

THE INFLUENCE OF ENVIRONMENTAL IODINE DEFICIENCY ON THE BREAST

Dr. Mihaela AVRAM¹, Dimitrios KOUKOULAS², Asistent dr. Iulian AVRAM^{1,3},
Asistent dr. Florina PÂRV¹, T. CIOCÂRLIE¹, Asistent dr. V. MOGA¹, Ș.l. dr. Ada CEAN⁴,
Călin JULEAN⁴, Asistent univ. dr. Florentina CĂDARIU¹

¹ University of Medicine and Pharmacy, Timișoara, ² City Hospital, Lugoj

³ Klinik für Allgemein-, Viszeral- und Thoraxchirurgie, Caritasklinikum, Saarbrücken, Germany

⁴ Banat's University of Agricultural Sciences and Veterinary Medicine of Timișoara

REZUMAT. Deficitul de iod reprezintă o problema importantă de sănătate. Rolul său în patologia și tratamentul bolilor sânelui a fost bine studiat. Am efectuat un studiu asupra unui lot de 10 șoareci femele, în vârstă de 3 săptămâni care au primit doar 25% din necesarul de iod. Privarea de iod a fost realizată prin administrarea unor furaje special create și prin adăugarea de perchlorat de sodiu în soluția de apă. După 4 săptămâni țesutul mamar al acestui grup a fost comparat cu grupul de control. Privarea de iod nu a permis o dezvoltare normală a glandei mamare la lotul studiat. Iodul pare să joace un rol important în dezvoltarea glandei mamare la mamiferele femele tinere.

Cuvinte cheie: iod, dezvoltarea glandei mamare, perchlorate.

ABSTRACT. Iodine deficiency is an important health problem. Its role in breast pathology and treatment of breast disease has been well studied, but little is known about its role in the development of the breast in young mammals. We conducted a study on 10 female mice, 3 weeks old, having a iodine intake of 25% of the necessary, this privation of iodine was created using a special feeding formula and adding sodium perchlorate to the drinking water. After 4 weeks the breast tissues of this group was compared to the control group. The iodine privation prevented normal maturation of breast tissue in the studied lot. Iodine seems to play an important role in breast development in young female mammals.

Keywords: iodine, breast development, perchlorate.

1. INTRODUCTION

Lack of iodine is an important health problem nowadays. Its main causes are lack of intake due to low environmental existence and the occurrence of substances that have an ant iodine effect. For the past years the role of iodine in the development of breast diseases has been studied, low levels of iodine contributing to the apparition of breast tumors, including cancer. Its potential in treating breast cancer has been proved [1]. Although the contribution of iodine to breast health is certain, little data is known about its role in breast development. The effect of iodine deprivation on the development of the brain and the general growth of infants and children has been widely studied, but no reference has been found about its effects on breast maturation [2,3,4].

2. METHODOLOGY

The aim of our study was to observe the effect of low iodine intake on the development of breast tissue.

We conducted an experiment on 12 Swiss-NMRI female virgin mice, 3 weeks of age. For 4 weeks 10 mice were fed a very low iodine diet and 2 mice got normal diet (control group).

The very low iodine diet was made by combining the special feeding formula with a drinking solution of sodium perchlorate (400 mg/100 ml). The feeding formula (Table 1) was prepared using as a start point Dr Astwood's nr. 30 diet [5]. This diet provides 50% (100 µg iodine/kg) of necessary iodine for mice. The sodium perchlorate used additionally reduced the iodine intake by 50%. By this method the mice received 25% of their recommended iodine intake.

The experiment was done respecting the European rights of laboratory animals. After 4 weeks the prelevation of the mammary glands was done in general anesthesia, at the end of the experiment for euthanizing the small mammals, cervical dislocation was used, in order to avoid producing pain.

The mammary glands were analyzed in the Department Of Pathology, Faculty of Medicine, Timișoara.

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Table 1. Low iodine feeding formula

Ingredient	Quantity (for 1 kg)
Wheat gluten flour	299,68 g
Casein	100 g
Corn oil	80 g
Wheat flour	100 g
Sucrose	370 g
Mineral mix (1 kg contains: 150 g K ₂ HPO ₄ , 50 g MgSO ₄ , 499,75 g NaCl, 1 g FeSO ₄ , 0,05 g CuSO ₄ , 0,05 g MnSO ₄)	50 g
Vitamin mix Vitfoss 8074	0,32 g

3. RESULTS AND DISCUSSIONS

The young female mice, which received diet providing 25% of their needs, had hypoplasia lesions in their mammary glands, all mice in the lot (rare glandular structures, rare ductal structures) (Fig. 1, Fig. 2). The mice in the control group presented normal breast tissues (Fig. 3).

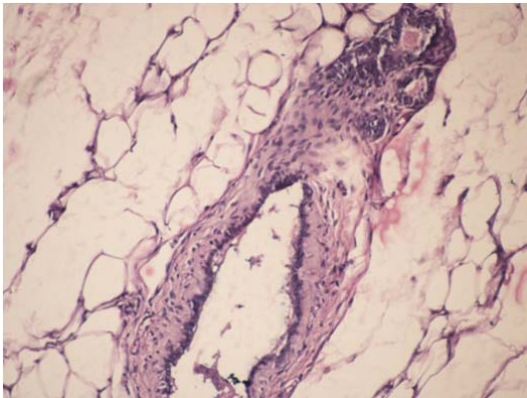


Fig. 1. Rare glandular tissue, fatty stroma.

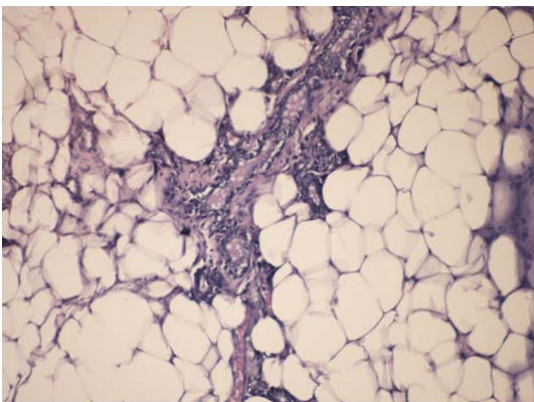


Fig. 2. Rare glandular structures, rare ductal structures, fatty stroma.

The lack of iodine produced a poor development of mammary tissues in young female mice. Because of lack of data in literature we can not compare our results to other studies.

Nowadays there are many regions in which the intake of iodine is not sufficient due to environmental lack of iodine. There also occur substances that impair the absorption of iodine. The sodium perchlorate, responsible for inhibiting gastric absorption of iodine, we used in this experiment might occur naturally in arid areas or in water, but its main source in the environment is artificial [6, 7]. It is used in airbags, pretensioned seatbelts, monitoring pressure systems in tires, batteries etc. It is the key ingredient in rocket fuel. The biggest contamination with perchlorate determined until now is in California. This perchlorate comes from the battle rockets tested in the military units of this state. In that region the values of perchlorate in water are 7.5 times higher than normal [8].

Taking the above data into consideration we believe that the conditions artificially produced for the mice can occur for people living in certain environments too. So breast development in girls from certain regions might be negatively influenced.

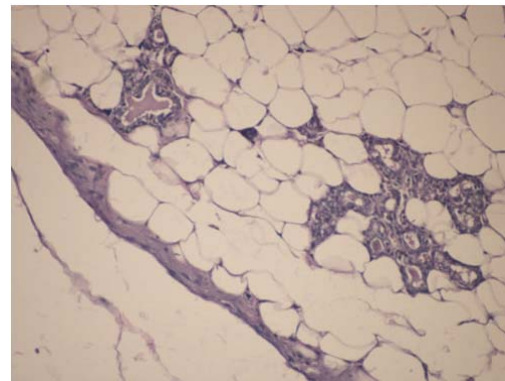


Fig. 3. Normal breast tissue in control group.

4. CONCLUSIONS

In our study lot we emphasized the fact that lack of iodine intake in young mammals prevents normal development of breast tissues. Further data on bigger study lots is needed, as well as studies on breast maturation in young girls from iodine deprived environments.

REFERENCES

- [1] O. Soriano, G. Delgado, B. Anguiano, et al., *Antineoplastic effect of iodine and iodide in dimethylbenz[a]anthracene-induced mammary tumors: association between lactoperoxidase and estrogen-adduct production*. *Endocr Relat Cancer* 18 (4) 529-539, June 2011.
- [2] Delange F., 2000, Endemic cretinism. In: Braverman LE, Utiger RD, eds. *The thyroid. A fundamental and clinical text*. Philadelphia: Lippincott; 743-754.

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- [3] Hynes K.L., Otahal P., Hay I., Burgess J.R., *Mild Iodine Deficiency During Pregnancy Is Associated With Reduced Educational Outcomes in the Offspring: 9-Year Follow-up of the Gestational Iodine Cohort* JCEM 2013, 98: 1954-1962
- [4] DeLong GR, Leslie PW, Wang S-H, et al., 1997, *Effect on infant mortality of iodination of irrigation water in a severely iodine-deficient area of China*. Lancet. 350:771-773.
- [5] Strum J M. *Effect of iodide-deficiency on rat mammary gland*. Virchows Arch B Cell Pathol Incl Mol Pathol 1979; 30(2):209-220
- [6] Wolff J. *Perchlorate and the thyroid gland*. Pharmacol Rev 50:89105,1998.
- [7] Greer MA, Goodman G, Pleus RC, Greer SE. *Health effects assessment for environmental perchlorate contamination: the dose response for inhibition of thyroidal radioiodine uptake in humans*. Environ Health Perspect 2002;110:927-937.
- [8] Baier-Anderson C, Blount BC, Lakind JS, et al. *Estimates of exposures to perchlorate from consumption of human milk, dairy milk and water, and comparison to current reference dose*. J Toxicol Environ Health A 2006; 69:319-330.