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HISTOCHEMICAL EXAMINATION OF THE COLLOIDS OF THE HYPOTHALAMUS-HYPOPHYSIS SYSTEM*

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Colloid or colloid-like substance in the hypothalamus-hypophysis system can be observed in five places, i. e. between the cell groups of the adenohypophysis and in the lumen of their acinar structures ; in the cavities of the pars intermedia (in certain kinds of animals in which they are developed, also in the cysts ; and in rodents in the so-called residual lumen) ; in the neurohypophysis ; in the infundibulum ; and in the anterior part of the hypothalamus. In the last three regions it can be found mainly between the fibres of the supraoptico-hypophyseal tract, but it may be noted also between the ganglion cells of the supraoptic and paraventricular nuclei or along the fibres of the tract connecting the two nuclei.

The pituitary colloid had already been observed by *Virchow* (1, 1857), but its origin and physiological role are still contested. There were authors who attributed it to eosinophile [2] or basophile cells [3], while others [4] were of the opinion that the colloid substance may originate from both kinds of chromophile cells. To decide whether the colloid in the pituitary is of only one or of different kinds was first attempted by *Kraus* [5] who differentiated with the aid of his staining method fuchsinophile, fuchsinophobe and tannin-resistant colloids. In his opinion the first two are degeneration products, while the last one a secretion produced by active cell function. According to *Collin* [6], and *Roussy* and *Mosinger* [7], the cells of the adenohypophysis release their product not only into the blood stream but directly into the neurohypophysis and thereby also into the mid-brain. This phenomenon is morphologically demonstrable in the form of colloid droplets (neurocrinie colloidale). The migration of colloid can be experimentally enhanced by extirpation of the upper cervical ganglion *(Roussy* and *Mosinger*, 8, *Popják*, 9) or by administration of picrotoxin *(Bachrach, Kovács* and *Varró*, 10). *Farkas* [11] has observed in humans that the cytoplasm of the cells of the anterior lobe, especially of the basophile ones, swells, disintegrates and, in the form of granules, enters the cavity of the acini and into the intercellular spaces, and is carried into the lumen of the capillaries.

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He has further noted that the basophile and chromophobe cells migrate into the neurohypophysis and infundibulum where their cytoplasm dissociates into granules, the nuclei becoming nude. *Selye* [12] administered a hypertonic salt solution into the jugular vein of white rats ; 6 hours after sacrificing the animals he observed in the adenohypophysis of the animals an increase of the holocrine secretion of the basophile cells, with extreme dilatation of the residual lumen which contained an accumulated serous or colloid-like substance. When a hypertonic NaCl solution mixed with trypan blue was administered, the dye appeared in the residual lumen within 6 hours. On the basis of these experimental data *Selye* is of the opinion that the colloid in both the anterior lobe and the residual lumen is the holocrine product of the basophile cells.

Scharrer's and *Gaupp*'s [13] examinations published in 1933 offered a different explanation for the origin of the colloid. These authors found in the hypothalamus secreting ganglion cells which, in their opinion, are able to produce colloid substance. Recently *Bargmann* [14], using *Gömöri*'s [15] alum-haematoxylin method, has succeeded in differentiating secretory products along the ganglion cells of the supraoptic and paraventricular nuclei and the fibres of the supraoptic pituitary tract. *Hild* [16] found on hypophysectomized frogs that the infundibular lobe of the animals killed 9 to 11 days after the operation was filled with a Gömöri positive colloid substance. After dissection of the stalk, a similar substance could be found in the central stump. *Drager* [50] placed fibrin foam in the sella turcica of hypophysectomized snakes. After sacrificing the animals he was able to demonstrate colloid-droplets in the fibrin foam.

The physiological role of the colloid is equally problematic. Some authors consider the substance a degeneration product while others regard it as a secretion containing active materials. *Bargmann* et al. [17] hold the Gömöri positive colloid to be the morphollogically tangible carrier-substance of the posterior lobe hormones. In their opinion these hormones are produced by the nuclei of the large cells of the anterior region of the hypothalamus, from where they are conveyed through the fibres of the supraoptic-pituitary tract into the neurohypophysis where on neural stimuli the pituicytes excrete them into the blood stream. It is equally imaginable that the product of the cells of the anterior lobe secreted into the capillaries is the carrier-substance of some hormone or hormones of the anterior pituitary. *Nowakowski* [18] and *Chirst* [19] believe that the colloid droplets of the supraoptic-pituitary tract are physiological degeneration products of nerve fibres as they have succeeded in demonstrating axonic fragments in them. Accordingly, these authors do not ascribe a function to the colloid.

On the basis of the literary data it may be stated that the origin and function of the colloid substance of the hypothalamo-pituitary system form a long disputed but so far undecided question. One of the reasons for this is, in

our opinion, that the nature and the chemical composition of the colloids present in the system are still little known. This is why in the present investigations we have endeavoured to approach the problem of the origin and possible function of the colloid of the midbrain-pituitary with histochemical methods. The recognition of the chemical composition might, by allowing to differentiate between the colloids of different parts, or by revealing the histochemical properties of the glandular cells and of the hypothalamic ganglion, throw some light upon the problems of origin and function.

Methods

The investigations were carried out on the hypothalamus and hypophysis of dogs, rats and humans. 24 dogs of different sex and kind, kept on a mixed diet, ranging in weight from 5 kgm. to 10 kgm., treated with 0,5 mg. of picrotoxin per kgm. of body weight or untreated, were sacrificed by intravenous administration of air. The hypothalamus and the pituitary gland were removed together and after treatment with different fixatives embedded in paraffine. Frozen sections were also made from several coherent parts of the midbrain and the pituitary gland. 20 untreated white rats, ranging in weight from 120 gm. to 150 gm. kept on a mixed diet, were killed by injuring the medulla oblongata. The hypothalamus and pituitary gland were separately removed, put into different fixatives and subsequently embedded in paraffine. Similarly were treated the hypothalamus and pituitary gland of 15 humans of different age and sex, who had died of different diseases. The specimens were removed soon after death. For fixation the following solutions were used. 10 per cent and 12 per cent formaldehyde ; 90 per cent, 96 per cent, and absolute ethanole ; Susa's and Carnoy's solutions ; 4 per cent basic lead acetate ; and anhydrous acetone. The hypothalamus and pituitary glands were examined in serial cuts 4 to 6 μ thick The thickness of frozen sections ranged from 10 μ to 30 μ. The hypothalamus was examined in frontal and sagittal sections, while the pituitary in horizontal ones.

(i) *Gömöri's alum-haematoxylin staining.* This method had been introduced by *Gömöri* [15] in 1939 for differentiating the beta cells of Langerhans' islands. *Bargmann* [14] found in 1950 that certain ganglia and colloid substances of the midbrain-pituitary system may be stained with this method. According to *Noetzel* [20]), the intima of the vessels is also stained. The chemical composition of the substance stained is not yet known ; positivity can be estimated only after staining following oxidation. *Bargmann*'s [14] method was used ; the material was fixed in Susa's solution and embedded in paraffine, then the deparaffinated sections were incubated in Bouin's chrome alum solution at 37° C for 24 hours and, after oxidation with $KMnO_4$ in acid medium, Gömöri's alum-haematoxylin stain was applied for 10 minutes. After differentiation in hydrochloric acid alcohol the sections were counterstained with a 0,1 per cent solution of azocarmine.

(ii) *Periodic acid-Schiff's method* (*Mc. Manus* 21 and *Hotchkiss* 22). Its essence is that chemical substances liable to oxidation into aldehyde with periodic acid, yield a red colour when treated with leucofuchsin. The hypothalamus and pituitaries were fixed in Susa's solution or in 10 per cent formaldehyde and embedded in paraffine. The serial cuts made were oxidized with 1 per cent periodic acid for 20 minutes and then placed in Schiff's reagent for 15 to 20 minutes. The nuclei were stained with Mayer's haematoxyline. For counterstaining, if necessary, phosphotungstic acid-orange G, or a 0,1 per cent aqueous solution of Lightgreen was used. As a control, sections with no previous oxidation with periodic acid were treated with Schiff's reagent in the usual way. A positive reaction is given by polysaccharides (glycogen), acid mucopolysaccharides, glyco- and mucoproteins (e. g. gonadotropic hormones containing hexoseamine),

certain substances of lipoid nature (e. g. lecithine, kerasine, cephalin, phrenosine etc.) and also by numerous other materials [23]. In order to determine by what chemical substances the periodic acid-leucofuchsin positivity was produced, the following histochemical methods were employed.

(a) *Saliva-amylase test.* Although glycogen is dissolved in aqueous fixatives, for the sake of its certain exclusion the sections were exposed to digestion with saliva for one hour before oxidation with periodic acid. Apart from this, Best's ammoniac carmine reaction too was carried out.

(b) *Demonstration of metachromasia.* To demonstrate acid mucopolysaccharides, metachromatic staining with toluidine blue was employed. Sulphuric acid esters of a large molecule start polymerization of the thiazine dye (e. g. toluidine blue) bound to them and the light absorbing capacity of the complex thus produced will differ from its surroundings (*Michaelis* and *Granick* [24]). The toluidine blue possesses three kinds of absorption picture ; the monomer alpha is blue, the dimer beta violet, while the polymer gamma is red. The gamma metachromasia, which is alcohol resistant, can be attributed mainly to the presence of sulphate esters (*Pearse* [23]). In our examinations *Sylven's* [25, 26] method was used. After fixation in 4 per cent aquaeous, alkaline lead acetate, complementary fixation in 10 per cent formaldehyde, and embedding in paraffine, the deparaffinated sections were stained for 10 minutes with 0,2 per cent toluidine blue dissolved in 20 per cent ethanol.

(iii) *Reactions used for demonstrating nucleoprotein.* Two kinds of nucleoprotein can be differentiated, ribo (pentose) nucleoprotein demonstrable in the cytoplasm and nucleolus, and the desoxy (thymo) ribonucleoprotein characteristic of the nucleus. The former shows basophilia and metachromasia [23]. The basophilia is, however, lost after hydrolysis with ribonuclease [27, 28, 29], or with warm n HCl. For fixation, Carnoy's solution was used ; the deparaffinated sections were stained with methylgreen-pyronine for 1 hour and, after washing, differentiated in alcohol. To prove that the basophilia observed was due to ribonucleic acid and not to some other compound, not *Brachet's* original method was used but hydrolysis with n HCl at 37° C for 3 hours, which procedure suspends basophilia produced by ribonucleic acid. Desoxyribonucleic acid was demonstrated with *Feulgen's* reaction [31], the essence of which is that the acid depolymerized with n HCl hydrolysis gives a red colour with Schiff's reagent [32, 33, 34].

(iv) *Differentiation of lipoid or lipoid complexes.* a) Staining with Sudan III. b) When the presence of *Pas* positive lipoid substances was suspected, extraction with boiling in a mixture of chloroform and methanol for 8 to 16 hours was performed, according to the recommendation of *Pearse* [23]. Freshly removed and unfixed specimens were treated in this way and subsequently embedded in paraffine. (It is important that the material should not be exposed to previous fixation as by that procedure the lipoid substances are made to form insoluble complex compounds.) Other fat solvents (chloroform, concentrated alcohol, acetone) were also employed. c) *Lorrain—Smith—Dietrich's* [35] lipoid method was employed in frozen sections according to the original prescription.

(v) *Other methods.* Kraus' colloid staining method ; mucin staining with vesuvine (Bismarck brown) ; argentophilia with Gömöri's method ; staining with Mallory's triple dye ; haematoxylin-eosine ; and van Gieson's stain.

Results

Gömöri's alum haematoxylin stain. With this method the colloid substance found in the neurohypophysis, infundibulum and in the anterior hypothalamus is coloured bluish-black, while the colloids of the adenohypophysis and middle lobe do not stain. Of the anterior nuclei of the hypothalamus only the cytoplasm

of the ganglion cells of the supraoptic and paraventricular nuclei gives a positive reaction. It is worth noting that not every ganglion cell takes on colour and the reaction in the positive ganglion cells is of different intensity. Difference can be observed also according to species, e. g the nuclei in the dog are more intensely stained than in humans or rats. With this method some of the fibres of the subraopticohypophyseal tract and part of the fibres connecting the ganglion cells of the paraventricular nucleus with the supraoptic one can also be demonstrated. Fibres giving a positive reaction often appear like strings of pearls (Perlschnurfaser, *Bargmann* 17). The intima of the vessels is also stained and so are the basophile cells of the adenohypophysis if *Gömöri*'s [15] original method is used. However, while the positive reaction of the basophile cells is brought about also without previous oxidation, staining of the colloid of the neural parts is strictly dependent on the oxidation. It is noteworthy that *Sávay* and *Csillik* [36] could demonstrate a positive reaction bound equally to oxidation in the cytoplasm of some of the spinal ganglion cells of rats.

PAS reaction. The colloid substance observable in all parts of the hypothalamus-hypophysis system yielded a positive result with McManus' and Hotchkiss' periodic leucofuschsin method. The positivity of the colloids of the neurophypophysis, infundibulum and of the anterior hypothalamus is, however, less intensive. The reason for the latter phenomenon may consist in the fact that the colloid substance of these sites possesses fewer groups oxidizable to aldehyde than the colloid of the anterior or middle lobes. The method is most suited for demonstrating both the intact and dissociating cytoplasm of the basophile cells migrated into the posterior lobe. After counterstaining with orange G it can be noted that the positivity in the anterior lobe is restricted to the cytoplasm of the basophile cells. The same can be observed after staining with Mallory's triple dye, i. e. that it is always the anilinophile cells which react positively to the PAS reaction. In the cytoplasm of eosinophile cells no granulation reacting positively to periodic acid leucofuchsin could be observed in any of the cases. The chromophobe cells also remain negative. The difference can be well studied on rats. In the anterior lobe of the human pituitary gland it can be established that the colloid substance occurring in the lumina always reacts positively, regardless of the fact whether the acini are formed by eosinophile or basophile cells. Similarly as with Gömöri's alum-haematoxylin stain, the intima of the vessels gives a positive PAS reaction, just as the cytoplasm of the ganglion cells of the supraoptic and paraventricular nuclei. Not every ganglion cell gives a positive reaction with the PAS method and differences in intensity can also be observed. The positivity of the cytoplasm of the ganglion cells is, however, of a mild degree, in comparison with the basophile cells of the adenohypophysis. Similarly, the fibres of the above mentioned tracts are only faintly shown by the PAS reaction.

Differentiation of colloids giving a positive PAS reaction. To determine whether in the colloids found at different sites it is the same subtance or several subtances differing from each other to which the positivity is due, the following methods have been employed. Presence of glycogen has been excluded by the *saliva-amylase* test. After an hour's digestion with saliva all the glycogen was broken down and rendered undemonstrable, while the positivity of the colloid substances persisted. By the aid of Best's ammoniac carmine reaction it became. however, evident that there is some glycogen in the colloid of the dog's middle lobe. For demonstrating mucopolysaccharides, *metachromatic* staining with 0.2 per cent toluidine blue was used. On applying this, the colloid substance of the middle lobe showed an intensive dark red colouring, which proved to be alcohol resistant. In contrast to this so-called gamma metachromasia the colloid in the anterior lobe did not stain in a convincing manner ; sometimes a violet colour appeared totally to disappear after a few seconds of alcoholic differentiation. The Nissl's granules of the ganglion cells showed a lesser degree of metachromasia which was hardly estimable. With the mucus-staining *vesuvine* (Bismarck brown) only the colloid of the middle lobe could be demonstrated but positive granules were revealed also in the cytoplasm of the cells of the dog's middle lobe.

Further differentiation was rendered possible by demonstrating tissue *basophilia* with methylgreen-pyronine. The colloid of both the anterior and middle lobes showed affinity to pyronine while that of the hypothalamo-neurohypophyseal parts did not stain with that dye. The Nissl's granules of the ganglion cells of the midbrain were also stained by pyronine. The basophilia, however, could not be demonstrated after hydrolysis with n HCl which means that the Nissl's granules contain ribonucleic acid. This observation is in accordance with *Roskin*'s [37] results. Differentiation of the positively reacting substances was made on the basis that after hydrolysis with n HCl at 37°C for 3 hours the colloid of the adenohypophysis, similarly to the basophile granules in the cytoplasm of basophile cells, lost its basophilia while the colloid of the middle lobe could be stained even afterwards. Consequently it is the ribonucleoprotein which is responsible for the basophilia of the colloid substance of the adenohypophysis, wihle the basophilia of the colloid in the middle lobe, considering also its metachromatic staining of the gamma type, may be ascribed to acid mucopolysaccharides containing sulphates in ester binding. As a positive result could nowhere be obtained with *Feulgens's reaction*, it may be stated that in no part of the midbrain-pituitary system does the colloid contain nucleoprotein containing desoxyribose characteristic of nuclei. It could be ascertained by further examinations that the Gömöri positive and periodic acid-Schiff positive colloid which does not show either basophilia or metachromasia and is to be found in the neurohypophysis, infundibulum and hypothalamus, cannot be demonstrated either with Gömöri's method or by

means of the PAS reaction, or even by staining with haematoxylin-eosine, if it has been exposed to boiling in a mixture of chloroform and methanol for four hours. The same has been observed also after treatment with cold chloroform, ether, acetone, and concentrated alcohol. The colloid of none of the parts could be stained with Sudan III, while in the cavities of the intermediate part of the human pituitary gland phagocytes overfilled with sudanophile substance were frequently observed. Colloid droplets reacting positively to Lorrain-Smith-Dietrich's lipoid method were observed in human neurohypophysis.

Other methods. With Kraus' colloid method, the colloid substance of the neural parts always proved fuchsinophile, displaying in the anterior and middle lobes fuchsinophile, fuchsinophobe and tannic acid resistant (pale reddish-violet) properties. With Mallory's trichrom dye the colloid substance in the midbrain-neurophyophysis was usually stained bluish-red, in the adenohypophysis anilinophile, while in the middle lobe both anilinophile and orangeophile. With Gömöri's silver method no argentophilia was observed in any of the colloids. On staining with haematoxylin-eosine, the neural parts proved to be eosinophile, the middle lobe yielded basophile patches, and the anterior lobe again basophilia. With van Gieson's dye the colloid was everywhere stained orange.

According to our examinations, the tissue reactions obtained with Mallory's and Kraus's method are not very suitable for differentiation of the colloid substances present in different areas. Kraus'method has been severely criticized also by *Abrikossoff* [38]. The colour developed with the methods is often variable and the eventual differences, apart from the intensive fuchsinophilia of the midbrain-neurohypophysis colloid, are of such a low degrce that they do not permit to draw conclusions.

Discussion

On the basis of the above examinations it may be stated that in the hypothalamus-hypophysis system there are three histochemically differentiable kinds of colloid substances present, one in the adenohypophysis, one in the middle lobe and a third variety in the hypothalamo-neurohypophyseal part. The colloid of the anterior lobe consists of carbohydrate bound to protein and ribonucleoprotein ; histochemicaly they possess the same properties as the cytoplasm of the basophile cells. The colloid of the middle lobe is a mucinelike compound containing acid mucopolysaccharides. The colloid of the hypothalamo-neurohypophyseal part may be considered as a glycolipo-protein.

According to our own experience, the »unitarian« theory on the colloid substance occurring in the midbrain-pituitary system seems to be inadequate. The colloid substance found in the neurohypophysis, infundibulum and the

anterior hypothalamus may, owing to its solubility in fat solvents, ist isolated Gömöri positivity and also on account of its other reactions, expressly be differentiated from the products of the anterior and middle lobes. On the other hand, the identical chemical nature of the Gömöri positive substance in the neural parts speaks in favour of an identical origin. The results of our examinations made with the aid of fat solvents agree with those of *Hild* [16], who extracted the Gömöri positive substance with acetone and subsequently obtained a positive reaction on staining the extract according to Gömöri's method. *Schiebler* [39] could extract a Gömöri positive substance from the neurohypophysis of cattle by centrifuging at different speeds and separated it from the other chemical substances of the neurohypophysis ; he also found that the Gömöri positive substance displayed a positive succinodehydrogenase activity. On the basis of our own examinations and the above mentioned literary data, the »neural origin« of the Gömöri positive colloid substance of the midbrain-neurohypophysis can hardly be disputed, consequently it does not originate from either the anterior or the middle lobe. This statement is supported by several authors [40] who had observed a colloid substance in the neurohypophysis of the whale in spite of the fact that in these animals the anterior and middle lobes are separated from the neural lobe by a thick sheath. As to its more precise origin, it is more likely that the Gömöri positive substance is the product of the supraoptic and paraventricular nuclei owing to the fact that of all the sites containing the Gömöri positive colloid substance only these nuclear groups show the morphological signs, such as plasma swelling and disintegration, of a secretory function.

As to the biological role of the Gömöri positive substance, the »hormone-carrier« theory of *Bargmann* et al. has not been supported by *Sávay* and *Csillik*'s above mentioned observation according to which some of the cells of the spinal sympathetic ganglia are also Gömöri positive. As regards this problem, no definite opinion can be formed merely on the basis of histochemical examinations. We endavour, however, to approach the problem by further functional morphological and biological investigations and observations of which some are already in progress.

The colloid substance of the anterior lobe originates in all probability from the cytoplasm of the basophile cells as is shown also by their agreeing histochemical properties. The disintegrated particles of the protoplasm enter into the lumen of the acini or into the interspaces between the cells. This makes it possible to explain our observation that a colloid substance with histochemical properties entirely different from the eosinophile cytoplasm is sometimes present among the eosinophile celles. As to the active substances contained, the PAS positive colloid substance of the anterior lobe may contain hormones of a glycoprotein character such as gonadotropic or thyreotropic hormones. These hormones contain in their molecules a not negligible quantity

of hexose or hexoseamine, so that they can be demonstrated by the PAS reaction. This is supported by the examinations of *Catchpole* [41], and *Kovács*, *Bachrach* and *Horváth* [42], who observed that following castration the PAS positive substance of the anterior lobe is accumulated. *Catchpole* found that the gonadotropic hormone and the PAS positive substance of the adenohypophysis possess identical properties as to solubility. Similarly, *Purves* and *Griesbach* [43] noted an increase of the PAS positive substance in the anterior lobe after thyroidectomy. The colloid substance of the adenohypophysis may enter into the capillaries, the cysts of the middle lobe, or, especially in humans, also into the neurohypophysis from where it may be followed as far as the tuber cinereum. The product invading the neural parts is, however, well differentiable by histochemical methods from the Gömöri positive substance and it occurred in not more than a small percentage of the investigated cases and only in small amounts. The fairly infrequent migration of the basophile cells into the tuber cinereum and their dissociation may account for the observations according to which in the tuber cinereum, beside a considerable quantity of adiuretin [44], vasopressor and oxitocic hormones [45], gonadotropic [46], or thyreotropic hormones [47] may sometimes also be demonstrated, at least in traces. We [48], however, could never demonstrate the presence of gonadotropic hormones in the tuber cinereum of rabbits and dogs, either by means of the frog test or with Aschheim-Zondek's reaction carried out in material extracted with physiological saline. Demonstration of thyreotropic hormone in saline extracts of human midbrain was performed on guinea pigs also with a negative result.

The colloid substance of the middle lobe shows histochemical properties in many respects similar to that of the anterior lobe, except that in the latter material a mucin-like substance is also present. As we have succeeded, similarly to *Rasmussen* [49], in demonstrating a positive granulation in the cytoplasm of the cells of the pars intermedia, it may be supposed that the colloid of the middle lobe originates *partly from the* anterior lobe and in certain kinds of animals partly as a product of the cells of the pars intermedia.

Our histochemical examinations suggest that in the midbrain-pituitary system the migration of several substances into different directions can be observed. The colloid substances produced may enter the vessels and from there the blood stream, the third ventricle and also the cerebrospinal fluid. The so-called neurocrinia, i. e. the direct migration of the secretion of the glandular part into the nervous system cannot be denied but it is by no means as significant as has been supposed by several authors, because the major part of the colloid of the anterior lobe enters to a greater extent into the blood or the middle lobe, and because, on the other hand, in the nervous system itself there is also produced a colloidlike substance that can be differentiated from the former with absolute certainty with the aid of histochemical

methods. The fact that a morphologically demonstrable secretion is produced by the nervous system raises new problems and further functional examinations are needed in order to clear the biological role of the secretion.

Summary

1. The colloid substances of the hypothalamo-pituitary system have been examined by various histochemical methods.

2. In the system three colloid substances can be differentiated, one in the adenohypophysis, one in the middle lobe and a third one in the hypothalamo-neurohypophyseal part. The last one is the so-called Gömöri positive substance.

3. Histochemically the colloid of the adenohypophysis consists of ribonucleoprotein and carbohydrates ; that of the middle lobe is a mucin-like compound containing acid mucosaccharides ; the colloid of the midbrain-neurohypophysis is probably a glyco-lipo-protein.

4. The colloid of the anterior lobe possesses the same histochemical properties as the cytoplasm of the basophile cells, so in all probability it takes its origin from them. The colloid substance of the middle lobe shows the properties of the colloid of the anterior lobe, while, on the other hand in certain kinds of animals it can be considered as the product of the cells of the pars intermedia. The so-called Gömöri positive colloid is produced in the hypothalamus-neurohypophysis system.

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ГИСТОХИМИЧЕСКОЕ ИССЛЕДОВАНИЕ КОЛЛОИДОВ ПОДБУГРОВОЙ—ГИПОФИЗАРНОЙ СИСТЕМЫ

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Резюме

1. Авторы исследовали разными способами коллоидальные вещества подбугровой-гипофизарной системы.

2. В этой системе можно различать 3 коллоидальных вещества : коллоид аденогипофиза ; коллоид средней доли гипофиза и подбугоровой-нейрогипофизарный коллоид (т. н. »*G*-положительное вещество«).

3. Гистохимически, коллоид аденогипофиза состоит из рибонуклеопротеидов и углеводов, коллоид средней доли является муциноподобной смесью, содержащей кислые мукосахариды. Коллоид промежуточного мозга и нейрогипофиза можно считать гликолипопротеидом.

4. Коллоид передней доли обнаруживает гистохимические свойства плазмы базофильных клеток ; поэтому вероятнее всего, что он из этих клеток и происходит. Коллоидальное вещество средней доли отчасти обнаруживает свойства коллоида передней доли, а отчасти у отдельных видов животных, может считаться продуктом клеток средней доли. Так называемый »*G*-положительный коллоид« выделяется в подбугровой-нейрогипофизарной системе.

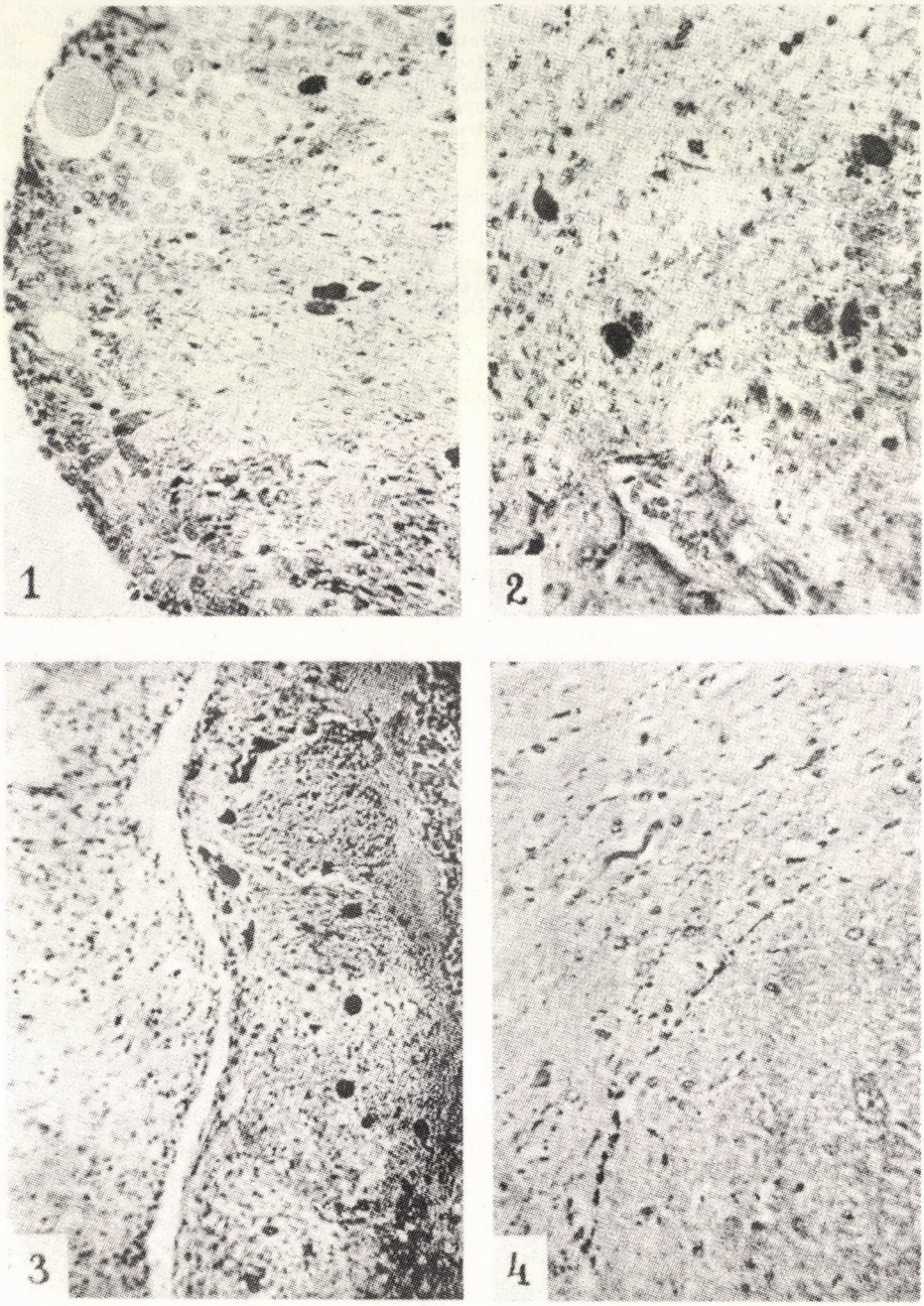


Fig. 1. **Part of the neurohypophysis-pars intermedia. Dog. Gömöri's stain. 320x.**
Fig. 2. Part of the neurohypophysis. Dog. Gömöri's stain. 320x.
Fig. 3. Several Gömöri positive colloid droplets in the dog's infundibulum. Gömöri's stain. 160x.
Fig. 4. Pearl-string-like positivity in the fibres of the dog's supraoptico-hypophyseal tract. («Perlschnurfaser», Bargmann.) Gömöri's stain. 320x.

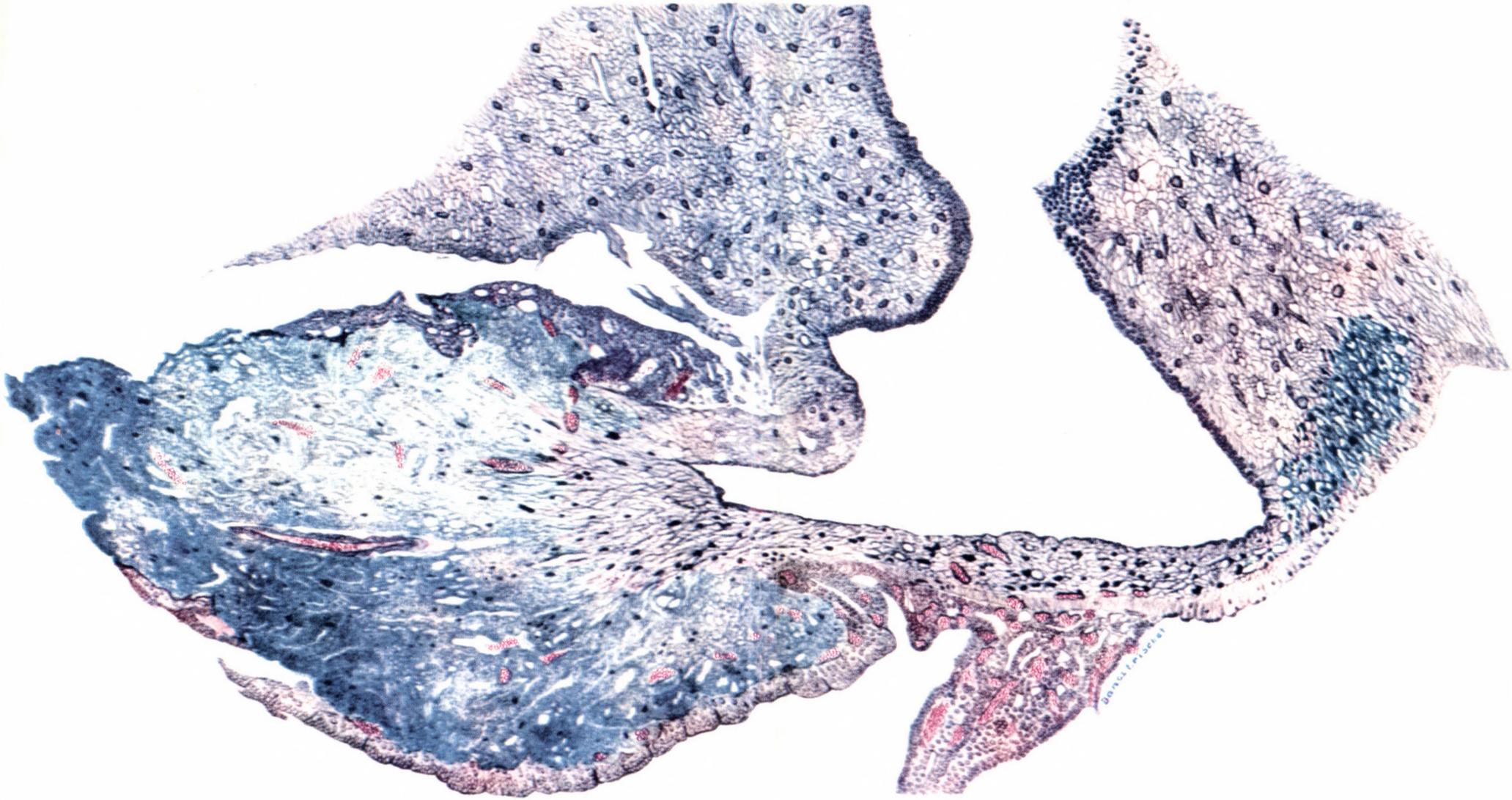


Fig. 10. Gömöri positive colloid droplets in the hypothalamo-hypophyseal system of dog. Drawing made from microscopical picture. Gömöri's stain

Fig. 11. **Colloid droplets of various staining from the pars intermedia of human hypophysis. Drawing made from microscopical picture. Kraus's staining**

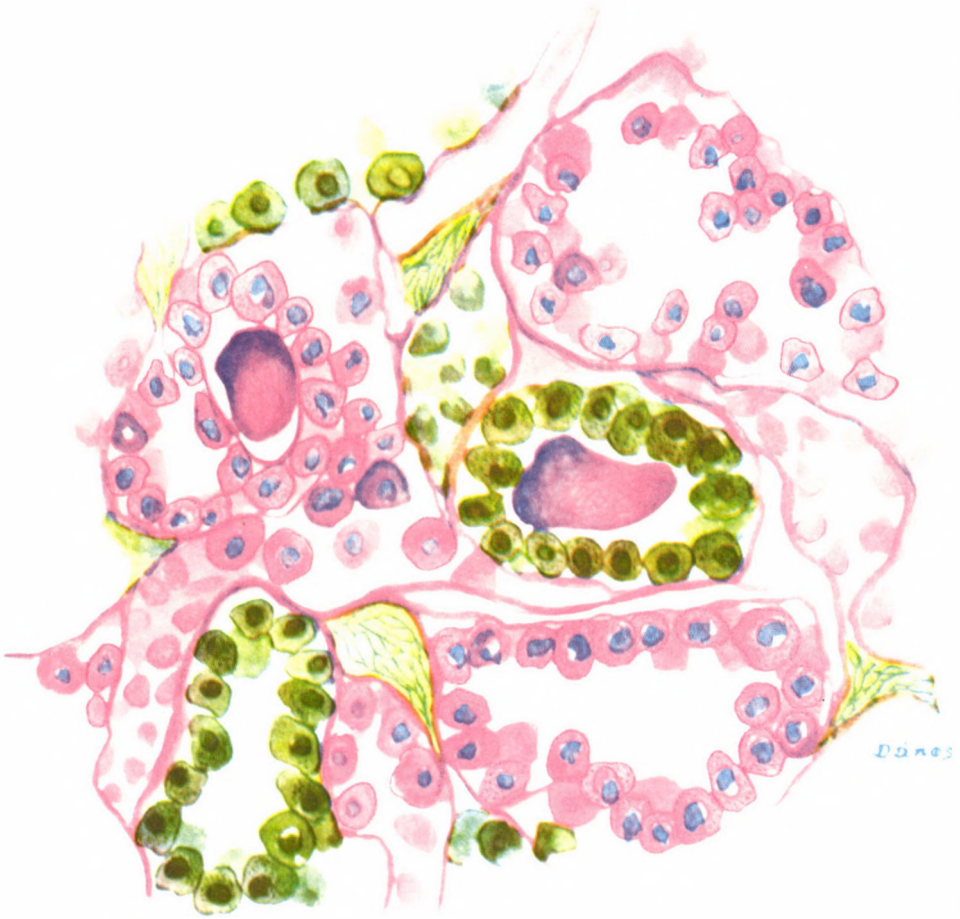
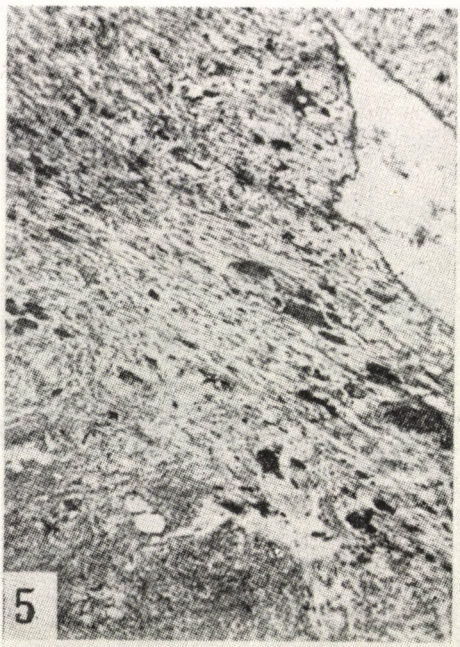
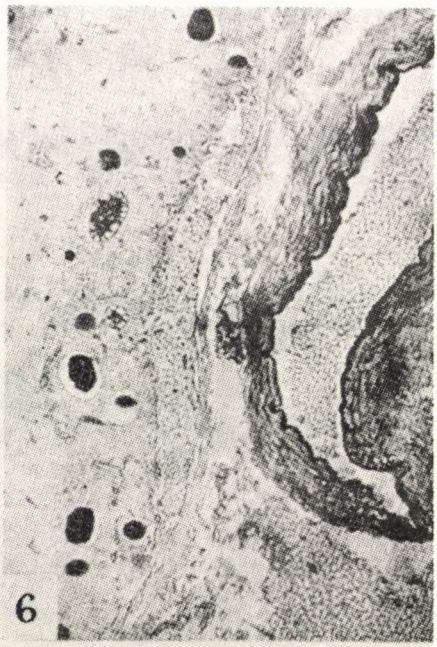
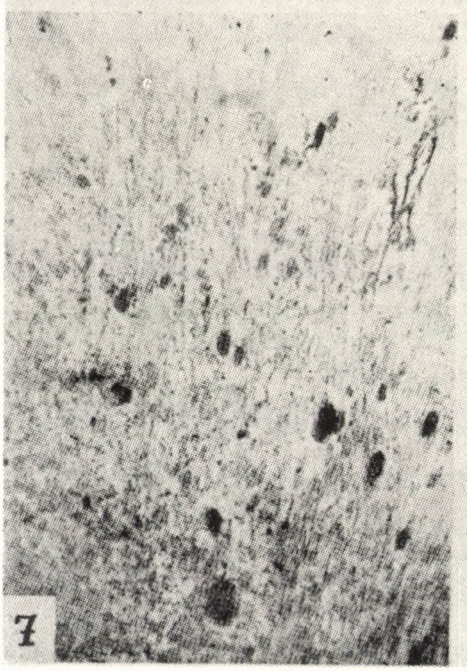


Fig. 12. Periodic acid-Schiff positive colloid from the anterior lobe of human hypophysis. Drawing. PAS reaction-light green. Mayer's haematoxylin







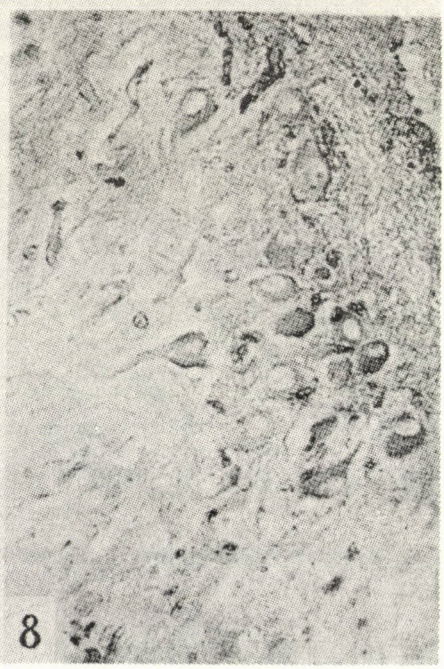


Fig. 5. **Infundibulo-hypophyseal part of the dog. Gömöri's stain. 150x.**
Fig. 6. Periodic acid-Schiff positivity in the pars intermedia of the dog. Pas reaction. 160x.
Fig. 7. Periodic acid-Schiff positive colloid in dog's infundibulum. Pas reaction. 320x.
Fig. 8. Periodic acid-Schiff positive ganglion cells in supraoptic nucleus of dog. PAS reaction. 320x.

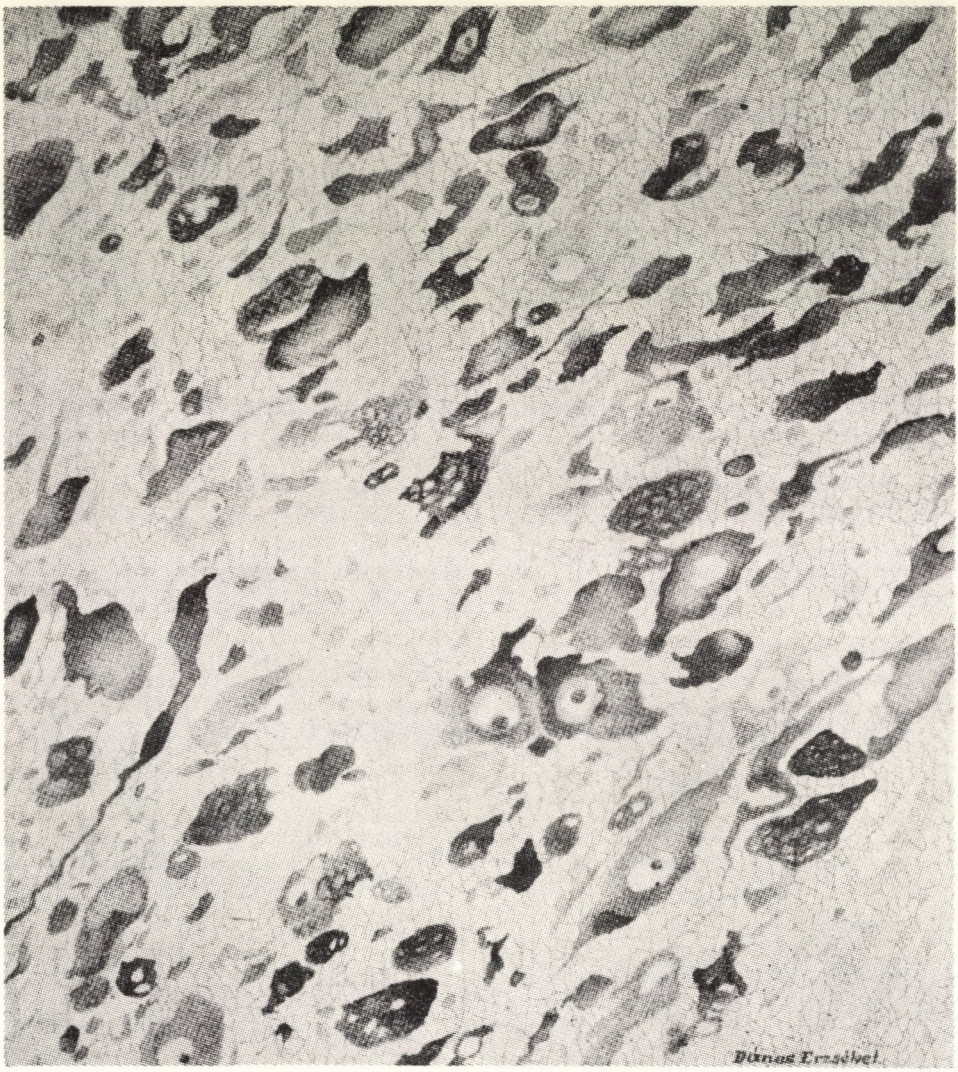


Fig. 9. **Neurosecretory phenomena in the supraoptic nucleus of dog. Drawing made from microscopcal picture. Gömöri's stain.**