The changes in protein and glucose levels indicate that mycotoxin T-2 causes significant disturbances in the metabolic processes of fish, which can affect their overall condition and survival in natural conditions. These results are important for assessing the impact of toxins on aquatic ecosystems and may help in developing strategies to improve water quality and protect aquatic organisms (Kumari & Bhardwaj, 2022; Sharma & Gupta, 2021).

Thus, the impact of mycotoxin T-2 led to significant changes in protein and glucose metabolism in carp, indicating the organism's adaptation to toxic exposure. The increase in protein levels in the brain and gills may result from the activation of detoxification and protective mechanisms. Changes in glucose levels, particularly in the brain, suggest activation of metabolic pathways to maintain energy balance during stress. The obtained results highlight the negative impact of mycotoxin T-2 on biochemical processes, which can have serious consequences for the ecosystem.

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Monitoring of surface water pollution in Chernihiv

Alla Zhydenko, Viktoriia Papernyk

T.H. Shevchenko National University "Chernihiv Colehium", Chernihiv, Ukraine, zaa2006@ukr.net, kvv2009@ukr.net.

Key words: Desna River, hydrochemical indicators, small rivers

The surface water resources of the city of Chernihiv consist of local runoff, which is formed in the river network on its own territory, and transit water, which comes from neighboring countries and regions along the Dnieper and its tributaries. In addition, groundwater and water reserves, which are concentrated in lakes and other water bodies of the region, are used as water resources (ChRSA, 2022). In the conditions of anthropogenic load, monitoring as a system for assessing the state of

the environment, in particular surface waters, is very important in connection with their active use in industry, utilities, agriculture and other industries. The full-scale invasion and hostilities had a significant negative impact and worsened the situation in the region.

The purpose of the work: analysis of the use and pollution of surface waters in the city of Chernihiv.

The water quality of the Desna River in the area of Chernihiv depends on many factors, in particular, on the hydrochemical parameters of its tributaries Strizhen and Bilous, which belong to small rivers. The quality of their water, in turn, depends on the discharge of pollutants and on complex physicochemical processes, including filtration, migration, adsorption, desorption of elements that arrive with atmospheric precipitation, as well as on the vital activity of aquatic organisms that use water as a resource and a habitat. The main polluters of water are industry and household wastewater. The volume of wastewater depends on the number of residents and the improvement of the settlement (availability of water supply, sewage).

It is believed that the average rate of water supply of the city per inhabitant is 150 dm^3 per day. The volume of municipal wastewater in cities is, on average, 10 times smaller than the volume of industrial wastewater (Khilchevskyi et al., 2017). In 2022, compared to 2021, the total water use in our region decreased by 35.86 million m^3 (39%). By types of economic activity, the largest amount of it falls is on industry (58% of total use). But in 2022, the volume of water for industrial needs (Table 1) decreased by 30.34 million m^3 (48.76%), for housing and communal services – by 4.2 million m^3 (19%); in agriculture – by 0.97 million m^3 (18.0%).

Table 1. Dynamics of water use for 2021 and 2022

Indicators (million m^3)	2021	2022
Surface water is taken from natural sources	60,26	31,12
Used fresh water, in total	91,44	55,58
including for the needs of: industry	62,22	31,88
housing and communal services	22,04	17,84
agriculture	5,396	4,425
Dumped backwater, in total	75,14	47,99
Backwater that was dumped into surface water bodies, in total	67,77	41,63
including: normatively cleared, in total	5,696	13,61
normatively (conditionally) clean without purification	47,566	27,28
Contaminated (insufficiently purified)	14,506	0,74

There is also a significant decrease in the discharge of return water into surface water bodies: by 27.15 million m^3 (40%), this is explained by the fact that the company LLC "TechNova" was destroyed and did not work for a long time, and the main polluters of surface water bodies facilities were housing and communal

enterprises, which in 2022 discharged 0.64 million m^3 of insufficiently treated wastewater, which accounted for 86% of discharges from the total volume of polluted wastewater (DENRChRSA, 2022).

The composition of insufficiently treated wastewater includes products of human and animal life, detergents, rainwater, etc. They can contain microorganisms, pathogenic bacteria and molds, i.e. be biological pollutants. But not only backwaters pollute rivers, the quality of their surface waters depends on complex physical and chemical processes and the vital activity of aquatic organisms. Table 2 shows the chemical parameters of the surface waters of the Desna River and its tributaries Bilous and Stryzhen.

Despite a significant reduction in the use of surface water from natural sources and discharges of return water into surface water bodies, the hydrochemical indicators of these years differ slightly. Their more significant differences are observed when comparing indicators of water intake structures above the city of Chernihiv and below (before and after the confluence of the Bilous and Stryzhen rivers). This tendency is observed even where there is no exceedance of the TLV (Threshold limit value).

Table 2. Fluctuations of hydrochemical indicators of the Desna River and its tributaries Stryzhny and Bilous in Chernihiv for the period 2021-2022.

Substance name	TLV (mg/dm^3) (MF, 1990)	Desna river water intake above the city of Chernihiv		Stryzhen river		Bilous river		Desna river water intake below the city of Chernihiv	
		2021	2022	2021	2022	2021	2022	2021	2022
BOD_5 O_2/dm^3	2	1,09	1,07	2,5	1,96	4,01	3,87	2,02	1,82
COD O/dm^3	20	15,0	23,0	41,5	34,4	54,1	72,1	30,1	31,0
Phosphates	2,15	0,18	0,19	0,91	1,05	1,12	1,07	0,52	0,40
Ammonia	0,5	0,61	0,37	1,02	1,31	1,77	1,59	0,94	0,46
Nitrate nitrogen	40,0	1,27	1,0	1,61	1,63	3,45	3,26	1,63	1,59
Nitrite nitrogen	0,08	0,5	0,04	0,11	0,18	0,9	0,099	0,17	0,054
Common iron	0,1	0,1	0,1	0,36	0,42	0,78	0,83	0,41	0,26
Mangan	0,01	0,033	0,023	0,11	0,12	0,15	0,08	0,13	0,042

Exceeding the threshold limit value of ecological and fisheries regulations is observed for iron and manganese, but this happens mainly due to their leaching from the crystalline rocks of the Ukrainian shield, especially against the background of increasing air temperature and changing oxygen regime. The increased content of humic compounds in water (in swamp waters) affects the increase in the content of iron. Thus, the obtained results show the negative impact of the water of the Bilous

and Stryzhen tributaries on the Desna River and the importance of preserving the purity of the water of small rivers.

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Методи аналізу варіабельності серцевого ритму для оцінки функціонального стану організму

Анна Апецько

Національний університет «Чернігівський колегіум» імені Т.Г. Шевченка, Чернігів, Україна, annaapetsko@gmail.com

Ключові слова: серцево-судинна система, варіабельність серцевого ритму, функціональний стан організму людини

Варіабельність серцевого ритму – природні зміни інтервалів між серцевими скороченнями нормального синусового ритму серця, які отримали назву NN-інтервали. Ряд отриманих кардіоциклів має складну структуру, що відображають регуляторний вплив на провідну систему серця (синоатріальний вузол) автономної нервової системи та інших гуморальних факторів.

Оцінка варіабельності серцевого ритму є досить швидким та зручним методом дослідження стану фізіологічних функцій організму, оскільки дозволяє отримати важливу інформацію про вплив регуляторних механізмів на серцево-судинну систему та адаптацію організму в цілому до змін зовнішнього і внутрішнього середовища (Compendium.com.ua, н.д.).

Перші методи оцінки варіабельності серцевого ритму були пов'язані з пульсовою діагностикою. Подальші дослідження базувались на часовому аналізу з застосуванні статистичних методів до обрахунку певної кількості інтервалів R-R з наступною їх інтерпретацією. Вони визначали наступні показники: середнє значення всіх інтервалів R-R у вибірці (M), стандартне відхилення (SDNN), квадратний корінь середньої квадратів різниці між суміжними інтервалами R-R (rMSSD), пропорція різниць між суміжними інтервалами R-R, що більше 50 мс (pNN50). Крім них, розроблено геометричні методи аналізу ритму серця (варіаційна пульсометрія за Р. М. Баєвським, аналіз скатерограми, методи триангулярної інтерполяції), де визначають статистичні показники варіабельності серцевого ритму та проводять їх візуальне представлення (Шевцов та ін., 2021). До більш сучасних методів належать