the amount of CaCl_2 is brought from 0.1 to 0.5 pCt. When yet more lime-salt is added, so that by this alone without the aid of other salts; the nucleoproteid-lime-combination might be dissolved, then the coagulation does not take place at all.

The arguments which I have on a former occasion brought forward in order to defend the view, that the nucleoproteids themselves and no admixtures, act, with the aid of lime, as a fibrin ferment, have been confirmed, I think, by the investigation of Mr. HUISKAMP. Chloride of calcium influences the action of ferment, at those very degrees of concentration, which render it capable of altering the state of the nucleoproteids.

The supposition, that that influence should be in relation with perfectly unknown admixtures, which should occur in the now very purely prepared nucleoproteids of the thymus, is, I think, not confirmed by a single observation.

The supposition, suggested by SCHÄFER¹⁾, in connexion with HORNE'S results, that the interference with the coagulation by calcium-, strontium- and baryumsalts is founded on the capability of salts of dissolving fibrin, is disproved by the observations of numerous investigators, also by those of Mr. HUISKAMP, from which it is evident, that a corresponding quantity of chloride of sodium does not bring about any delay or incompleteness of the coagulation.

Botanics. — "*Contributions to the knowledge of some undescribed or imperfectly known Fungi*" (4th Part and end)²⁾. By Prof. C. A. J. A. OUDEMANS.

† † MELANCONIEAE.

α. Hyalosporae.

GLOEOSPORIUM Desmazières et Montagne.

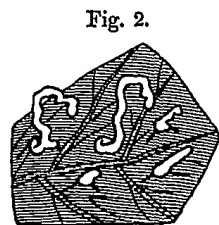


Fig. 2.
Gl. Aucubae Oud.
Upper face.

85. GLOEOSPORIUM AUCUBAE Oud. n. sp. — On the leaves of *Aucuba japonica*. — Bussum, July 1900. — Mr. C. J. KONING.

Epigenum. In foliis necatis nigrefactis globuli vel cirrhi subtilissimi, dilute straminei, conspicui fiunt, qui, officia epidermidis minima obturantes et e cavernulis infra-epidermoidalibus, 500 μ latis,

¹⁾ Textbook of Physiol., I, p. 170.

²⁾ For 3rd Part see these Proceedings p. 332.