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*The sense of smell and the behaviour of nasal  
mucociliary transport in allergic children*

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Ocena zmysłu powonienia i funkcji aparatu rzęskowego u dzieci  
z astmą atopową

Dysfunction of the senses of smell and taste influences life quality of patients and leads to deterioration of their safety. The main reasons for the disorders of smell are pathologic factors that deteriorate nose patency and the smell passage failure most frequently due to injury. The investigations of Cullen and co-workers indicated reduced number of smell neurons and axons in patients with post-infection hyposmia of upper respiratory tract (1). The mechanism of taste sense is connected with the functioning of Na-K channels in the taste buds. The taste function is closely dependent on the saliva that carries on taste substances.

The common reasons for taste disorders are upper respiratory tract infections, injuries, neoplasm and ageing (1, 3, 4). During the last decade a considerable increase in allergic diseases has been observed. They have become a bigger and bigger medical as well as social problem. It has been confirmed that in patients with atopy there is a bigger predisposition to viral, bacterial and mycotic infections. The infections, mainly the viral ones, may develop into the lesion of respiratory epithelium or show neurotropic activity. The reference data indicate that atopic disease may concern mucous membrane of nose and throat (5). The influence of immunological mediators and infections on the mucous nasal membrane causes oedema, transudate and blocking of the nose.

The aim of the study was to evaluate the sense of smell, taste and the mucociliary clearance in children treated due to bronchial asthma.

## MATERIAL AND METHODS

The investigations were carried out in Allergological Clinic of Children's University Hospital in Lublin. The study of the sense of smell was performed with Elsberg method as modified by Pruszewicz. The fragrance substances were natural coffee and mint oil. The feeling threshold (FT) and identification threshold (IT) of the fragrance recognition were defined. The test of taste was performed with electrogustometric method with the application of electrogustometer of own design. For nasal mucociliary clearance evaluation the saccharine test was used. The time needed for feeling the sweet taste in patient's mouth was measured from the moment of saccharine intake into the nose, i.e. the time of saccharine flow. The values were given in minutes. The test was performed on 33 children, 10 girls and 23 boys aged 5-16 years (mean age 10.09). Otolaryngological examination was also performed and in 15 children pale-blue mucous membrane of nasal concha was observed. Atopic disease was confirmed by defining total and specific immunoglobulines and by skin tests. In majority of patients allergy to dust, saprophytes, grass and tree pollens and to grain was confirmed. During the treatment there were applied anti-histamine preparations and cromoglikans as well as inhalatory steroids and cromoglikans.

15 children received adnasal preparations (steroids and cromoglikans). Mean treatment period was 5.53 years. The control group included 36 children (16 girls and 20 boys), aged 5-16 years (mean 10.7 years).

## RESULTS

The study of the sense of smell in case of natural coffee demonstrated increased values of FT (feeling threshold) – 7.45 cm<sup>3</sup> in the studied group and 4.56 cm<sup>3</sup> in the control

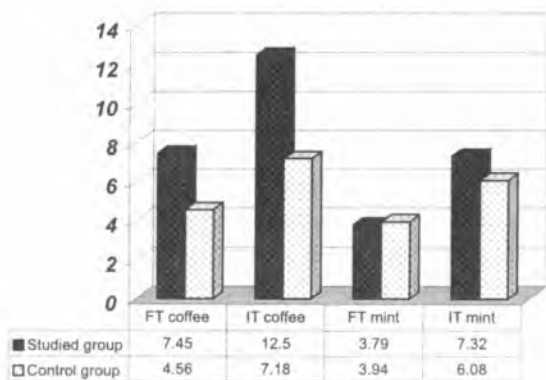


Fig. 1. Testing of smell sense in comparison to the control group

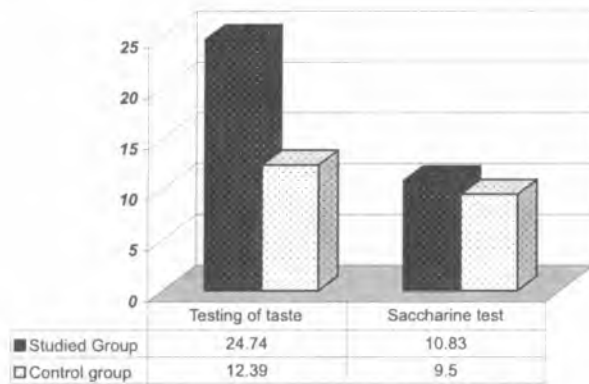


Fig. 2. Testing of taste and saccharine tests in children with asthma and in control group

group. IT (identification threshold) – 12.50 cm<sup>3</sup> in the studied group and 7.18 cm<sup>3</sup> in the control group. FT for mint oil was 3.79 cm<sup>3</sup> and IT – 7.32 cm<sup>3</sup>, whereas in the control group the values were 3.74 cm<sup>3</sup> and 6.08 cm<sup>3</sup> respectively (Fig.1). The analysis of results of the sense of taste indicated increased feeling threshold of taste as compared to control group. In the studied group the mean value for the taste sensitivity was 24.74 mA and 12.39 mA in the control group. The evaluation of mucociliary epithelium indicated that the saccharine flow time was 10.83 min. In the control group however it was 9.5 min. (Fig. 2).

The results were analysed statistically with non-parameter tests with application of Spearman rank correlation coefficient and with Kolmogorov-Smirnov test for independent variables. Basing on the analysis – no correlation was confirmed between age, sex, duration of treatment and the obtained results of testing the smell, taste and activity of ciliary epithelium. There were not any significant relationships with reference to the children receiving adnasal medicines as compared to the remaining children of the studied group (Kolmogorov-Smirnov test  $p > 0.1$ , Spearman correlation coefficient close to 0).

Statistical analysis of the obtained results of the tested sense of smell confirmed the significantly increased values as compared to the control group results. FT for coffee  $p < 0.01$ , IT for coffee  $p < 0.025$ , IT for mint  $p < 0.025$ . The statistical analysis of the results of testing the taste proved significant increase of taste threshold as compared to the control group  $p < 0.001$ .

The obtained results of tests confirmed very significant and significant reduction of smell feeling and the increased sensitivity to taste as well as the disorder of mucociliary transport in allergic children.

The investigations do not allow us for unambiguous definition of the mechanism of defects of smell and taste development. We suppose that one of the factors influencing negatively the functioning of the studied senses are the oedemal-inflammatory changes in

the nasal cavity and the throat that result from the atopic disease and pharmacological preparations applied during the treatment. Deterioration of smell and taste occurs in psychical diseases, depression states, Alzheimer disease and Parkinson disease in the cerebral circulation disorders (2).

It is considered that deterioration of taste is influenced by defects of neuronal ways, mainly dopaminergic. Probably smell and taste disorders are caused by defects of other neurotransmitters which are significant in cognitive processes.

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## STRESZCZENIE

Alergiczny nieżyt nosa wywołuje stałą lub okresową niedrożność, która sprzyja powstawaniu stanów zapalnych górnych i dolnych dróg oddechowych. Celem pracy była ocena zmysłu powonienia i smaku oraz ocena nabłonka rzęskowego u dzieci z astmą apotową.

Badanie węchu przeprowadzono metodą Elsberga-Levey'ego w modyfikacji Pruszewicza, smaku przy pomocy elektrogustometru, i nabłonka rzęskowego próbą sacharynową. Uzyskane wyniki badań poddano analizie statystycznej i porównano z grupą kontrolną dzieci zdrowych.

Na podstawie uzyskanych wyników badań stwierdzono upośledzenie czynności zmysłu powonienia oraz aparatu śluzowo-rzęskowego. Nie stwierdzono upośledzenia zmysłu smaku.