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**EPIDEMIOLOGICAL FEATURES OF THE
MEASLES IN KIROVOGRAD REGION
in 2004 – 2015**

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Introduction. The incidence of measles in Ukraine remains an actual problem. Measle is related to vaccine - controlled infections. However, low levels of immunization of the child population by planned measles vaccine, insufficient provision of immunobiological drugs (vaccines) in recent years, anti-vaccine companies contribute to the increase of the measles morbidity in Ukraine [1].

Prominent scientist L.V. Gromashevsky spoke about measles, which is a "disease of unique distribution". All humans who did not suffer of the measles and did not have protective post vaccine immunity are susceptible to measles. High contagion of the measles is observed in the presence of a receptive team. The susceptibility index reaches 95-96% and the natural susceptibility to 100% [2]. In the implementation of the Program for the elimination of measles, an important role is assigned to laboratory diagnostics as an integral part of epidemiological surveillance, which assures laboratory confirmation of all cases of measles disease. Only the availability of objective laboratory data will allow evidence of measles elimination in each specific territory under the Elimination Program. To obtain such information, a laboratory network has been set up in Ukraine (virusological laboratories in each oblast laboratory center and the National Laboratory for the diagnosis of measles and rubella of the Ministry of Health of Ukraine).

Observation, monitoring of the circulation of measles viruses is one of the main tasks of these laboratories. Laboratory diagnosis of the measles is necessary and important for confirmation of cases of measles (confirmation or cancellation of all suspicious, probable cases); confirmation of clinical diagnoses at an early stage of the development of the outbreak; confirmation of flashes; the identification of the strains of the virus and the genetic characteristics of the viral isolates. Laboratory confirmation of each suspected, probable case of measles during the implementation of the Program for the elimination of measles is important in the context of an increase in the proportion of immunization and reduced morbidity, the presence of light, erased and atypical forms of measles. The importance of laboratory diagnosis is necessary for differential diagnosis with other exanthemas' diseases with rash and fever [3, 4].

The purpose of the study: to analyze the peculiarities of the epidemic situation of measles in the Kirovograd region, the state of laboratory diagnosis of measles.

Materials and methods: Data from the official statistical reporting of the state institution "Kirovograd

Regional Laboratory Center of the Ministry of Health of Ukraine" (forms №1, № 2, № 40), demographic annual indicators of the State Statistics Service of Ukraine and the Main Department of Statistics in Kirovograd region.

Results and discussion: The epidemiological analysis of measles incidence in the Kirovograd region in the period 2004-2015 and the results of laboratory diagnosis of cases in measles in this period of observation have been carried out.

The peculiarities of manifestation of the epidemic process of measles in the Kirovograd region require a detailed study also because Kirovograd region is the only region in Ukraine with rich natural reserves of uranium ore. The presence of uranium raw materials on the territory of the region in turn increases the natural radiation background. Uranium-mining enterprises are located and operate on the territory of the region. The technological process of which enhances natural ionizing radiation technogenously. The effect of technogenic contamination by natural radionuclide of the environment and the increased natural radiation background on the human immune state, as well as the manifestations of the epidemic process of the measles, the influence on the properties of viruses, including virus of measles, is not excluded.

The information from the official state statistical forms on infectious diseases and their laboratory diagnostics in the Kirovograd region (reporting form №1, №2 and №40), data of demographic indicators of the State Statistics Service and the Main Department of Statistics in the Kirovograd region were used in this topic.

From 2004 to 2015, the incidence of measles in Ukraine ranged from 0.06 (2009) to 90.7 per 100 thousand population (2006). During this period, there were two peaks of the measles in Ukraine: in 2006 - 90.7 per 100 thousand and in 2012 - 27.9 per 100 thousand populations. During 2007-2010, the incidence of measles in Ukraine gradually decreased (2.15, 0.11, 0.06, and 0.08 per 100 thousand populations, respectively). The decrease in measles was observed in all age groups, both among urban and rural populations. In 2011 the incidence rate for measles in Ukraine increased by 36.3 times compared to 2010 and amounted to 2.94 and 0.08 per 100 thousand population), with the incidence rate among children under 17 years old rising 83 times (11, 63 per 100 thousand population in 2011 against 0.14 per 100 thousand population in 2010).

The dynamics of measles morbidity in the Kirovograd region for the period 2004-2015 is characterized by unstable levels. The trend of the morbidity of the population of the region repeats the course of measles morbidity in Ukraine with a slight decrease or excess. In this period, the incidence rates of the Kirovograd region were lower than the Republican figures in 2005 (by 49%); 2007 (by 67%); 2008 (by 9.0%); 2011 (by 76%); 2013 (by 67%) according to similar indicators in Ukraine. In 2010 and 2015, the incidence of measles in the Kirovograd region was not recorded. In all other years of the observation period, the incidence rates of measles in the Kirovograd region were higher than in Ukraine as a whole. In the region, one peak of the incidence of growth was observed in 2006, when the

incidence rate in the Kirovograd region (147.9 per 100 thousand populations) exceeded the similar indicator in Ukraine (90.7 per 100 thousand populations) in 1, 63 times.

According to the state statistical reporting on the results of the 12 months of 2006, the Kirovograd region ranked 5th in Ukraine in terms of measles incidence, yielding only Kiev (220.5 per 100 thousand population), Vinnitsa region (182.8 per 100 thousand population), Kiev region (161.5 per 100 thousand population), Rivne region (156.3 per 100 thousand population) and Ivano-Frankovsk region (155.0 per 100 thousand population). The Kirovograd oblast's index was 147.9 per 100 thousand populations with an average in Ukraine of 90.7 per 100

thousand populations.

A retrospective analysis of measles morbidity in the Kirovograd region was conducted in the period from 2004 to 2015. During this time, 1,741 inhabitants of the region suffered from measles, including - 472 (21, 1%) children and 1269 (78,9%) adults. If the share of children's population in the overall incidence of measles in the Kirovograd oblast amounted to 85.7% in 2007; in 2013 - 62.5%; in 2005 - 53,6%; then in 2006 - 25.2%; in 2011 - 28.6%; in 2014 - 36.8%. In 2008-2009, the incidence of measles among the children population was not recorded at all, with an intensive indicator of measles incidence in the region of 0.1 per 100 thousand populations and 0.2, respectively (Table 1).

Table 1. Incidence of measles in children and adults in Ukraine and Kirovograd region in the period 2004 -2015 (per 100 thousand populations)

Years	Ukraine				Kirovograd region			
	The all population		Children		The all population		Children	
	Abs.	Per 100 thous.	Abs.	Per 100 thous.	Abs.	Per 100 thous.	Abs.	Per 100 thous.
2004	146	0,31	51	0,68	3	0,3	1	0,53
2005	2392	5,08	340	4,6	28	2,6	15	13,57
2006	42724	90,7	9346	133,7	1578	147,9	398	242,6
2007	1005	2,15	383	5,6	7	0,7	6	3,82
2008	48	0,11	20	0,3	1	0,1	0	0
2009	30	0,06	0	0	2	0,2	0	0
2010	39	0,08	12	0,1	0	0	0	0
2011	1333	2,91	940	11,6	7	0,7	2	1,13
2012	12746	27,9	7931	99,1	34	3,4	14	7,9
2013	3309	7,28	2266	28,4	24	2,4	15	8,6
2014	2303	5,13	1599	20,1	57	5,8	21	12,1
2015	105	0,24	76	1,0	0	0	0	0
Total	66180		22964		1741		472	

The laboratories confirmation of a clinical diagnosis in the early stages of the development of the outbreak improving the effectiveness of epidemiological surveillance of the measles promotes. 214 samples of blood serums from patients with suspected measles and a clinical diagnosis of "Measles" were received to the virusological laboratory of the Kirovograd Regional Laboratory, accounting for 12.3% of all reported cases of measles in the period 2004-

2015. Sampling Blood serum for ELISA testing was conducted in accordance with WHO recommendations. 214 samples (100%) were investigated for the detection of antibodies to the IgM class of the virus of the measles. In the study of blood serum antibodies of the class IgM found in 42.5% (91 people). In 57.5% (150 people), no specific antibodies to the measles virus were detected. Data on examined patients with measles are given in Table 2.

Table2. Resultsofthe laboratory confirmation of measles in the Kirovograd region in the period 2004-2015.

Years	The number of cases of measles (abs.)	Numberoflaboratories surveyed persons		Of these, with laboratory confirmation		The proportion of laboratory confirmed cases of measles (%)
		Abs.	%	Abs.	%	
2004	3	-	-	-	-	-
2005	28	-	-	-	-	-
2006	1578	99	6,3	30	30	1,9
2007	7	7	100	2	28,6	28,6
2008	1	1	100	1	100	100
2009	2	2	100	-	-	-
2010	0	-	-	-	-	-
2011	7	7	100	2	28,6	28,6
2012	34	34	100	30	88,2	88,2

2013	24	22	91,6	9	40,9	37,5
2014	57	42	73,7	17	40,5	30
2015	0	-	-	-	-	-
Total	1741	214	12,3	91	42,5	5,2

The share of laboratory confirmed cases of measles (detected Ig class antibodies to the measles virus) in the context of the administrative territories of the Kirovograd

region in the period from 2004 to 2015 is shown in Figure 1.

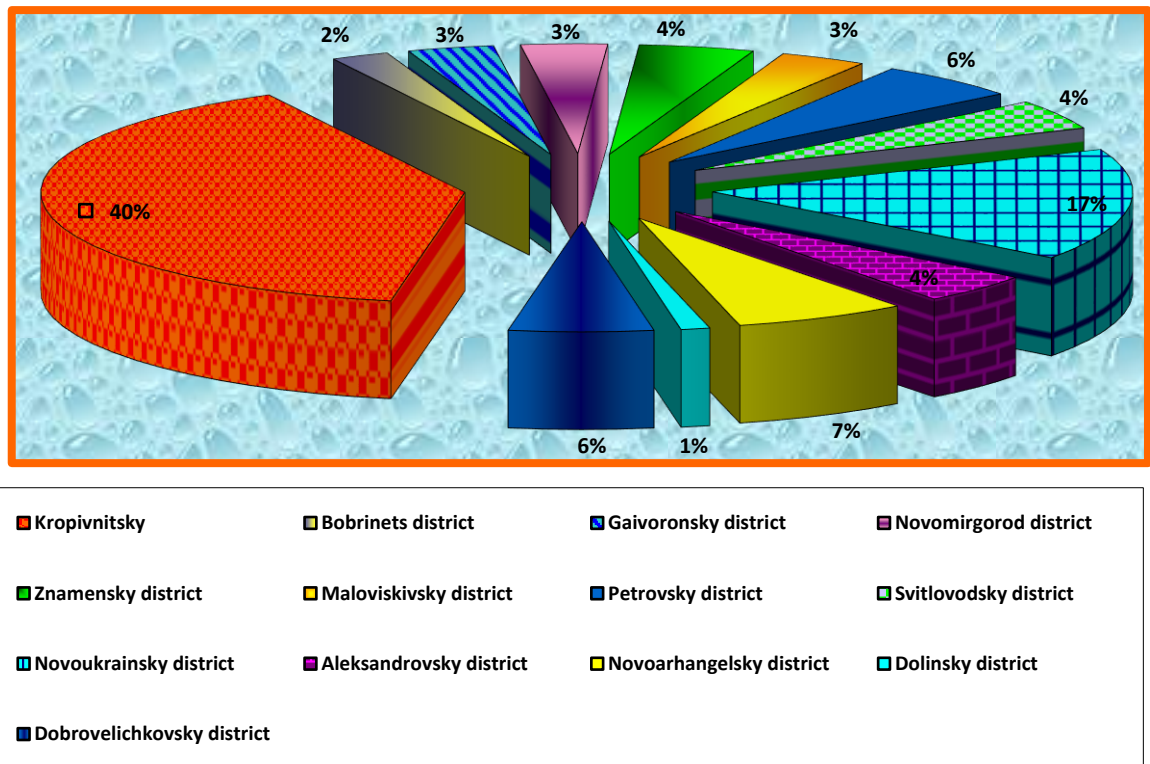


Figure 1. The share of laboratory confirmed cases of measles in the context of administrative territories of the Kirovograd region in 2004-2015.

In the research areas where nuclear facilities are located and operated, the proportion of laboratory confirmed cases of measles ranged from 41% in Kropivnitskiy to 3% in Maloviskivskiy district.

Implementation of the Program for the Elimination of Bark and Rubella in Ukraine requires effective laboratory control of virus circulation, which includes the definition of their genotypes in all administrative territories of the country. Serologically, the pathogen of the measles refers to monotype viruses, but the analysis of the sequences of RNA isolates showed that there are several excellent variants that circulate in certain areas. The genotyping of isolated strains allows finding the source, pathways of infection, to be identified local and imported cases [6].

The genotypes circulating in the Kirovograd region were determined only in 2013. For this purpose, 16 samples urine and 14 isolates of viruses (including 2 isolates from seven-year-old children from the Kirovograd region, Dobrovelichkivka village of Dobrovelichkovsky district) were delivered from Ukraine in 2013 to the

Regional Reference Laboratory of the WHO (G. M. Gabrichevsky Institute of Epidemiology and Microbiology, Moscow). According to the results of the study, 2 genotypes of D4 of the measles virus genotype were determined in Kirovograd region.

Isolated in the Kirovograd region strains of virus cortex genotype D4 belong to the genetic line "MVs / Manchester. GBR / 10.09 / [D4]", as well as isolates from the Autonomous Republic of Crimea, Volyn, Dnepr, Donetsk, Zaporozhe, Lvov, Odessa, Khmel'nitskyi oblasts and Kyiv. These strains of virus viruses were actively circulating in 2013 in Western Europe (Germany, France, Italy, Greece, Romania, Croatia, etc.).

In the Kirovograd oblast, as well as in Ukraine as a whole, coverage of vaccination of children at the age of 1 at 95% and above was achieved only in 2004, 2005 and 2006 (98.9%, 96.8%, 96.9% respectively), and the coverage of children at the age of 6 years with two doses of the vaccine did not reach the level of 95% in any year of the observation period (2004-2015).

The levels of immunization against the measles

population in the Kirovograd region since 2009 were insufficient and below 95%. The plan for vaccination against measles in children in 1 year is fulfilled: on 75,9% (2009), 52,8 (2010); 62.3% (2011); 89, 8% (2012); 80.7% (2013); 86.5% (2014); to 39.6% (2015). The implementation of the revaccination plan for children 6 years of age is secured by 71.6% (2009); 31, 5% (2010); 31.0% (2011); 89.2% (2012); 77.9% (2013); 73.0% (2014); 27.4% (2015).

The volume of coverage of preventive vaccinations of the children was influenced by the availability of vaccine drugs in the Kirovograd region and the refusal of parents from vaccinations. The negative tendency to provide the area with vaccine preparations against measles, rubella and epidemic parotitis was from 90% of the annual need in 2009 to 24.8% and 50.5% in 2014, 2015 in accordance.

Conclusions. Despite the fact that the intensity of the epidemic process of measles in the Kirovograd region during the last epidemic peak was significantly lower than in Ukraine in general, the marked tendency to increase the incidence among children and insufficient coverage of children by vaccination and revaccination is an unfavorable prognostic sign. This refers to the risk of further growth of the intensity of the epidemic process at the expense of those age groups of the population who must be protected in accordance with the vaccination calendar, and the loss of the measles infection as a "managed" status. The current situation requires immediate action to restore immunization in the country in full.

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