дослідження динаміки структурних елементів бронхів визначали величину товщини їх слизової оболонки, м'язового шару, а також підслизового прошарку, волокнисто-м'язово-хрящової та адвентиційної оболонок. *Результати.* Виявлено факт потоншення слизової оболонки бронхів в ранньому періоді розвитку алергічного запального процесу в легенях на 23-тю і 30-ту доби спостереження. Одночасно при цьому в 1-ій та 2-ій експериментальних групах спостерігається потовщення м'язового шару слизової оболонки бронхів відповідно в 1,2 і в 1,4 рази, порівняно з контролем. Найсуттєвіше потовщення м'язової пластинки слизової оболонки бронхів виявляється протягом пізнього періоду розвитку алергічного запального процесу в легенях на 36-ту добу спостереження в 3-ій експериментальній групі, коефіцієнт збільшення був 2,5. *Висновки.* Встановлено, що сенсибілізація та інгаляційна алергізація морських свинок овальбуміном веде до потоншення слизової оболонки бронхів (в 1,7 разів порівняно з контролем) за рахунок масивної деструкції епітеліального покриву в ранньому періоді, з наступним потовщенням слизової оболонки бронхів в пізньому розвитку алергічного запалення дихальних шляхів (в 1,2 рази порівняно з контролем) за рахунок гіпертрофії м'язового шару (коефіцієнт збільшення 2,5 в 3-ій експериментальній групі) і набряку сполучнотканинного компоненту. Зазначені певні зміни носять стадійний характер і є результатом впливу нейроендокринних та імунних факторів розвитку алергічного запалення на епітеліальний, сполучнотканинний та гладком'язовий компоненти стінки бронхів.

Ключові слова: бронх; експериментальне алергічне запалення; овальбумін; морська свинка.

DYNAMICS OF THE STRUCTURAL ELEMENTS OF GUINEA PIGS BRONCHI AFTER OVALBUMIN SENSITIZATION

Popko S. S., Evtushenko V. M.

Abstract. The reaction of structural elements of bronchi is the urgen tissue of morphology and medicine in general, as well as one of the insufficiently studied point in the study of morphological changes in the bronchi with allergic inflammation in the chronobiological aspect. The purpose of the study is to study the dynamics of the structural elements of the bronchial wall of guinea pigs sensitized with ovalbumin. Material and methods. We have studied the lung of 48 guinea pigs, using histological, morphometric and statistical methods under conditions of experimental ovalbumin-induced allergic inflammation, simulated by three times subcutaneous sensitization and subsequent 8-day intranasal inhalation of ovalbumin. To assess the dynamics of the bronchi structural elements, the thickness of their mucosa, muscle layer, submucosa, fibromusculocartilagineous layer and adventitial layer were determined. Results. The fact of thinning of the bronchial mucosa was revealed in the early period of the development of an allergic inflammatory process in the lungs on the 23rd and 30th days of observation. Simultaneously, there is a thickening of the muscle layer respectively by 1.2 and 1.4 times compared with the control in the 1st and 2nd experimental groups. The most significant thickening of the muscle layer is observed in the late period of the development of allergic inflammatory process in the lung on the 36th day of observation in the 3rd experimental group, which increasing coefficient is 2.5. Conclusions. It was found that sensitization and challenge with ovalbumin lead to a thinning of the bronchial mucosa (1.7 times compared to control) due to massive destruction of the epithelial layer in the early period, followed by thickening of the bronchial mucosa in the late development of allergic inflammation of the airways (1.2 times compared with control) due to hypertrophy of the muscle layer (increasing coefficient is 2.5 in the third experimental group) and edema of the connective tissue component. These changes have staged nature and are the result of the effect of neuroendocrine and immune factors in the development of allergic inflammation on the epithelial, connective tissue and smooth muscle components of the bronchial wall.

Key words: bronchus; experimental allergic inflammation; ovalbumin; guinea pig.

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HORMONAL ACTIVITY FEATURES OF INTRAFOLLICULAR COLLOID OF WHITE RAT'S THYROID GLAND IN COMMON DISORDERS OF ITS FUNCTION

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Introduction. Thyroid gland's hormones are characterized by a wide range of effects on the body. This is due to the mechanism features of their action, which is realized at the genomic level, while the points of its application in the cell are its nucleus and mitochondria. Thyroid hormones (THs) are involved in the processes of energy metabolism, tissue growth and differentiation, control of heat production and oxygen absorption by tissues, maintenance of normal respiratory center function, the course of energy processes in adipose tissue. They promote the formation of erythropoietin and increase erythropoiesis, stimulate motility of the gastrointestinal tract, effect the activity of the skeletal musculation striated muscles and myocardium, improve the

adaptation of the cardiovascular system to the stressors of adverse factors.

Due to participation in protein metabolism, THs are required for synthesis of many structural proteins in the body, which determines their effect on the mass of such important internal organs as the adrenal glands and liver, and on the body weight as an integrative index of the body status [1, 2, 3]. Generalization of the above gives the understanding that the thyroid gland (TG) is an organ that plays one of the leading roles in the processes of ensuring vital functions of the body.

Progressive growth of various thyroid pathologies [4, 5] and its maintenance at a high level are due to a number of objective reasons, which include the presence of iodine-deficient biogeochemical habitats [6, 7], poor diet of certain social groups [8, 9], anthropo- and technogenic environment pollution with chemicals having thyroid-disrupting properties [10, 11], and salts of heavy metals [12, 13], damaging effects of physical factors [14]. This afforded ground to L.V. Gerbilsky et al. back in 1994 for raising the issue of environmental disorders of the TG as an important health problem in Ukraine.

In general, the territory of Ukraine is characterized by a mosaic location, and even a combination of areas with iodine deficiency and areas with environmental pollution [15, 16]. That is why the study of thyroid activity should involve a wide arsenal of methods. Thus, implementation of mathematical technologies permitted to study the intimate mechanisms of thyroid hormones synthesis and secretion when consuming iodine of different chemical nature [17, 18, 19]. However, the most common methods to determine the condition of the gland and to study its functional capacity are morphological and biochemical ones. Their combination, which are histochemical methods, permits to comprehensively study morphofunctional cell status and to visually determine localization of certain chemical compounds and substances. The histochemical methods permitted to study a number of the thyroid gland's features in normal and in pathology, in particular, to clarify the histochemistry of nucleic acids, glycogen, ascorbic acid, minerals in thyroiditis of various etiopathogenesis, neoplastic processes, etc.

The study of the TG's hormonal activity using the possibilities of histochemical method A. DesMarais & Q.N. LaHam permits to draw accurate conclusions about the organ's functional status: in special staining of histological specimens hormonally active colloid fraction containing iodinated thyroglobulin is discolored to blue, whereas in its absence colloid is discolored to yellow. In recent years, the method has been used to study the effects of various chemical [20] and physical factors on the TG, including hypergravity [21], electromagnetic [22, 23] and radioisotope [24, 25] radiation. At the same time, despite the urgency of the thyroid pathology problem in the available scientific sources, the use of A. DesMarais & Q.N. LaHam method to study activity of the TG in its common functional disorders is inadequately treated [26].

The aim of the study. The Aim of this work was to study the features of the rat TG intrafollicular colloid's hormonal activity in such common disorders of thyroid activity as hypothyroidism due to iodine deficiency, potentiated iodine deficiency hypothyroidism, hyperthyroidism.

Object and methods of the research. The study was carried out in the spring and summer period under standard vivarium conditions. Given that the nature of nutrition and TG structure of rats are the closest to those in humans, the experimental animals were white nonlinear male rats with initial weight of 140-160 g. Ten rats of the control group (group 1) were kept on a common diet, thirty animals of experimental groups (groups 2 – 4, ten rats in each group) – on a semi-synthetic isocaloric starch-casein diet, deficient in iodine.

Water-soluble vitamins were supplied with a standard vitamin solution made of distilled water, fat-soluble vitamins and α-tocopherol – with unrefined sunflower oil. All nutrients were consumed by rats in the amounts recommended for animals of this species and age. Essential macro- and micronutrients were obtained with a salt mixture of J.H. Jones & C. Foster, from which potassium iodide was extracted; the residual iodine content in this diet did not exceed 1.6-1.8 μg/rat/day. Fiber was consumed by rats with filter paper in the amount of 0.1-0.2 g/rat/day. The food mixture was laid in the feeders once a day in the morning after cleaning the cages, the drinking bowls were filled with distilled water, access to which was free.

Group 1 rats were a universal control for animals of other groups – the state of their TG intrafollicular colloid served as a normal standard. Histochemical features of intrafollicular colloid in group 2 rats consuming a semi-synthetic iodine-deficient isocaloric diet indicated changes in hypothyroidism caused by alimentary iodine deficiency.

In order to aggravate TG disorders inherent in hypothyroidism, rats of group 3 received the thyrostatic drug mercazolyl (ZAT "Farmatsevtychna kompaniya "Zdorov'ya", UA) in a histologically confirmed amount of 3 mg/kg body weight, the state of TG intrafollicular colloid in this group rats served the model of potentiated hypothyroidism. In group 4 rats the state of hyperthyroidism was induced by oral administration of thyreoidinum (OOO "Belgorodvitaminy", RU), which they consumed in a tested dose of 15 mg/100 g body weight. Given the high sensitivity of the TG to stress, mercazolyl and thyreoidinum were consumed by animals of groups 3 and 4 physiologically with the food mixture. The study design is presented in **table 1**.

At the end of the 30-day observation, the rats were decapitated under ether anesthesia, their TGs were carefully separated from the connective tissue and prepared for histological examination according to standard procedures. The TG intrafollicular colloid hormonal activity in rats of each group was studied in histological specimens stained by the method of A. DesMarais & Q.N. LaHam [27]. Each study began with a visual inspection of the specimens to establish the features of the TG's histoarchitectonics. After that, 400 follicles were studied, in which the color and condition of the colloid were determined.

The functional activity of the TG was evidenced by: the percentage of follicles with blue colloid (BCF – blue colored follicles), which contained iodinated thyroglobulin; the percentage of follicles with hormonally inactive yellow colloid (YCF – yellow colored follicles); the percentage of follicles with mixed colloid, consisting of colloid fragments colored in blue and yellow in different ratios (BYCF – blue-yellow colored follicles); the percent-

Table 1 – Study design to clarify histochemical features of the thyroid gland's intrafollicular colloid in nonlinear white male rats under the model conditions of hypothyroidism due to iodine deficiency in the diet, potentiated iodine deficiency hypothyroidism and hyperthyroidism (n = 40)

Group of animals	Nutritional conditions; Background iodine content in the food mixture	Amount of mercazolyl, (mg/kg body weight)	Amount of thyroidinum, (mg/100 g body weight)
1 n = 10	CGVF	not given	not given
2 n = 10	ISCD 1.6-1.8 μg/kg body weight	not given	not given
3 n = 10	ISCD 1.6-1.8 μg/kg body weight	3	not given
4 n = 10	ISCD 1.6-1.8 μg/kg body weight	not given	15

Note. CGVF – complete general vivarium feed; ISCD – isocaloric starch-casein diet.

age of follicles in which no colloid was detected (FWC – follicles without colloid), marked by us as "dumb".

To expand the interpretive capabilities of the method, we proposed to supplement the summary part of the study with new indices: the percentages sum of follicles capable of supplying thyroid hormones – the content of follicles with functionally active colloid (BCF and BYCF), which according to our data is within the limits of 98% in the intact male rats, as well as the ratio between the percentages of BCF and YCF, which in the thyroid glands of intact male rats makes 35:1.

Stained histological specimens were examined under a Biolam (RU) light microscope at magnification of x320, and the morphological picture of the TG was objectified using Olympus OM-D, 5 Mpx digital camera.

The data obtained in each group were summarized and presented as the arithmetic mean and its error [28], and then the percentage (M±m) of follicles with different contents was determined; digital parameters were processed using the licensed StatSoft Statistica v 6.0 software; the data reliability was assessed by Student's *t*-test at the level of statistical significance p≤0.05. At all stages of the study, the requirements of "European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes" were met (Strasbourg, 1986; Kyiv, 2013).

Table 2 – Hormonal activity of thyroid glands' intrafollicular colloid in nonlinear white male rats under model conditions of hypothyroidism caused by iodine deficiency in the diet, potentiated iodine deficiency hypothyroidism, hyperthyroidism (n = 40)

Group of animals	Intrafollicular colloid color of thyrocytes			
	blue, %	yellow, %	mixed, %	without colloid, %
1 n=10	69.75 ± 4.67	1.50 ± 0.30	28.75 ± 1.02	not found
2 n=10	14.60 ± 1.43 p < 0.01 (1)	9.60 ± 0.91 p < 0.01 (1)	75.60 ± 2.86 p < 0.01 (1)	not found
3 n=10	2.22 ± 0.68 p < 0.01 (1) p < 0.01 (2)	3.50 ± 0.35 p < 0.01 (1) p < 0.01 (2)	15.75 ± 1.68 p < 0.01 (1) p < 0.01 (2)	78.75 ± 3.03
4 n=10	85.33 ± 3.3 p < 0.01 (1)	1.33 ± 0. 54	not found	13.33 ± 3.3

Note. Numbers in parentheses indicate the number of the group which was compared to; indices were not included in the table at p>0.05.

Results and discussion. Visual examination of rat TG histological specimens in all studied groups showed the organ-specificity of their histoarchitectonics. The results studying the histochemical features of the TG intrafollicular colloid are presented in **table 2**.

Histochemical features of the TG intrafollicular colloid of intact rats are presented in **fig. 1**.

Histochemical characteristics of the TG intrafollicular colloid in rats of group 2 are presented in **fig. 2**

Analysis of digital parameters in **table 2** showed that under the conditions of iodine deficiency in the diet, the TG functional activity in rats of the discussed group underwent pronounced changes. This consisted in a rapid decrease in the BCF percentage and a significant increase in the YCF content (compared to the parameters of intact animals in group 1; p<0.01); the ratio of BCF to YCF was 1.5:1 compared to 35:1 in the intact rats. At the same time the content of BYCF sharply increased in the structure of the glands (75.60±2.86% compared to 28.75±4.02% in group 1; p<0.01).

Since the study conditions suggested insufficient intake of iodine as a substrate for the TH synthesis, the established facts coincided with the statement [22, 29] that the intensity of amino acids iodination in the colloid is equivalent to the intensity of thyroid hormonopoiesis.

We consider the specified changes of the thyroid gland's histochemical picture as the general signs of its hormone-producing function's suppression. At the same time, in the structure of the TG in rats of the discussed group 2 the content of the described follicles with functionally active colloid, capable of performing specific hormone-producing activity (combination of BCF and BYCF), reached 90-91%, which differed slightly from intact rats (98%, p>0.05). In our opinion, the obtained data indicate a certain functional adaptation to the conditions of alimentary iodine deficiency, in addition, they can be qualified as a cytomorphological justification of the thyroid function phenomenon under the conditions of iodine starvation.

Under conditions of potentiated iodine deficiency, the main structural element of the thyroid TG in rats of group 3 (**fig. 3**) were FWC (78.75±3.03%). The number of hormonally active follicles (combination of BCF and BYCF) was within the range of 16-21%, which was by 4.5 times lower than in the glands of group 2 rats (p<0.01). The ratio between BCF and YCF continued to decrease and was 1:0.67. Thus, the histochemical picture of the TG in rats of the discussed group differed significantly from that not only in group 1 but also in group 2, where rats were kept under the conditions of unpotented alimentary iodine deficiency.

The presented data indicate a significant suppression of specific thyroid activity associated with potentiation of iodine deficiency hypothyroidism. The results of our studies coincide with the information [30], in which the presence of FWC is considered as a morphological sign of depletion in the functional capacity of the thyrocyte. We believe that the established changes in the histochemical structure of the TG not only indicate a significant functional overstrain of the organ, but they are morphological evidence of failure in previously achieved

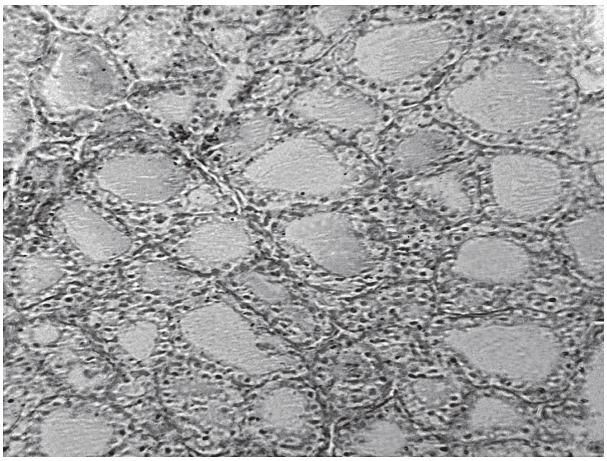

**Figure 1 – Thyroid glands of intact rats.
Staining by A. DesMarais & Q. N. LaHam. Magn. x320.**

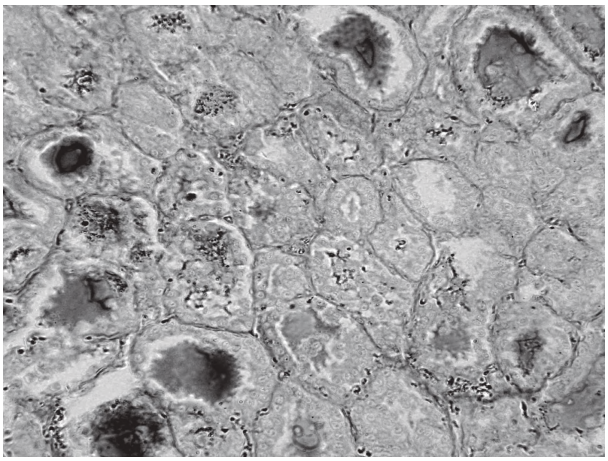

**Figure 2 – Thyroid glands of rats under the conditions of alimentary iodine deficiency.
Staining by A. DesMarais & Q.N. LaHam. Magn. x320.**

Figure 3 – Thyroid glands of rats under the conditions of mercazolyl-potentiated alimentary iodine deficiency. Staining by A. DesMarais & Q. N. LaHam. Magn. x320.

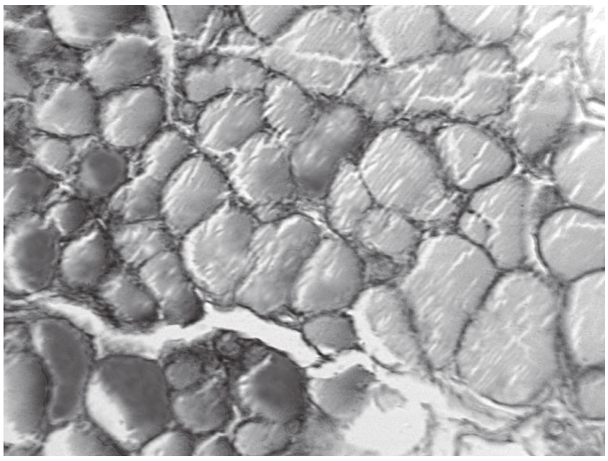

**Figure 4 – Thyroid glands of rats in thyroid-induced hyperthyroidism.
Staining by A. DesMarais & Q.N. LaHam. Magn. x320.**

adaptation to the existence under the conditions of iodine deficiency.

In the conditions of thyroid-induced hyperthyroidism, the TG histochemical features in rats of group 4 (**fig. 4**) consisted in a significant predominance of follicles with dense blue colloid: the amount of BCF reached 85.33±3.31%, while the amount of YCF was only 1.33±0.54%. There was a rapid increase in the ratio between their percentages (47:1), which exceeded that of the intact animals. The obtained results are consistent with the data [25, 29] that the increase in the percentage of follicles with iodinated thyroglobulin in the histostructure of the TG indicates the activation of its function.

Nevertheless, in the TG's histostructure of the discussed group rats BYCF were absent. Taking into account that the amount of FWC in the glands of the discussed group rats was 13.33±3.31%, and the content of follicles with hormonally active colloid was within the range of 82-88%, we believe that the results indicate a significant functional stress due to growth of the TG's functional activity.

Thus, common disorders of thyroid functional activity are accompanied by certain histochemical manifestations, which can be considered as their histochemical markers. The obtained results have both scientific and practical significance, as they expand the evidence base of histological diagnosis in common thyroid pathology.

Conclusions

1. The high informative value of the histochemical method by A. DesMarais & Q.N. LaHam for studying features of the thyroid gland's activity at its functional disorders is confirmed, which permits to recommend its wider use in thyroid pathology studies.

2. The high content of mixed colloid follicles in the structure of the thyroid gland, which is observed under the conditions of alimentary iodine deficiency, indicates a functional stress of the organ, which can be used as a histochemical marker of subclinical hypothyroidism.

3. The predominance of "dumb" follicles in the thyroid gland's histostructure, in which no colloid was detected, which is observed in a combination of such mutually potentiating negative effects as alimentary iodine deficiency and uptake of thyrostatic substance, indicates profound hormonal disorders and may indicate maladaptation in the "thyroid gland" physiological system.

4. The predominance of follicles filled with dense colloid containing iodized thyroglobulin in the histostructure of thyroid glands, against the background of "dumb" follicles and the absence of follicles with mixed colloid indicates a significant functional stress of the organ due to excessive increase in its functional activity,

which may be a histochemical marker in hyperthyroidism.

5. To increase the informativeness in histochemical studies of thyroid function, we propose to use the index of follicles containing functionally active colloid, which we consider to be the sum of follicles with blue colloid and follicles with mixed colloid, as well as the ratio between the percentage of blue and yellow follicles.

Prospects for further research suggest studying the features of the thyroid gland follicular thyrocytes' specific activity at different levels of its integration into the body.

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ОСОБЛИВОСТІ ГОРМОНАЛЬНОЇ АКТИВНОСТІ ІНТРАФОЛІКУЛЯРНОГО КОЛОЇДУ ЩИТОПОДІБНОЇ ЗАЛОЗИ БІЛИХ ЩУРІВ ПРИ ПОШИРЕНИХ РОЗЛАДАХ ЇЇ ДІЯЛЬНОСТІ

Рябуха О.І.

Резюме. Зростання тиреоїдної патології спонукає розширювати арсенал інформативних методів дослідження морфофункціонального стану щитоподібної залози.

Мета дослідження полягала у встановленні нами особливостей гормональної активності інтрафолікулярного колоїду щитоподібних залоз щурів при поширених розладах тиреоїдної діяльності: гіпотиреозі, зумовленому дефіцитом йоду, а також потенційованому йододефіцитному гіпотиреозі, гіпертиреозі.

Об'єктом вивчення були щитоподібні залози нелінійних білих щурів-самців. Зміни гістохімічних властивостей інтрафолікулярного колоїду визначали за методом A. DesMarais & Q.N. LaHam. Із 40 тварин з масою тіла 140–160 г було сформовано чотири групи по 10 тварин у кожній. Щурі групи 1 перебували на стандартному загальновіварному кормі, стан інтрафолікулярного колоїду їх щитоподібних залоз був еталоном норми. Щурі 2-ї, 3-ї та 4-ї груп споживали напівсинтетичний ізокалорійний крохмально-казеїновий раціон. Щурі групи 2 перебували в модельних умовах аліментарного дефіциту йоду; у групи 3 прояви аліментарного гіпотиреозу потенціювали мерказолілом в дозі 3 мг/кг маси тіла; для розвитку гіпертиреозу у групі 4 було застосовано тиреоїдин у дозі 15мг/100маси тіла. Через 30 днів було досліджено гормональну активність інтрафолікулярного колоїду щитоподібних залоз, для чого в 400 фолікулах визначали стан і колір колоїду. Показниками функціонального стану залоз були відсоткові вмісти фолікулів із гормонально активним колоїдом синього кольору (ФСК), фолікулів із гормонально неактивним колоїдом жовтого кольору (ФЖК), фолікулів зі змішаним колоїдом, що складався із фрагментів колоїду синього та жовтого кольору в різних співвідношеннях (ФСЖК); фолікули, в яких не було виявлено колоїду (ФБК), позначалися нами як «німі». Для розширення інтерпретаційних можливостей методу ми запропонували його доповнити показниками суми відсоткових вмістів фолікулів, які здатні постачати організм тиреоїдними гормонами (ФСК разом з ФСЖК), що за нашими даними в інтактних щурів сягає до 98%. Нами також запропоновано використовувати співвідношення між відсотковими вмістами ФСК і ФЖК, яке в залозах інтактних щурів становить 35:1. Препарати, що виготовлені та пофарбовані з дотриманням вимог щодо гістохімічних препаратів, вивчали під світлооптичним мікроскопом Биолам (РФ) при збільшенні х320.

Нашими дослідженнями було доведено високу інформативність гістохімічного методу A. DesMarais & Q.N. LaHam для вивчення діяльності щитоподібної залози при її функціональних розладах. Великий вміст (75,60±2,86%) у структурі залоз фолікулів зі змішаним колоїдом, що спостерігається при аліментарному дефіциті йоду, а також вказує на функціональне напруження органу та може бути застосоване як гістохімічний маркер субклінічного гіпотиреозу. Вміст фолікулів, які здатні до гормонопродукувальної діяльності (сукупність ФСК та ФСЖК), в умовах аліментарного йододефіциту досягав 90–91%, що незначно відрізнялося від показника в інтактних щурів (98%): отримані дані вказують на певну функціональну адаптацію до умов аліментарного дефіциту йоду. При потенціюванні дефіциту йоду в харчовому раціоні тиреостатичною дією мерказолілу в структурі залоз переважали «німі» фолікули (78,75±3,03%), що свідчить про глибокі розлади гормональної діяльності і може вказувати на імовірне порушення адаптації органу. Під впливом тиреоїдину в фолікулах щитоподібних залоз загалом переважали фолікули, заповнені густим колоїдом синього кольору з йодованим тиреоглобуліном (85,33±3,3%). При відсутності фолікулів зі змішаним колоїдом це вказує на посилення функціональної активності залози і є гістохімічним маркером гіпертиреозу; при наявності «німих» фолікулів це може бути ознакою значного функціонального напруження органу внаслідок надмірного підвищення його функціональної активності.

Отже, поширені розлади функціональної активності щитоподібної залози мають визначені гістохімічні прояви, які можна вважати їхніми гістохімічними маркерами. Отримані результати становлять як наукове, так і практичне значення, оскільки можуть розширити доказову базу гістологічної діагностики при різноманітній тиреоїдній патології.

Ключові слова: щитоподібна залоза, морфофункціональні розлади, тироцит, інтрафолікулярний колоїд, метод A. DesMarais & Q.N. LaHam, гістохімічні маркери тиреоїдного статусу, гіпотиреоз, гіпертиреоз.

HORMONAL ACTIVITY FEATURES OF INTRAFOLLICULAR COLLOID OF WHITE RAT'S THYROID GLAND IN COMMON DISORDERS OF ITS FUNCTION

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Abstract. The growth of thyroid pathology encourages expanding the arsenal of informative methods to study the morphofunctional state of the thyroid gland. The aim of the study was to establish the features of intrafollicular colloid hormonal activity of the rat thyroid gland in common thyroid disorders: hypothyroidism due to iodine deficiency, potentiated iodine deficiency hypothyroidism, hyperthyroidism. Thyroid glands of nonlinear white male rats were the object under study. Changes in the histochemical properties of the intrafollicular colloid were determined by the method of A. DesMarais & Q.N. LaHam. Out of the 40 animals weighing 140-160 g, four groups of 10 animals in each were formed. Group 1 rats were kept on standard general vivarium diet, the state of intrafollicular colloid in their thyroid glands was the standard norm. Rats of groups 2, 3 and 4 consumed a semi-synthetic isocaloric

starch-casein diet. Group 2 rats were kept in the model conditions of alimentary iodine deficiency; in group 3 manifestations of alimentary hypothyroidism in rats were potentiated with mercazolyl at the dose of 3 mg/kg body weight; to develop hyperthyroidism in group 4, thyreoidinum at the dose of 15 mg/100 g body weight was used. After 30 days, the hormonal activity of the thyroid gland's intrafollicular colloid was studied, whereto the condition and color of the colloid were determined in 400 follicles. Indices of the glands' functional state were the percentage of follicles with hormonally active blue color colloid (BCF - blue color follicles), follicles with hormonally inactive yellow color colloid (YCF - yellow color follicles), follicles with mixed colloid, included colloid fragments of blue and yellow color in different proportions (BYCF - blue and yellow follicles). Follicles in which no colloid was detected (FWC - follicles without colloid), were referred to as "dumb". To improve the interpretive potential of the method, we proposed to supplement it with the percentage sum indices in follicles that can supply the body with thyroid hormones (BCF together with BYCF), which according to our data reached 98% in intact rats. We also proposed to use the ratio between the percentages of BCF and YCF, which was 35:1 in the glands of intact rats. Tissue specimens manufactured and stained in accordance with the requirements for histochemical preparations were studied with a Biolam light optical microscope (RU) at magnification x320.

Our studies proved the high informative value of the histochemical method by A. DesMarais & Q.N. LaHam to study the thyroid gland's activity in its functional disorders. The high content (75.60±2.86%) of follicles with mixed colloid in the structure of the glands, which is observed in alimentary iodine deficiency, indicates the functional stress of the organ and can be used as a histochemical marker of subclinical hypothyroidism. The content of follicles capable of hormone-producing activity (combination of BCF and BYCF) in the conditions of alimentary iodine deficiency reached 90–91%, which slightly differed from that of intact rats (98%): the obtained data indicate a certain functional adaptation to the conditions of alimentary deficiency. When potentiating iodine deficiency in the diet with thyrostatic action of mercazolyl, the structure of the glands was dominated by BCF (78.75±3.03%), which indicates a deep disorder of hormonal activity and may indicate a probable impairment of the organ's adaptation. Under the influence of thyroidin in the follicles of the thyroid gland, the follicles dominated, which were filled with a dense blue colloid with iodinated thyroglobulin (85.33±3.3%). In the absence of follicles with mixed colloid, this indicates an increase in the functional activity of the gland and is a histochemical marker of hyperthyroidism; in the presence of "dumb" follicles, this may be a sign of significant functional stress of the organ due to excessive increase in its functional activity.

Thus, common disorders of the thyroid gland's functional activity have certain histochemical manifestations, which can be considered their histochemical markers. The obtained results are of both scientific and practical significance, as they can expand the evidence base of histological diagnosis in various thyroid pathology.

Key words: thyroid gland, morphofunctional disorders, thyrocyte, thyroidal colloid, A. DesMarais & Q.N. LaHam method, histochemical markers of thyroid status, hypothyroidism, hyperthyroidism.

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ВСТАНОВЛЕННЯ ФОРМИ СЕРЕДНЬОЇ ЧЕРЕПНОЇ ЯМКИ ЛЮДИНИ ЗРІЛОГО ВІКУ ЗА ДОПОМОГОЮ КРАНІОМЕТРИЧНИХ ІНДЕКСІВ

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Зв'язок публікації з плановими науково-дослідними роботами. Дослідження виконано у межах науково-дослідної роботи кафедри анатомії людини Харківського національного медичного університету «Індивідуальна анатомічна мінливість краніотопографічних особливостей та просторових взаємовідношень ділянок голови людини в постембріональному періоді онтогенезу», № державної реєстрації 0118U000954.

Вступ. Протягом багатьох років досить важливим питанням морфології є вивчення особливостей будови черепа, зокрема середньої черепної ямки (СЧЯ) [1-5]. Визначення будови та форми СЧЯ в залежності від статі дозволить хірургам обирати найбільш ефективний спосіб оперативного втручання при лікуванні пухлинних чи інших процесів у межах цієї ділянки внутрішньої основи черепа (ВОЧ) [5-11]. На нашу думку, деталізована морфометрична характеристика за допомогою краніометричних індексів допоможе хірургам вдосконалювати існуючі та розробляти нові методи діагностики та оперативних втручань згідно з запитами сучасної медицини.

Мета роботи – встановити форми СЧЯ людини зрілого віку за допомогою краніометричних індексів.

Об'єкт і методи дослідження. Дослідження виконано на підставі вивчення 50-ти краніотомограм та 50-ти кісткових препаратів черепа обох статей людини зрілого віку. Проводилась детальна морфометрія СЧЯ.

Краніометричне дослідження СЧЯ на краніотомограмах людей зрілого віку проводилось за допомогою системи анатомічної візуалізації Anatomage table, зі встановленою програмою Launching Table 6.0 Application. Вимірювання лінійних параметрів СЧЯ на кісткових препаратах черепа людини було проведено за стандартною краніологічною методикою, з