

INFECTIOUS DISEASES AND ANIMAL IMMUNOLOGY

ИНФЕКЦИОННЫЕ БОЛЕЗНИ И ИММУНОЛОГИЯ ЖИВОТНЫХ



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Monitoring Chicken Infectious Diseases in the Krasnodar Territory and the Republic of Adygea

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Abstract

Introduction. One of the major goals set before the agro-industrial complex is to supply the population of the Russian Federation with the high-quality raw materials and products of animal husbandry. Therefore, poultry farms are implementing modern technologies of intensive poultry farming and carry out regular prophylactic work to ensure epizootological safety of poultry rearing. To make these measures effective, it is necessary to specify the diseases typical for poultry in different regions of the country. The aim of the research is to study and analyse the pathogens isolated from pathological material from chickens reared in the Krasnodar Territory and the Republic of Adygea for planning the effective anti-epizootic, preventive and therapeutic measures.

Materials and Methods. The objects of the study were chickens from the poultry farms of the Krasnodar Territory and the Republic of Adygea and biological material from dead birds (pathological material). In total, 2018 samples were examined during the period of 2019–2023. The research was carried out using a range of methods (epizootological, clinical, pathoanatomical, bacteriological, serological) based on the commonly accepted techniques.

Results. During a five-year research period, 5 pathogens of infectious diseases were isolated from the pathological material obtained from chickens reared in the Krasnodar Territory and the Republic of Adygea (*E. coli*, *E. faecalis*, *St. aureus*, *Str. pneumoniae*, *S. pullorum*), both pure culture and mixed culture. 26 serotypes of *E. coli* pathogen were isolated from chickens. Whereas, percentage of escherichiosis detected in chickens in the Krasnodar Territory and the Republic of Adygea equaled to 41.43%; enterococcosis — to 26.51%; staphylococcal infection — to 18.11%; streptococcosis — to 12.29 %; salmonellosis — to 0.1%; mixed (escherichiosis and enterococcosis) infection — to 1.64%.

Discussion and Conclusion. Based on the conducted monitoring, it can be concluded that at poultry farms of the Krasnodar Territory and the Republic of Adygea the current situation with the infectious diseases in chickens has improved compared to that five years ago, however, the percentage of escherichiosis, streptococcosis, staphylococcosis and enterococcosis morbidity in poultry is still quite high. Therefore, we recommend the management of the farms to plan the anti-epizootic measures aimed at timely prevention of the above mentioned infectious diseases.

Keywords: poultry, chickens, bacteriological research, infectious diseases, monitoring, pathological material, Krasnodar Territory, Republic of Adygea

Declaration of Compliance with the Principles of the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes: the authors declare that all research was conducted in compliance with the principles of Good Laboratory Practice.

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Мониторинг инфекционных болезней кур в Краснодарском крае и в Республике Адыгея

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Аннотация

Введение. Одной из основных задач агропромышленного комплекса является обеспечение населения Российской Федерации доброкачественным сырьем и продуктами животноводства. Для этого на птицеводческих предприятиях внедряют современные технологии ведения интенсивного птицеводства, проводят регулярные профилактические работы по обеспечению эпизоотологической безопасности выращивания птицы. Чтобы эти мероприятия были эффективными, необходимо знать, какие заболевания характерны для птицы в разных регионах страны. Целью данной работы является изучение и анализ выделенных патогенов из патологического материала от кур, выращенных в Краснодарском крае и в Республике Адыгея, для планирования эффективных противоэпизоотических, профилактических и лечебных мероприятий.

Материалы и методы. Объектом исследования были куры птицеводческих предприятий Краснодарского края и Республики Адыгея и биологический материал от павшей птицы (патматериал). Всего в период 2019–2023 гг. было исследовано 2018 проб. При проведении исследований использовали комплекс методов (эпизоотологические, клинические, патологоанатомические, бактериологические, серологические), которые осуществляли по общепринятым методикам.

Результаты исследования. Из поступившего патматериала от кур, выращенных в Краснодарском крае и в Республике Адыгея, за пятилетний период исследования было выделено 5 патогенов инфекционных болезней (*E. coli*, *E. faecalis*, *St. aureus*, *Str. pneumoniae*, *S. pullorum*), как в чистом виде, так и в виде ассоциации с другими микробами. Из патогенных *E. coli* у птицы выделено 26 серотипов. При этом выявленный эшерихиоз у кур в Краснодарском крае и в Республике Адыгея составил 41,43 %; энтерококкоз — 26,51 %; стафилококковая инфекция — 18,04 %; стрептококкоз — 12,29 %, сальмонеллез — 0,1 %, смешанная инфекция (эшерихиоз и энтерококкоз) — 1,64 %.

Обсуждение и заключение. На основании проведенного мониторинга можно заключить, что в настоящее время ситуация с инфекционными заболеваниями кур на птицеводческих предприятиях Краснодарского края и Республики Адыгея улучшилась по сравнению с предыдущими годами, однако процент заболевания птицы эшерихиозом, стрептококкозом, стафилококкозом и энтерококкозом остается весьма высоким. В связи с этим рекомендуем руководству хозяйств запланировать противоэпизоотические мероприятия, направленные на своевременную профилактику и лечение указанных инфекционных болезней.

Ключевые слова: птица сельскохозяйственная, куры, бактериологические исследования, инфекционные болезни, мониторинг, патматериал, Краснодарский край, Республика Адыгея

Декларация о соблюдении принципов Европейской конвенции о защите позвоночных животных, используемых для экспериментов и других научных целей: авторы заявляют, что все проведенные исследования соответствовали принципам конвенции и правилам надлежащей лабораторной практики.

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Introduction. One of the main objectives of the agro-industrial complex is supplying the population of the Russian Federation with the high-quality raw materials and products of animal husbandry. In the frame of this activity, poultry farms are implementing innovative technologies of intensive poultry farming, as well as carry out regular prophylactic work to ensure epizootological safety of poultry rearing. The most dangerous infectious diseases for chickens are tuberculosis, Newcastle disease, leucosis,

escherichiosis, avian influenza, infectious laryngotracheitis, Marek's disease and others. In case of outbreak, these diseases cause mass poultry mortality inducing major economic damage to the poultry industry.

In recent years, the interest of the researchers to animal diseases caused by opportunistic microflora has raised [1, 2, 3]. In the context of decreased resistance of the organism to infection, violation of veterinary, animal hygiene, sanitary rules for rearing animals, there occur

diseases caused by concomitant microflora — streptococcosis, staphylococcosis, escherichiosis, enterococcosis, salmonellosis [4, 5]. According to the data obtained by many researchers, agricultural poultry can infect other species of animals, as well as humans, therefore, it is necessary to conduct timely monitoring of microbes and detect pathogenic species to prevent infected products from reaching animals and people [6, 7, 8]. The use of antibiotics for treatment of sick animals without checking their efficacy against the isolated microorganisms, violation of the dosage and course of therapy lead to rapid adaptation of microbes to unfavourable factors and emergence of the new variants of pathogens, especially of *E. coli*. Therefore, to prevent infectious diseases, the mandatory action plan of each poultry farm should include quick high-quality diagnostics and various veterinary and sanitary procedures to prevent contamination of animal husbandry raw materials and infecting susceptible animals and people [9, 10]. *The aim of the article* is to study and analyse the pathogens isolated from pathological material from chickens reared in the Krasnodar Territory and the Republic of Adygea to ensure efficient organisation of the anti-epizootic, preventive and therapeutic measures.

Materials and Methods. The research was conducted at the Department of Microbiology, Epizootology and Virology Department, at Territory-level Veterinary Laboratory of Kropotkin and at various poultry farms of the Krasnodar Territory and the Republic of Adygea in the period of 2019–2023. The objects of the study were agricultural poultry (chickens) and isolates of microorganisms (pathological material) from sick and dead birds. A total of 2018 samples were examined. A comprehensive examination was carried out taking into account the epizootological indicators, clinical signs in poultry, pathological changes and the results of laboratory tests as per the isolated pathogen.

Laboratory diagnostics was based on the use of bacteriological tests that enable the isolation of a pathogen, its identification, determination of the type, serotype, pathogenicity of a microorganism [11–14]. The diagnostics was carried out in compliance with the current regulatory documents adopted by the Veterinary Authorities of the Russian Federation on bacteriological methods of examining the pathological material (from the heart, liver, spleen, intestinal contents, bone marrow) obtained from fallen and forcibly killed birds.

The study on the isolation of the pathogen of colibacillosis (escherichiosis) was carried out in compliance with the “Methodological Guidelines for the Bacteriological Diagnostics of Colibacillosis (Escherichiosis) in Animals”, approved on July 27, 2000 by the Deputy Head of the Veterinary Medicine Department of the Ministry of Agriculture and Food of the Russian Federation.

The study on enterococcosis and mixed intestinal infection was carried out in compliance with the “Methodological Guidelines for the Bacteriological Diagnostics of Mixed Intestinal Infection in Young Animals Caused by Pathogenic Enterobacteria” No. 13-7-2/1759 of October 11, 1999 adopted by the Veterinary Medicine Department of the Ministry of Agriculture and Food of the Russian Federation.

The study on staphylococcosis was carried out in compliance with the “Methodological Guidelines for Laboratory Diagnostics of Staphylococcosis in Animals” approved on June 30, 1987 by the Head of the Main Veterinary Directorate of the State Agro-Industrial Committee of the USSR.

The study on the isolation of pathogens of streptococcosis was carried out in compliance with the “Methodological Guidelines for Laboratory Diagnostics of Streptococcosis in Animals” approved on September 25, 1990 by the Deputy Head of the Main Veterinary Directorate with the State Veterinary Inspectorate under the State Commission of the USSR Council of Ministers for Food and Procurement.

For the study on salmonellosis, “Methodological Guidelines MU 4.2.2723–10 for Laboratory Diagnostics of Salmonellosis, Detection of Salmonella in Food Products and Environmental Objects” published by the Federal Centre for Hygiene and Epidemiology of Rospotrebnadzor in 2011 was used.

Standard laboratory equipment was used to conduct the research: a thermostat at 37 °C, and a microscope (“Biolam”, Russia) [15, 16]. Bacteriological tests included determination of the morphological, tinctorial, bacteria culture, and serological indicators in the isolated microorganisms [17–20].

The epizootic situation was assessed based on the analysis of disease outbreaks registered in the record books of the farms.

Research Results. During laboratory study of the pathological material from poultry from the various farms of the Krasnodar Territory and the Republic of Adygea in the period of 2019–2023, 5 pathogens of infectious diseases were isolated: escherichiosis (*E. coli*), enterococcosis (*E. faecalis*), staphylococcosis (*St. aureus*), streptococcosis (*Str. pneumoniae*), mixed microflora (*E. coli*, *E. faecalis*), salmonellosis (*S. pullorum*) (Fig. 1, Table 1).

A significant number of different *E. coli* serotypes are known. Intestinal bacterium (*E. coli*) has different types of antigens: O-antigen (somatic), K-antigen (capsular), H-antigen (flagellar), some of them are pathogenic, others are non-pathogenic. Of the pathogenic *E. coli* from chickens, 26 serotypes of somatic O-antigen were isolated, the most common were serotypes 1, 2, 9, 15, 20, 27, 33, 45, 55, 78, 139 (Fig. 2, Table 2).

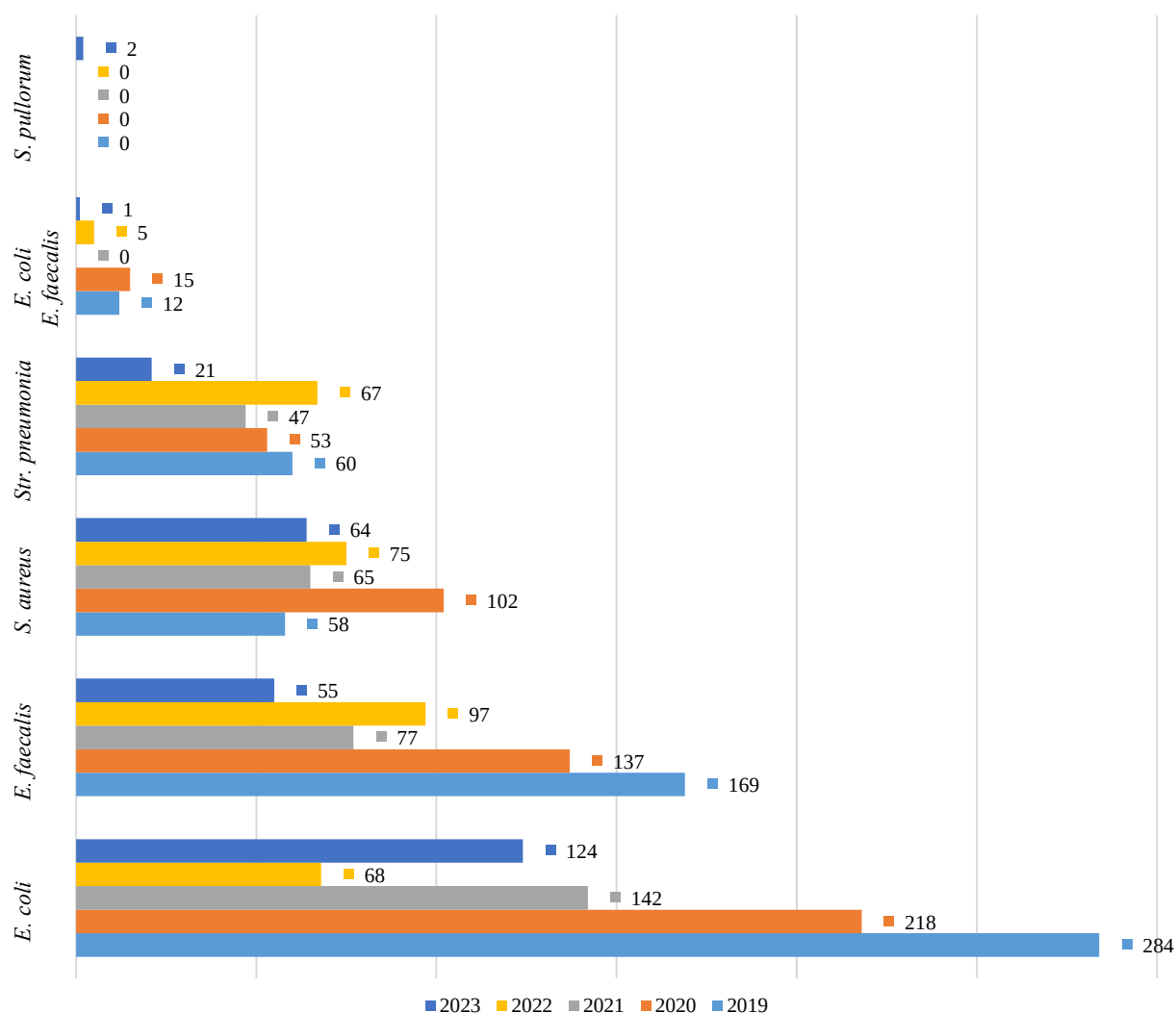


Fig. 1. Dynamics of pathogen isolation from chickens reared in the Krasnodar Territory and the Republic of Adygea in the period of 2019–2023

Table 1

Monitoring cases of infectious diseases in chickens in the Krasnodar Territory and the Republic of Adygea in the period of 2019–2023

No	Title	2019		2020		2021		2022		2023		Total	
		num ber	%*	num ber	%*	num ber	%*	num ber	%*	num ber	%*	num ber	%*
1.	Escherichiosis	284	48,54	218	41,52	142	42,90	68	21,79	124	46,79	836	41,43
2.	Enterococcosis	169	28,88	137	26,09	77	23,26	97	31,08	55	20,75	535	26,51
3.	Staphylococcosis	58	9,91	102	19,42	65	19,63	75	24,03	64	24,15	364	18,04
4.	Streptococcosis	60	10,25	53	10,09	47	14,19	67	21,47	21	7,92	248	12,29
5.	Escherichiosis + enterococcosis	12	2,05	15	2,85	0	0	5	1,6	1	0,37	33	1,64
6.	Salmonellosis	2	0,34	0	0	0	0	0	0	0	0	2	0,1
Total		585	18,28	525	26,01	331	16,40	312	15,46	265	13,13	2018	100,0

Note: * — percentage of the total number of samples tested (n=2018)

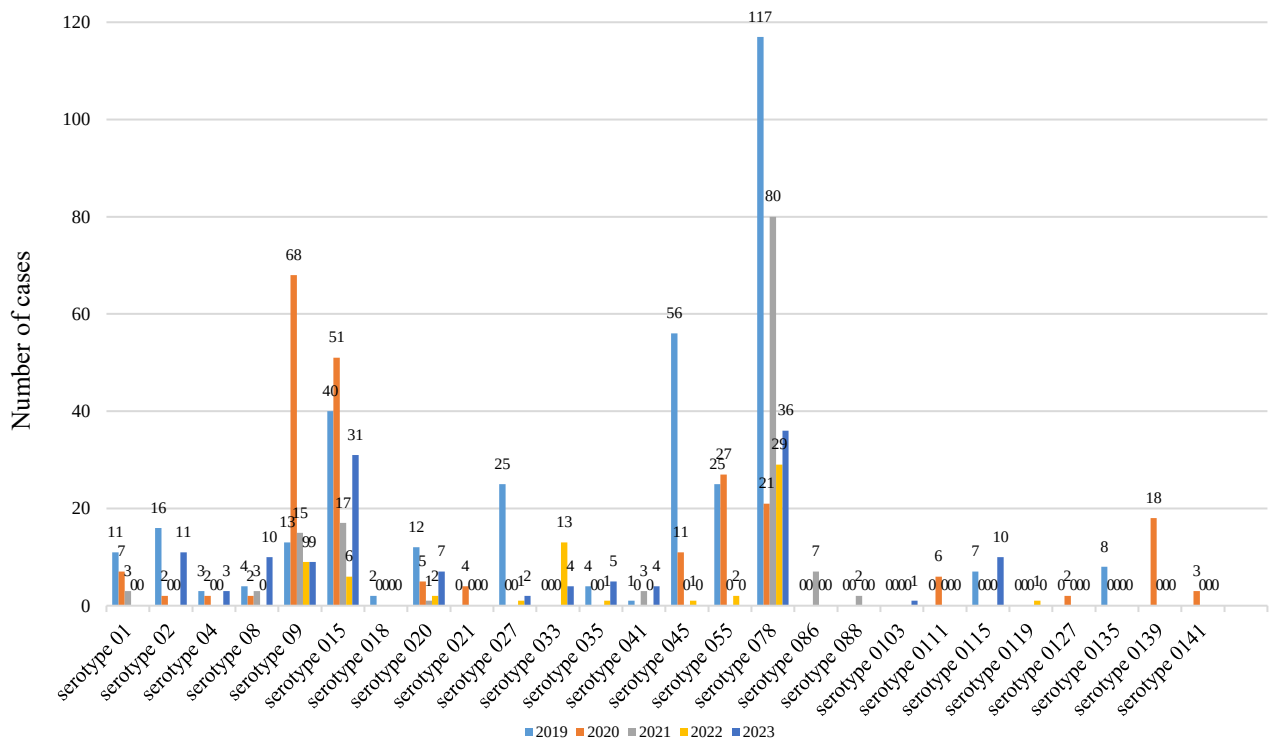


Fig. 2. Dynamics of isolated *E. coli* serotypes from pathological material from chickens reared in the Krasnodar Territory and the Republic of Adygea in the period of 2019–2023.

Table 2
Isolated *E. coli* serotypes from pathological material from chickens reared in the Krasnodar Territory and the Republic of Adygea in the period of 2019–2023

	<i>E. coli</i> Serotypes	2019		2020		2021		2022		2023		Total	
		Numb er	%*	Numb er	%**	Numb er	%***	Numb er	%****	Numb er	%*****	Numb er	%
1.	01	11	3,87	7	3,21	3	2,01	0	0	0	0	21	2,22
2.	02	16	5,63	2	0,91	0	0	0	0	11	9,01	18	1,9
3.	04	2	0,70	0	0	0	0	0	0	3	2,45	10	1,05
4.	08	4	1,40	0	0	3	2,01	0	0	10	8,19	22	2,32
5.	09	13	4,57	68	31,19	15	10,06	9	13,23	9	7,37	114	12,05
6.	015	40	14,08	51	23,39	17	11,40	6	8,82	31	25,40	145	15,32
7.	018	2	0,70	0	0	0	0	0	0	0	0	2	0,21
8.	020	12	4,22	5	2,29	1	0,67	2	2,94	7	5,73	27	2,85
9.	021	0	0	4	1,83	0	0	0	0	0	0	4	0,42
10.	027	5	1,76	0	0	0	0	1	1,47	2	1,63	28	2,96
11.	033	0	0	0	0	0	0	13	19,11	4	3,27	17	1,8
12.	035	4	1,40	0	0	0	0	1	1,47	0	0	5	0,53
13.	041	1	0,35	0	0	0	0	3	4,41	0	0	4	0,42
14.	045	26	9,15	0	0	11	7,38	1	1,47	0	0	68	7,19
15.	055	25	8,80	27	12,38	0	0	2	2,94	0	0	54	5,7
16.	078	115	40,49	21	9,63	80	53,69	29	42,64	36	29,50	342	36,15
17.	086	0	0	0	0	7	4,69	0	0	0	0	7	0,73
18.	088	0	0	0	0	2	1,34	0	0	0	0	2	0,21
19.	0103	0	0	0	0	0	0	0	0	1	0,81	1	0,10
20.	0111	0	0	6	2,75	0	0	0	0	0	0	6	0,63
21.	0115	0	0	7	3,21	0	0	0	0	10	8,19	17	1,8
22.	0119	0	0	0	0	0	0	1	1,47	0	0	1	0,10
23.	0127	0	0	2	0,91	0	0	0	0	0	0	2	0,21
24.	0135	8	2,81	0	0	0	0	0	0	0	0	8	0,84

	<i>E. coli</i> Serotypes	2019		2020		2021		2022		2023		Total	
		Number	%*	Number	%**	Number	%***	Number	%****	Number	%*****	Number	%
25.	0139	0	0	18	8,25	0	0	0	0	0	0	18	1,9
26.	0141	0	0	0	0	3	2,01	0	0	0	0	3	0,31
Total		284	30,02	218	23,04	149	15,75	68	7,18	122	12,89	946	100

Note: * — percentage of the total number of cases of escherichiosis in 2019 (n=284)

** — percentage of the total number of cases of escherichiosis in 2020 (n=218)

*** — percentage of the total number of cases of escherichiosis 2021 (n=149)

**** — percentage of the total number of cases of escherichiosis in 2022 (n=68)

***** — percentage of the total number of cases of escherichiosis in 2023 (n=122)

The pathogenic microorganisms *E. coli*, *E. faecalis*, *St. aureus*, *Str. pneumoniae*, *S. pullorum* detected as a result of monitoring, both pure culture and mixed culture with other microbes, caused the following infectious diseases in chickens: escherichiosis (41.43%), enterococcosis (26.51%), staphylococcosis (18.04%), streptococcosis (12.29%), mixed intestinal infection (escherichiosis and enterococcosis) — 1.64%, salmonellosis (0.1%).

Discussion and Conclusion. Based on the results of the conducted monitoring, a tendency towards improvement of the epizootic situation at poultry farms of the Krasnodar Territory and the Republic of Adygea can be noted compared to the situation five years ago. Nevertheless, the percentage of chickens infected with escherichiosis, streptococcosis, staphylococcosis and

enterococcosis remains quite high. Due to high variability of the pathogen causing escherichiosis (*E. Coli*) (26 serotypes have been isolated over the past 5 years), it can infect humans through raw materials and products of animal husbandry. In this regard, the management of poultry farms is strongly recommended to take timely measures on diagnostics and prophylaxis of the above infectious diseases, as well as to treat poultry located in the unfavorable places after mandatory determination of the isolated pathogenic microorganisms' sensitivity to antibiotics. At the same time, the biological features of these types of microbes must be taken into account when developing the efficient technology for rearing poultry and animals at poultry and husbandry farms.

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LV Shevchenko: developing the concept, conducting research.

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