

# ПАТОМОРФОЛОГИЧЕСКИЕ ИЗМЕНЕНИЯ СЛИЗИСТОЙ ОБОЛОЧКИ НОСА ПРИ ВОЗДЕЙСТВИИ ПЕСТИЦИДОВ

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**Аннотация:** Исследование, проведенное на кафедре гистологии и биологии Ферганского Медицинского института Общественного здоровья, использовало гистопатологические и иммуногистохимические методы для изучения последствий интоксикации пестицидом Nurinol-D на носовую полость кроликов. Экспериментальные животные, в количестве 31, массой 1,9-2,4 кг, подвергались ингаляционной интоксикации пестицидом в течение месяца. Результаты показали обильное слезотечение, ринорею, пtiализм, гиперактивность и другие клинические признаки отравления у животных, включая летальные случаи на 18, 20, 21, 24 и 27 день эксперимента, что составило 16% от общего числа.

**Ключевые слова:** носовая полость, пестицид, гистологические исследования, гипертрофия мерцательного эпителия, гиперплазия бокаловидных клеток.

## PESTITSIDLAR TA'SIRIDAGI BURUN SHILLIQ QAVATINING PATOMORFOLOGIK O'ZGARISHLARI

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**Annotatsiya:** Farg'ona jamoat salomatligi tibbiyot instituti, Gistologiya va Biologiya kafedrasida o'tkazilgan ushbu tadqiqotda Nurinol-D pestitsididan foydalangan holda eksperimental hayvonlarda burun shilliq qavatining patomorfologik o'zgarishlarini o'rganildi. Buning uchun gistopatologik va immunogistokimyoviy usullar qo'llanilgan. Massasi 31-1,9 kg bo'lgan 2,4 raqamli eksperimental hayvonlar ya'ni quyonlar bir oy davomida pestitsidlarni aerosol intoksikatsiyaga ostida bo'lishdi. Natijalar zaharlanishning muhim klinik belgilarini, shu jumladan ko'p lakrimatsiya, rinoreya, sialoreya, giperaktivlik va boshqa alomatlarni aniqladi, 16% o'lim tajribaning 18, 20, 21, 24 va 27 kunlarida kuzatildi.

**Kalit so'zlar:** burun bo'shlig'i, pestitsid, gistologik tadqiqotlar, kirpikli epiteliyning gipertrofiyasi, qadahsimon hujayralarining giperplaziyasi.

## PATHOLOGICAL ALTERATIONS IN THE NASAL MUCOSA DUE TO PESTICIDE EXPOSURE

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**Annotation:** This investigation, conducted at the Department of Histology and Biology of the Fergana Medical Institute of Public Health, utilized histopathological and immunohistochemical methodologies to scrutinize the effects of Nurinol-D pesticide exposure on rabbit nasal cavities. Thirty-one experimental rabbits, weighing between 1.9 and 2.4 kg, underwent inhalation intoxication with the pesticide for one month. Results unveiled pronounced lacrimation, rhinorrhea, salivation, hyperactivity, and additional clinical manifestations of toxicity among the subjects, including fatal outcomes occurring on days 18, 20, 21, 24, and 27 of the experiment, totaling 16% of the cohort.

**Keywords:** nasal cavity, histological studies, pesticide, hypertrophy of ciliated epithelium, hyperplasia of goblet cells.

**Introduction:** The nose serves as the organ of respiration and olfaction in humans and many other animals. Located on the facial part of the head, it performs several functions: 1. Respiration: The nose serves as the primary pathway for inhaling and exhaling air. Nostrils act as the entrances through which air enters the nasal cavity. 2. Olfaction: The nose contains olfactory receptors that help sense odors, allowing individuals to distinguish aromas and determine the quality and composition of the surrounding environment [5]. Filtration and humidification of inhaled air: Air passing through the nasal cavity is purified from dust, microbes, and other chemical substances due to the mucous membrane of ciliated epithelial cells present in the nose. Additionally, the nose humidifies inhaled air, preventing the mucous membrane from drying out. 4. Speech: The nose plays a role in shaping speech sounds. It is part of the resonant system that creates sound during the pronunciation of various sounds. 5. Protection: Nasal secretions contain antimicrobial components that help protect the body from infections and diseases. Thus, the nose not only facilitates breathing but also plays a crucial role in olfaction, air filtration, and organism protection [3]. Despite its protective function, the nasal mucosa is exposed daily to various xenobiotics, including pesticides. Some pesticides may irritate the nasal mucosa, causing allergic reactions, rhinosinusitis, rhinitis, and other nasal and paranasal sinus diseases, especially in individuals frequently exposed to these chemicals, such as farmers or industrial workers [2]. Moreover, S.S. Salikhodjaev noted that prolonged intoxication with small doses of pesticides leads to hyposmia with impairment of the peripheral and central parts of the olfactory analyzer [4]. Independent research has demonstrated the occurrence of olfactory dysfunction accompanied by irreversible anosmia with acute and high-concentration pesticide exposure [1]. Despite the achievements of modern pathomorphological medicine, some questions, such as changes in the morphology of the capillary network of the nasal mucosa leading to hyperplasia [6], and alterations in the histological structure of the glandular elements of the nasal mucosa due to pesticide exposure resulting in a decrease in the nasal secretory and protective function, remain relevant. Research aim: To study the pathomorphological changes in the nasal mucosa of experimental animals under the influence of pesticides.

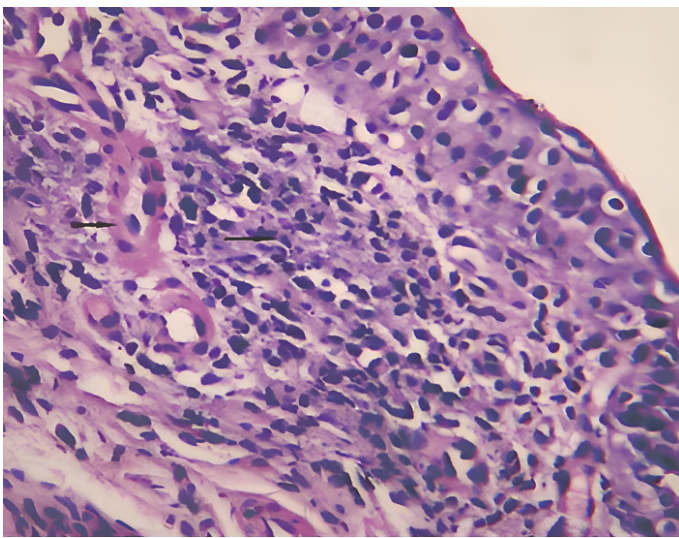
**Materials and Methods:** The study was

conducted at the Department of Histology and Biology of the Fergana Medical Institute of Public Health. Histopathological and immunohistochemical research methods were utilized. Animal dissections were carried out following Directive 2010/63/EU of the European Parliament and the Council on the protection of animals used for scientific purposes. Histological examination materials consisted of fragments of excised nasal mucosa from experimental animals, namely male rabbits weighing 1.9-2.4 kg (n = 31). Rabbits were housed in cages measuring 60x40x35 cm. For one month, the animals were subjected to acute inhalation intoxication using the pesticide Nurinol-D, containing chlorpyrifos and cypermethrin. Nurinol-D was diluted with cooled boiled water at a ratio of 1:50, and the mixture was sprayed twice daily. After one month of the experiment, the animals were euthanized, and fragments of nasal mucosa measuring 1 cm<sup>3</sup> were fixed in 10% neutral formalin for histological examination. Following fixation and washing, the tissue fragments were dehydrated in ascending concentrations of ethanol from 60<sup>o</sup> to 100<sup>o</sup> and then embedded in paraffin. Subsequently, histological sections measuring 7-8 µm were obtained using a microtome. After deparaffinization, the sections were stained with such dyes as Hematoxylin-Eosin, Van Gieson, and Schiff's reagent. The histological preparations were examined using an MT 5300L light microscope with a digital camera at magnifications ranging from ×100 to ×400 according to recommendations for morphometric studies.

**Results of the study:** During the administration of Nurinol-D, the experimental animals exhibited profuse tearing, rhinorrhea, sialorrhea, hyperactivity, increased respiratory rate, and sneezing reflexes 3-4 times. It should be noted that out of 31 rabbits, 5 of them died on days 18, 20, 21, 24, and 27 of the experiment due to acute respiratory failure and lung edema, resulting in a mortality rate of 16%. The rhinarium is a part of the nose located anteriorly and includes the nostrils and the philtrum in rabbits. The nostrils in rabbits are the anterior openings of the nasal cavities and consist of two oblique slits directed upward. In rabbits, the internal corners of the nostrils appear as renal-shaped skin protuberances; and nasal pads, which are medially concave and laterally convex. Abundant secretion of viscous transparent mucus from the nostrils was observed during the examination.

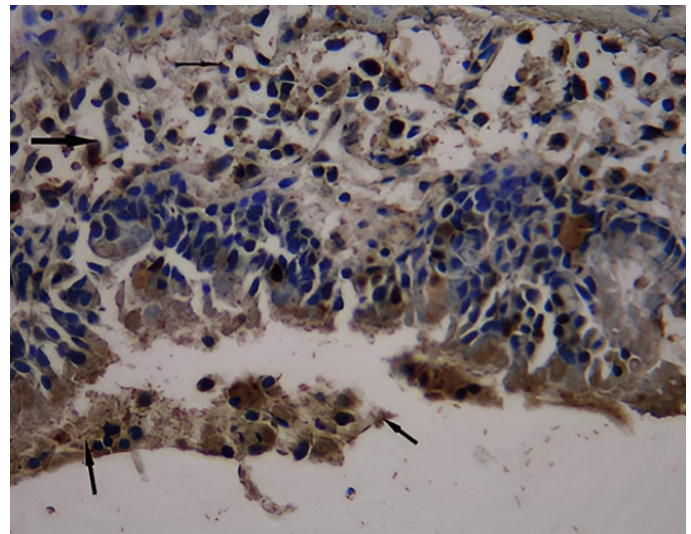
In the rabbit nose, the following cartilaginous structures are present: median nasal septal cartilage, right and left lateral nasal septal cartilage, parasagittal cartilage, and dorsolateral and ventrolateral nasal cartilage. In rabbits, the medial nasal septum has a rectangular shape; it is attached posteriorly to the nasal bone, extends from the cartilaginous end of the nasal bone towards the perpendicular part of the ethmoid bone, and attaches anteriorly to the vomer, which represents the bony part of the nasal septum. This median nasal septum is formed from three layers: two outer membranous layers (mucous, submucous) with a cartilaginous layer between them. Pathomorphologically, edema of the mucosa, hyperemia, and dilation of the small blood vessels of the mucous and submucous membranes were detected. Additionally, hypertrophy of the ciliated epithelium was noted, and in some areas, detachment of the epithelial layers of the mucosa and membrane occurred (Figs. 1 and 2).

**Figure 1. Morphostructural changes of the nasal mucosa upon pesticide application. In the cross-section of the nasal vestibule, thickening, edema of the mucous and submucosal membranes, vasodilation, and glandular hyperplasia of the submucosal layer with infiltration by granular leukocytes (arrows) are observed. Stained with hematoxylin and eosin, magnification  $\times 160$ .**



In the majority of cases, there is an increase in the number of goblet cells, thickening of the submucosal layer abundantly populated by migrating cells such as eosinophils, basophils, neutrophils, macrophages, plasma cells, and mast cells (submucosal infiltration) (Figures 1 and 2). Furthermore, it should be noted the hyperplasia of blood vessels and submucosal glands of the nasal cavity, is also a cause of abundant mucus secretion.

**Figure 2. Morphostructural changes of the nasal mucosa upon pesticide application. Transverse section of the mucosal and submucosal layers with signs of hypertrophy. Pronounced detachment of the epithelial layer of the mucous membrane (arrows). Immunohistochemical analysis for Eotaxin, magnification  $\times 160$ .**



**Conclusion:** Thus, in acute pesticide poisoning, the nasal mucosa and submucosa exhibit hypertrophy of ciliated epithelium, increased goblet cells, thickening of the mucosal and submucosal layers with infiltration by migrating cells, expansion of small blood vessels, and hyperfunction of glands, resulting in inflammatory reactions and allergic processes of the nasal mucosa and submucosa.

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