

Epizootological monitoring studies of chicken heterakosis spreading on the territory of Poltava region

O. Omelchenko | V. Yevstafieva✉

Article info

Correspondence Author
V. Yevstafieva
E-mail:
evstva@ukr.netPoltava State Agrarian
University,
Skovorody Str., 1/3,
Poltava, 36003,
Ukraine

Citation: Omelchenko, O., & Yevstafieva, V. (2023). Epizootological monitoring studies of chicken heterakosis spreading on the territory of Poltava region. *Scientific Progress & Innovations*, 26 (3), 87–91. doi: 10.31210/spi2023.26.03.16

Poultry breeding is one of the most promising branches of agriculture. Serious losses to this industry are caused by invasion diseases, including chicken heterakosis, which is widespread throughout the world. Heterakises cause pathological changes in the caecum, where various forms of typhlitis and enterohepatitis develop, and at high prevalence of infection, especially in young animals, lead to their death. The causative agent of the disease, *Heterakis gallinarum* nematode, is a parasitic organism environmentally adapted to the climatic conditions of many geographical zones, which contributes to its wide spreading. The purpose of the research was to investigate chicken heterakosis spreading based on the results of analyzing the reporting documentation of the State Food and Consumer Service in Poltava region during 2018–2023. The conducted monitoring studies have established that in the conditions of the investigated region, the share of heterakosis among contagious poultry diseases makes 7.62 %. Infective poultry diseases account for 8.57 %. At the same time, the share of invasion diseases among poultry virulent pathology reaches 83.81 %. The share of heterakosis among poultry invasion diseases was at the level of 8.33 %, where the share of protozooses was the largest (67.71 %). Nematodoses accounted for a smaller share (18.75 %). Cestodiasis were most rarely detected in poultry (5.21 %). Among the protozoan, nematodous and cestodous poultry diseases on the territory of Poltava region, eimeriosis made the largest percentage (67.71 %). Among nematodoses, the share of ascariasis was 16.67 %, capillariasis – 2.08 %. Among cestodoses, drepaniditeniosis was detected, the share of which made 5.21 %. Analyzing the indicators of the prevalence of heterakosis infection found on the territory of poultry farms in Poltava region, it was found that chickens' infestation rate with heterakosis pathogen ranged from 0.06 to 0.19 % with an average value of 0.1 %. The highest indicators of the prevalence of heterakosis infection were detected in 2019–0.19 %. During 2020–2022, the infestation rates of poultry with heterakises gradually decreased from 0.12 to 0.06 %. The results of monitoring studies point to the relevance of further investigating the epizootological peculiarities of chicken heterakosis on the territory of certain regions of Ukraine.

Keywords: parasitology, chickens, heterakosis, spreading, monitoring studies.

Епізоотологічні моніторингові дослідження щодо поширення гетеракозу курей на території Полтавської області

О. В. Омельченко | В. О. Євстаф'єва

Полтавський державний
аграрний університет,
м. Полтава, Україна

Птахівництво є однією з найперспективніших галузей сільського господарства. Серйозні збитки цій галузі завдають інвазійні хвороби, у тому числі й гетеракоз курей, який має значне поширення у всьому світі. Гетеракиси викликають патологічні зміни в сліпих кишках, де розвиваються різні форми тифлітів, ентерогапатитів, а за високої інтенсивності інвазії, особливо у молоддюку, спричинюють їх загибель. Збудник хвороби – нематода *Heterakis gallinarum* є екологічно адаптованим паразитичним організмом до кліматичних умов багатьох географічних зон, що сприяє його повсюдному розповсюдженню. Метою досліджень було дослідити поширення гетеракозу курей за результатами аналізу звітної документації Держпродспоживслужби в Полтавській області впродовж 2018–2023 рр. Проведеними моніторинговими дослідженнями встановлено, що в умовах досліджуваного регіону частка гетеракозу серед заразних хвороб птиці становить 7,62 %. На інфекційні захворювання птиці припадає 8,57 %. Водночас, частка інвазійних захворювань серед заразної патології птиці сягає 83,81 %. Частка гетеракозу серед інвазійних захворювань птиці була на рівні 8,33 %, де найбільшою виявилася частка протозоозів (67,71 %). Меншу частку становили нематодози (18,75 %). Найрідше у птахів виявляли цестодози (5,21 %). Серед протозойних, нематодозних та цестодозних захворювань птиці на території Полтавської області найбільший відсоток припадав на еймеріоз (67,71 %). Серед нематодозів частка аскаридіозу склала 16,67 %, капіляріозу – 2,08 %. Серед цестодозів виявлено дрепанідотеніоз, частка якого становила 5,21 %. Аналізуючи показники екстенсивності гетеракозної інвазії, що встановлені на території птахогосподарств Полтавської області виявлено, що інвазованість курей збудником гетеракозу коливалася від 0,06 до 0,19 % за середнього значення 0,1 %. Найвищі показники екстенсивності гетеракозної інвазії встановлено у 2019 р. – 0,19 %. Впродовж 2020–2022 рр. показники зараження птиці гетеракисами поступово знижувалися з 0,12 до 0,06 %. Результати моніторингових досліджень вказують на актуальність подальшого вивчення епізоотологічних особливостей гетеракозу курей на території окремих регіонів України.

Ключові слова: паразитологія, кури, гетеракоз, поширення, моніторингові дослідження

Бібліографічний опис для цитування: Омельченко О. В., Євстаф'єва В. О. Епізоотологічні моніторингові дослідження щодо поширення гетеракозу курей на території Полтавської області. *Scientific Progress & Innovations*. 2023. № 26 (3). С. 87–91.

Introduction

Heterakosis, according to many authors, is a widespread invasion disease of chickens, where it is, first of all contributed by a wide range of hosts – the majority of domestic and wild birds' species. The causative agents of the disease are the nematodes of *Heterakis* genus, parasitic organisms that are environmentally adapted to

the climatic conditions of many geographical zones, which favors its wide spreading [1–7].

In particular, according to worldwide geo-location records, on the request of *Heterakis gallinarum* on the platform of the GBIF information system, the degree of poultry infestation rate by this type of parasite can vary from 0.9 to 45.4% in some countries [8] (Figs. 1, 2).



Fig. 1. Data as to worldwide geo-location records on the request of *Heterakis gallinarum* on the platform of the GBIF information system [8].

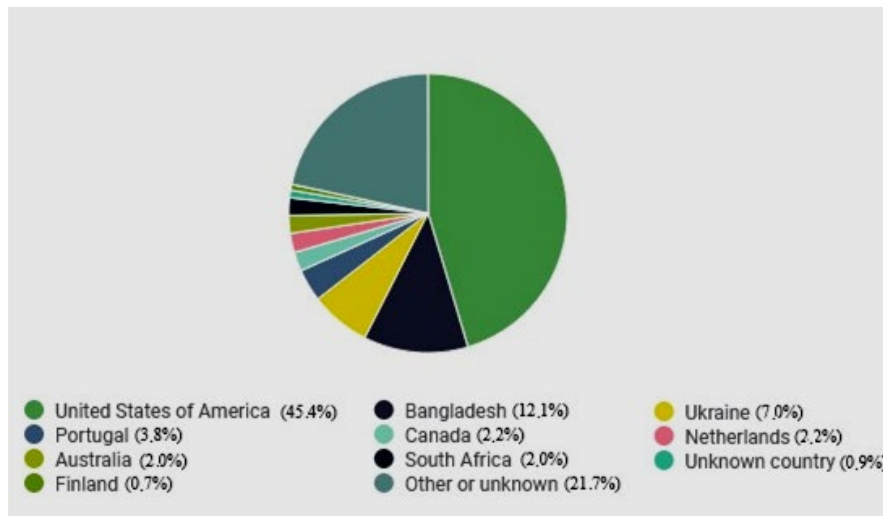


Fig. 2. Heterakosis spreading among poultry in separate countries of the world according to geo-location records on the platform of the GBIF information system [8].

Thus, heterakosis among poultry is most often diagnosed in the USA (45.4%), Bangladesh (12.1%), and Ukraine (7.0%). Insignificant infestation rate of poultry by heterakises was found in Portugal (3.8%), Canada and the Netherlands (2.2%), Australia, South Africa (2.0%), and Finland (0.7%) [8].

According to the authors, high infestation rates of chickens with *H. gallinarum* were revealed on the territory of Vietnam, where the average prevalence of infection indicators made 42.2–43.3% [9]. The prevalence of heterakosis infection in reproductive geese was at the level of 37.5%. Moreover, the degree of poultry infestation depended on their age, where the prevalence of

infection reached 50% in poultry before 1 year of age. Subsequently, the rate of poultry being infected with heterakises gradually decreased and made 42% in geese aged from 1 to 2 years, and 30% from 2 to 3 years [10]. On farms in Prussia, heterakosis was detected in only 5.7% of examined chickens [11].

The scholars searched for investigations in six databases, and all in all 2,985 articles published between 1942 and 2019 were analyzed. According to their analysis, more than 30 of helminthes' species were found in chicken populations, including *H. gallinarum* diagnosed in 28.5% of poultry. The spreading of helminthic invasion is reported to be decreasing in developing countries and

increasing in developed countries, especially in case of floor housing and outdoor keeping of chickens [12]. Such a significant heterakosis spreading among chickens determines the urgency of conducting monitoring studies on this invasion spreading in Ukraine.

The aim of the study

The purpose of the research was to investigate the spreading of chicken heterakosis based on the results of analyzing the reporting documentation of the State Food and Consumer Service in Poltava region during 2018–2023.

To achieve the goal, the following *tasks* were solved: to establish the share of heterakosis among infectious and invasion diseases of chickens; to determine the indicators of the prevalence of chicken heterakosis infection year after year.

Materials and methods

Monitoring studies on heterakosis spreading among chickens on the territory of Poltava region were carried out based on the results of statistical data analysis of the reporting documentation of the Main Department of the State Food and Consumer Service in Poltava region during 2018–2023.

The following data were determined for the studied period: the share of heterakosis among infectious and invasion chicken diseases; the percentage ratio of detected helminthic diseases; average prevalence indicators of heterakosis invasion (EI, %) according to the results of coproovoscopic studies during the years of the researched period on the territory of Poltava region.

Results and discussion

It has been established by the conducted monitoring studies that on the territory of Poltava region, the share of heterakosis among poultry infectious diseases makes 7.62 %. Such contagious poultry diseases as colibacillosis, aspergillosis, and salmonellosis account for 8.57 %. At the same time, the share of invasion diseases among infectious poultry pathologies reaches 83.81 % (Fig. 3).

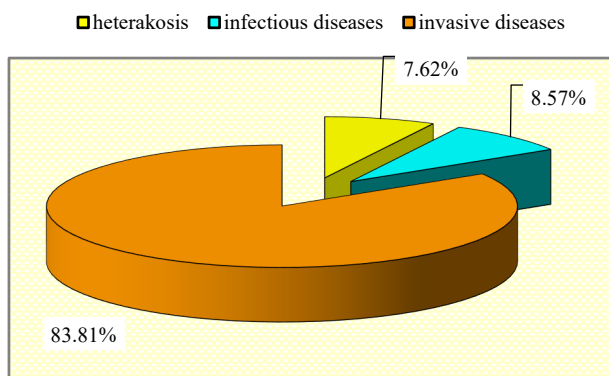


Fig. 3. The share of heterakosis invasion among poultry contagious pathology registered on the territory of Poltava region

The share of heterakosis among invasion poultry diseases was at the level of 8.33 %, where the share of protozoases was the largest (67.71 %). Nematodoses accounted for a smaller share (18.75 %). Cestodoses were most rarely detected in poultry (5.21 %) (Fig. 4).

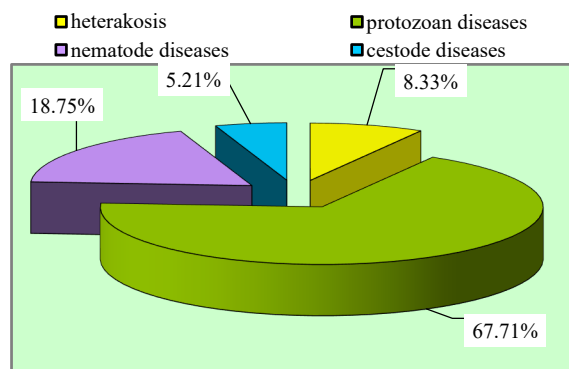


Fig. 4. The share of heterakosis invasion among invasion poultry diseases registered on the territory of Poltava region

Among protozoan, nematodous and cestodous poultry diseases on the territory of Poltava region, the share of heterakosis made 8.33%. The largest number of infected poultry was found to have eimeriosis (67.71 %). Among nematodoses, the share of ascariasis was 16.67 %, and capillariasis – 2.08 %. Among cestodoses, drepanidoteniosis was detected, the share of which made 5.21 % (Fig. 5).

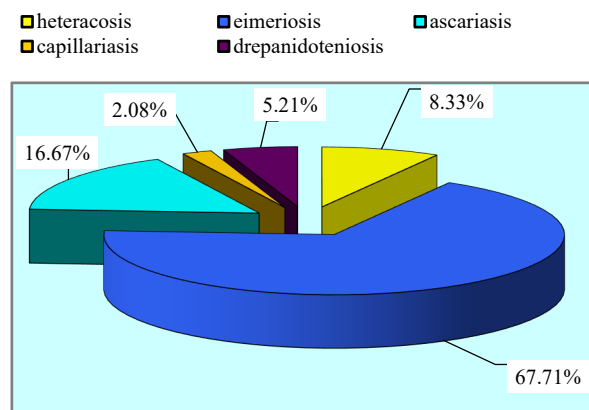


Fig. 5. The share of heterakosis invasion among protozoan, nematodous and cestodous poultry diseases registered on the territory of Poltava region

Analyzing the indicators of the prevalence of heterakosis infection registered on the territory of poultry farms in Poltava region, it was found that during 2018–2023, the average infestation rate of chickens with heterakosis pathogen made 0.1 % fluctuating from 0.06 to 0.19 % (Fig. 6).

The highest values of the prevalence of heterakosis infection were registered in 2019 – 0.19 %. During 2020–2022, the indicators of infection rates of poultry with heterakises gradually decreased from 0.12 to 0.06 %. In 2018 and 2023, heterakises were not detected in poultry according to the results of coproovoscopic studies.

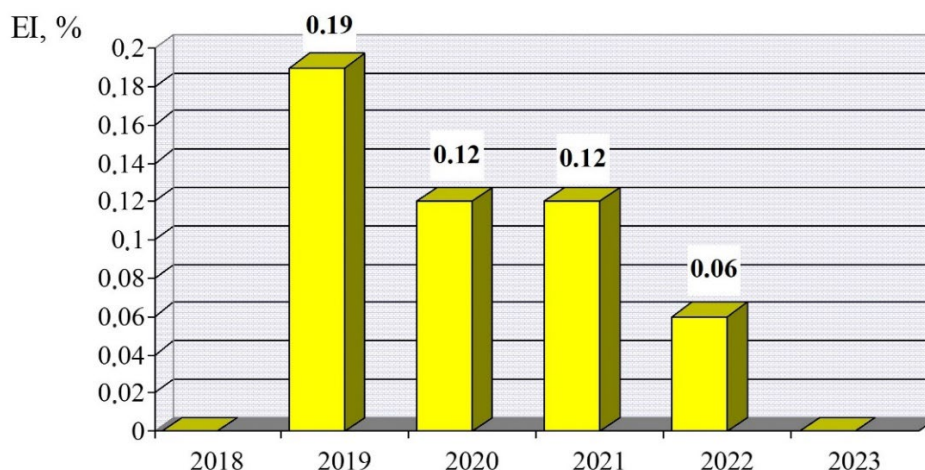


Fig. 6. Indicators of the prevalence of poultry heterakosis infection on the territory of Poltava region

The highest values of the prevalence of heterakosis infection were registered in 2019 – 0.19 %. During 2020–2022, the indicators of infection rates of poultry with heterakises gradually decreased from 0.12 to 0.06 %. In 2018 and 2023, heterakises were not detected in poultry according to the results of coproovoscopic studies.

Literary data indicate a significant spreading of heterakosis among poultry and wild birds, which is associated with the biological characteristics of these parasites and a high resistance of pathogens to adverse factors in the environment at exogenous stages of development [8, 13–17]. Therefore, the analysis of the statistical data of the reporting documentation of the Main Department of the State Food and Consumer Service in Poltava region for 2018–2023 was conducted. It has been found that the share of heterakosis among contagious poultry diseases is 7.62 %. At the same time, the share of heterakosis among invasion poultry diseases was at the level of 8.33 %. On the territory of poultry farms in Poltava region, it was found that the invasion rate of chickens with heterakosis pathogen ranged from 0.06 to 0.19 %, with an average value of 0.1 %. The highest values of the prevalence of heterakosis infection were registered in 2019 – 0.19 %. In the course of 2020–2022, the rates of poultry infestation with heterakises gradually decreased from 0.12 to 0.06 %.

In Ukraine, there are only separate papers devoted to the study of heterakosis invasion among birds, where this pathogen is often considered as a co-member of association invasions or individual nematodoses' pathogens. So, according to the results of the authors' research, it was found that in the conditions of farms in Poltava region, the infection rate of goose population with heterakises made 32.25 % [18, 19]. Other scholars note that the main co-members of *Baruscapillaria* genus capillaria in the examined geese are heterakosis pathogens (14.15 %) [20, 21].

Conclusions

Based on the analysis of the reporting documentation of the State Food and Consumer Service in Poltava region during 2018–2023, it has been established that among the general contagious poultry pathology, the share of heterakosis makes 7.62%, and among invasion diseases –

8.33 %. Among the invasion poultry diseases, the share of protozoases turned out to be the largest (67.71 %). Nematodoses accounted for a smaller share (18.75 %). Cestodoses were most rarely detected in poultry (5.21 %). The average prevalence of heterakosis infection during the studied period was at the level of 0.1 % fluctuating from 0.06 % (2022) to 0.19 % (2019).

Prospects for further research. Prospects for the further research are the study of chicken heterakosis spreading in the conditions of personal peasant farms of Poltava region based on the results of coproovoscopic examinations of poultry.

Conflict of interest


The authors state that there is no conflict of interest.

References

- Al-Moussawi, A. A. (2016). Nematodes of the Turkey *Meleagris gallopavo* (Galliformes: Phasianidae) from Al-Nasiryah, Iraq. *Journal of Biodiversity and Environmental Sciences*, 8 (4), 126–131.
- Amundson, C. L., Traub, N. J., Smith-Herron, A. J., & Flint, P. L. (2016). Helminth community structure in two species of arctic-breeding waterfowl. *International Journal for Parasitology: Parasites and Wildlife*, 5 (3), 263–272. <https://doi.org/10.1016/j.ijppaw.2016.09.002>
- Yevstafiyeva, V. A., Melnychuk, V. V., Nikiforova, O. V., Suprunenko, K. V., Korchan, L. N., Lokes-Krupka, T. P., Nehrebetskyi, I. S., & Korchan, N. I. (2018). Comparative morphology and biology of nematodes of genus *Heterakis* (Nematoda, Heterakidae), parasites of the domestic goose (*Anser anser*) in Ukraine. *Regulatory Mechanisms in Biosystems*, 9 (2), 229–236. <https://doi.org/10.15421/021834>
- Kaufmann, F., Daş, G., Sohnrey, B., & Gaulty, M. (2011). Helminth infections in laying hens kept in organic free range systems in Germany. *Livestock Science*, 141 (2–3), 182–187. <https://doi.org/10.1016/j.livsci.2011.05.015>
- Ogbaje, C. I., Agbo, E. O., & Ajanusi, O. J. (2012). Prevalence of *Ascaridia galli*, *Heterakis gallinarum* and tapeworm infections in birds slaughtered in Makurdi Township. *International Journal of Poultry Science*, 11 (2), 103–107. <https://doi.org/10.3923/ijps.2012.103.107>
- Phiri, I. K., Phiri, A. M., Ziela, M., Chota, A., Masuku, M., & Monrad, J. (2007). Prevalence and distribution of gastrointestinal helminths and their effects on weight gain in free-range chickens in Central Zambia. *Tropical Animal Health and Production*, 39 (4), 309–315. <https://doi.org/10.1007/s11250-007-9021-5>

7. Tompkins, D. M., Greenman, J. V., Robertson, P. A., & Hudson, P. J. (2000). The role of shared parasites in the exclusion of wildlife hosts: *Heterakis gallinarum* in the ring-necked pheasant and the grey partridge. *Journal of Animal Ecology*, 69 (5), 829–840. <https://doi.org/10.1046/j.1365-2656.2000.00439.x>
8. *Heterakis gallinarum* (Schränk, 1788) Madsen, 1949 in GBIF Secretariat. *GBIF Backbone Taxonomy*. <https://doi.org/10.15468/39omei>
9. Van, N. T. B., Cuong, N. V., Yen, N. T. P., Nhi, N. T. H., Kiet, B. T., Hoang, N. V., Hien, V. B., Thwaites, G., Carrique-Mas, J. J., & Ribas, A. (2019). Characterisation of gastrointestinal helminths and their impact in commercial small-scale chicken flocks in the Mekong Delta of Vietnam. *Tropical Animal Health and Production*, 52 (1), 53–62. <https://doi.org/10.1007/s11250-019-01982-3>
10. Bobrek, K., & Gawel, A. (2020). Prevalence of *Heterakis* infection in parental flocks of geese. *Avian Diseases*, 64 (4), 552–555. <https://doi.org/10.1637/0005-2086-64.4.552>
11. Tomza-Marciniak, A., Pilarczyk, B., Tobińska, B., & Tarasewicz, N. (2014). Gastrointestinal parasites of free-range chickens. *Annals of Parasitology*, 60 (4), 305–308.
12. Shifaw, A., Feyera, T., Walkden-Brown, S. W., Sharpe, B., Elliott, T., & Ruhne, I. (2021). Global and regional prevalence of helminth infection in chickens over time: a systematic review and meta-analysis. *Poultry Science*, 100 (5), 101082. <https://doi.org/10.1016/j.psj.2021.101082>
13. Wuthijaree, K., Lambert, C., & Gauly, M. (2017). Prevalence of gastrointestinal helminth infections in free-range laying hens under mountain farming production conditions. *British Poultry Science*, 58 (6), 649–655. <https://doi.org/10.1080/00071668.2017.1379049>
14. Wongrak, K., Daş, G., Moors, E., Sohnrey, B., & Gauly, M. (2014). Establishment of gastro-intestinal helminth infections in free-range chickens: a longitudinal on farm study. *Berliner und Münchener Tierärztliche Wochenschrift*, 127 (7-8), 314–321.
15. Sherwin, C. M., Nasr, M. A. F., Gale, E., Petek, M., Stafford, K., Turp, M., & Coles, G. C. (2013). Prevalence of nematode infection and faecal egg counts in free-range laying hens: relations to housing and husbandry. *British Poultry Science*, 54 (1), 12–23. <https://doi.org/10.1080/00071668.2012.757577>
16. Gicik, Y., & Arslan, M. Ö. (2003). The prevalence of helminths in the alimentary tract of geese (*Anser anser domesticus*) in Kars District, Turkey. *Veterinary Research Communications*, 27 (5), 391–395. <https://doi.org/10.1023/a:1024710221179>
17. Fedynich, A. M., Finger, R. S., Ballard, B. M., Garvon, J. M., & Mayfield, M. J. (2005). Helminths of ross' and greater white-fronted geese wintering in South Texas, U.S.A. *Comparative Parasitology*, 72 (1), 33–38. <https://doi.org/10.1654/4159>
18. Yevstafieva, V. O., & Mykhailiutenko, S. M. (2011). Poshyrennia kyshkovykh nematodoziv husei u hospodarstvakh Poltavskoi oblasti. *Visnyk Poltavskoi Derzhavnoi Ahrarnoi Akademii*, 4, 91–93. [in Ukrainian]
19. Mykhailiutenko, S. M. (2012). Poshyrennia kyshkovykh nematodoziv husei u pryvatnykh hospodarstvakh Poltavskoi oblasti. *Visnyk Zhytomyrskoho Natsionalnoho Ah-Roekolohichnoho Universytetu*, 1 (3(1)), 87–90. [in Ukrainian]
20. Yeresko, V. I., & Kovalenko, V. O. (2017). Capillariasis as a part of mixtinvasions of the digestive tract of geese. *Bulletin of Poltava State Agrarian Academy*, 4, 143–145. <https://doi.org/10.31210/visnyk2017.04.29>
21. Yevstafieva, V., Yeresko, V., Melnychuk, V., & Bakhur, T. (2020). Prevalence and co-infection of *Baruscapillaria* genus (Nematoda, Capillariidae) in domestic geese in Ukraine. *Folia Veterinaria*, 64 (1), 32–38. <https://doi.org/10.2478/fv-2020-0005>

ORCID

- O. Omelchenko  <https://orcid.org/0009-0003-2012-1563>
 V. Yevstafieva  <https://orcid.org/0000-0003-4809-2584>



2023 Omelchenko O. and Yevstafieva V. This is an open-access article distributed under the Creative Commons Attribution License <http://creativecommons.org/licenses/by/4.0>, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.