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OVERVIEW OF THE EPIDEMIC SITUATION ON CERTAIN INFECTIOUS ANIMAL DISEASES IN THE RUSSIAN FEDERATION IN 2018

N. S. Bardina[1], A. V. Varkentin[2], A. K. Karaulov[3]

[1] Junior Researcher, FGBI "ARRIAH", Vladimir, Russia, *e-mail: bardina@arriah.ru; ORCID ID 0000-0002-6620-8838*

[2] Head of the Sector, Candidate of Science (Veterinary Medicine), FGBI "ARRIAH", Vladimir, Russia, *e-mail: varkentin@arriah.ru; ORCID ID 0000-0002-9732-1083*

[3] Head of the Information and Analytical Centre, Candidate of Science (Veterinary Medicine), FGBI "ARRIAH", Vladimir, Russia, *e-mail: karaulov@arriah.ru; ORCID ID 0000-0002-5731-5762*

SUMMARY

The paper presents the results of analysis of epidemic situation on infectious animal diseases subject to compulsory OIE notification: FMD, African swine fever, classical swine fever, lumpy skin disease, sheep and goat pox, and highly pathogenic avian influenza. The paper presents data on the specified diseases situation in the Russian Federation, broken down by Subjects, and also provides a comparative description of the data for 2017 and 2018. Besides, attention is focused on some features of the epidemic process, depending on the season. For a long time the Russian Federation has been infected with several highly dangerous animal diseases, such as African and classical swine fever, FMD, lumpy skin disease, sheep and goat pox, and highly dangerous avian influenza. The specified above infections cause great damage to animal husbandry in the country which has a negative impact on its export potential. Analysis of the ASF epidemic situation demonstrates that the Russian Federation has been permanently infected and there is a trend for the geographic spread of the epidemic. Despite the fact that the number of ASF outbreaks newly detected in 2018 is almost half that of 2017, the situation remains tense. The forecast is still unfavorable. Lumpy skin disease has been reported in the Russian Federation for four years already. Herewith, from year to year the disease has been invading new territories. The HPAI epidemic situation is of great concern as in 2018 82 outbreaks were reported in poultry population which is 2.3 times more than in 2017. Besides, there is a trend for the epidemic extension. Thus, in 2018 avian influenza was reported in previously disease free Subjects of the Russian Federation. In 2018 the Russian Federation remained permanently infected with FMD, sheep and goat pox, and classical swine fever.

Key words: FMD, African swine fever, classical swine fever, lumpy skin disease, pox, avian influenza.

INTRODUCTION

Rapidness and effectiveness of anti-epidemic and preventive measures primarily depend on whether veterinarians have reliable and complete information on the epidemic situation in the designated and neighboring territories. It is especially important to obtain timely and up-to-date information on the diseases notifiable to the World Organization for Animal Health (OIE).

The Russian Federation is currently infected with a number of highly dangerous animal diseases, including foot-and-mouth disease, lumpy skin disease (LSD), highly pathogenic avian influenza, sheep and goat pox, African and classical swine fever.

MATERIALS AND METHODS

The official data of the OIE [3] and the FGBI "Veterinary Center" of the Ministry of Agriculture of the Russian Federation regarding the epidemic situation in the Russian Federation [2] were used. Information analysis was carried out using the method of retrospective analysis [1]. In order to unify and compare the data obtained, the following indicators were used: disease occurrence (number of outbreaks) and morbidity (number of diseased animals).

Results of statistical analysis were interpreted using the Microsoft Office Excel application package.

RESULTS AND DISCUSSION

Foot-and-mouth disease (FMD)

In 2018 five FMD outbreaks that occurred on the territory of the Russian Federation were notified to the OIE. The disease was detected in cattle and small ruminant populations. All outbreaks were located in the Borzinsky Raion of the Zabaykalsky Krai (near the state border with the Republic of Mongolia).

In 2017 five FMD outbreaks were also reported in the Subject of the Russian Federation of the Republic of Bashkortostan.

African Swine Fever

African swine fever (ASF) was first detected in the territory of the Russian Federation in November 2007 (a wild boar case was detected in the Chechen Republic bordering on Georgia). Since 2007 outbreaks have been reported almost every month. About 53–298 ASF outbreaks (n_{mean} = 109) are notified to the OIE by the Russian Federation through WAHIS electronic platform. The geographic spread of epidemics has nearly reached catastrophic levels. Over the entire monitoring period (from 2007 to 2018) ASF cases were reported in 51 Subjects of the Russian Federation. In most cases the situation was not limited to sporadic outbreaks. It often happened that more and more ASF outbreaks continued to emerge in the region after the first infection case was detected, until the territory was recognized endemic. ASF spread in previously disease-free territories is often caused by uncontrolled keeping of pigs, non-observance of veterinary and sanitary rules, the owners' attempts to hide the information about diseased animals, as well as owing to illegal dumping of carcasses of infected pigs in places accessible to wild boars (forest belt areas, outskirts of settlements and villages). Such cases are becoming the reason for the ASF spread in the Tver, Tula, Moscow Oblasts and other Subjects of the Central Federal District. The ASF outbreaks in Russia were observed in 2011, 2016 and 2017. Thus, in 2011 ASF was first identified in seven previously free regions of the Russian Federation, in 2016 – in six regions, in 2017 – in eight regions. If earlier (before 2016) the ASF epidemic had had a more characteristic trend for diffuse distribution with a small number of distant cases in the territory of the Russian Federation, in 2017 new outbreaks were reported in the regions of the Siberian and Ural Federal Districts that are geographically remote from the endemic zone: the Irkutsk, Omsk, Chelyabinsk, Tyumen Oblasts, the Krasnoyarsk Krai and the Yamalia-Nenetsia Autonomous Okrug. In these regions the infection was not widespread. The occurrence of outbreaks in the above-mentioned Subjects of the Russian Federation with a high degree of probability was a consequence of human activities, i.e. the anthropogenic factor of infection spread comes to the forefront at this time. Quite revealing from an epidemic point of view was the fact that ASF was detected in the Kaliningrad Oblast in 2016. The situation with a widespread infection in wild animals in the European countries bordering on Russia allows a high degree of probability for suggesting the ASF entry into the Kaliningrad Oblast via migratory boars.

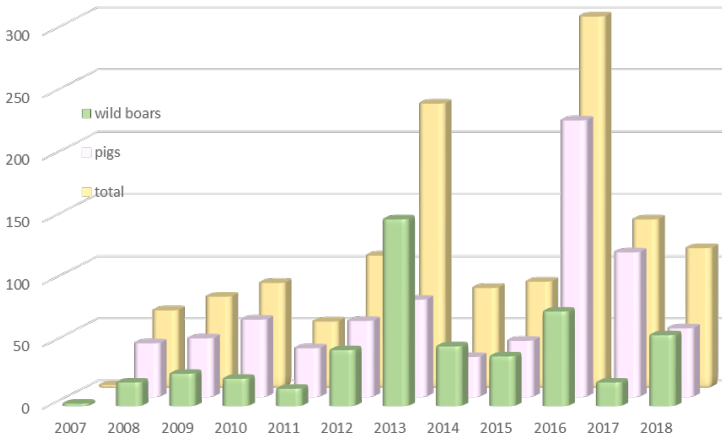

Fig. 1. Annual dynamics of ASF outbreaks in three populations: total population, pigs, wild boars (2007–2018)

Along with ASF epidemic coverage of all new territories, a trend for the animal health improvement in the regions of the endemic zone should be noted. Thus, no new outbreaks were reported in 2016–2018 or only single cases were reported in most Subjects of the South and North Caucasian Federal Districts, where a significant number of ASF outbreaks were detected annually in the first years after the infection introduction. Due to the absence of a state monitoring program, there is no clear evidence of the real disease freedom in the southern regions of the Russian Federation. There still remains the probability of concealed information on disease occurrence.

Figure 1 shows the dynamics of ASF trend in the Russian Federation over the years in three animal populations (cumulatively, as well as separately for pigs and wild boars), which makes it possible to trace the change in the epidemic situation for the entire period of epidemic study (2007–2018).

Figure 1 shows that at the initial stages of the epidemic development (2008–2011), the number of outbreaks detected in domestic pig population prevailed over that in wild animals. In 2012 the number of outbreaks in the wild boar population significantly increased markedly and nearly reached the infection level in domestic pigs. The ASF epidemic situation significantly worsened in 2013 due to an increase in the number of disease cases in wild animals, when the number of infected settlements newly detected during the year exceeded their total number for the entire previous observation period (2007–2012). So, for five years from 2007 to 2012, 128 ASF outbreaks were reported in wild boars, while in 2013 the number was 150. The total number of ASF outbreaks reached 228 in 2013, which is three times higher than the average annual rate for the previous five years (n = 76). It should be noted that such an apparent surge of infection is probably due not so much to a real deterioration of the situation, but to an increase in the surveillance activity of veterinary services. In 2013 most of the infected settlements were detected in the Smolensk Oblast, where a mass shooting of wild boars and subsequent ASF testing began after the first cases of infection were detected. Practically every disease case was recorded in the reports as an outbreak leading to a rise in disease occurrence that, in fact, resulted from overdiagnosis. In 2014 the number of disease outbreaks in wild boar population reached 60% of the total disease occurrence level, in 2015 this indicator decreased to 47% (up to 2012 it had not reached 30%). The number of outbreaks in the total population in 2014–2015 did not exceed the epidemic threshold. In 2016 the ASF epidemic situation sharply deteriorated – 291 disease outbreaks were detected, including 76 cases in wild animal population, 215 cases – in domestic pig population. The epidemic threshold in the total population was significantly exceeded, mainly due to infection level in domestic pigs (the number of outbreaks within the indicated period of time was three times higher than average). In 2017 203 ASF outbreaks were recorded, 150 of them occurred in domestic pig population.

In 2018 109 ASF outbreaks were notified to the OIE in the Russian Federation: 54 in wild pigs and 55 in domestic pigs. Outbreaks were reported in 17 Subjects of the

Table 1
ASF epidemic situation in RF in 2018

RF Subject	Number of outbreaks		Date of the first outbreak reported	Date of the outbreak resolved
	pigs	wild boars		
Belgorod Oblast	1	8	05.01.2018	15.11.2018
Volgograd Oblast	2	0	03.01.2018	24.07.2018
Krasnodar Krai	2	0	05.01.2018	12.02.2018
Kaliningrad Oblast	22	35	15.01.2018	19.12.2018
Saratov Oblast	8	0	01.02.2018	23.08.2018
Vladimir Oblast	1	1	26.02.2018	16.08.2018
Leningard Oblast	2	6	08.06.2018	19.11.2018
Oryol Oblast	5	0	24.06.2018	13.12.2018
Nizhny Novgorod Oblast	2	2	24.06.2018	24.12.2018
Tver Oblast	2	1	27.06.2018	22.10.2018
Ivanovo Oblast	1	0	15.07.2018	03.09.2018
Moscow Oblast	3	0	22.07.2018	15.10.2018
Novgorod Oblast	1	0	13.07.2018	23.11.2018
Tula Oblast	1	0	18.07.2018	12.09.2018
Rostov Oblast	1	0	27.08.2018	26.10.2018
Pskov Oblast	0	1	28.08.2018	20.09.2018
Lipetsk Oblast	1	0	03.09.2018	07.11.2018
Republic of Crimea	0	3	15.01.2018	11.04.2018

Russian Federation (with the exception of the Republic of Crimea, the outbreaks in this territory (n = 3) were not reported to the OIE). Data on the ASF epidemic situation by regions are presented in Table 1.

In comparison: 188 ASF outbreaks were reported in the Russian Federation in 2017 (203 outbreaks including those in the Republic of Crimea), which is almost 1.9 times more than in 2018. In addition, the ASF geographical distribution was much wider in the previous year. Twenty-four regions of the country, including the Siberian and Ural Federal Districts, where the disease was registered for the first time, were infected.

The diagram in Figure 2 shows the distribution of ASF outbreaks in two populations by month.

Figure 2 shows that the summer months (June – August) were most unfavorable for domestic pigs with regard to ASF, when a total of 44 outbreaks were detected, which makes up 80% of the total level of annual infection. A one-month shift for wild boars was observed compared to domestic pigs, i.e. July, August, September were the most unfavorable for this population in 2018. During these three months, 34 ASF outbreaks were recorded in wild animals (59.6% of the total number identified during the year). This peak shift may indicate the effects of the epidemic process developing in the domestic pig population on the wild boar population. The occurrence of the disease in the wild is associated with illegal burial or dumping of ASF-infected domestic pig carcasses. Occasionally, such landfills are found in forest belt areas, they are available for wild boars and become the source of infection. A one-month shift of the epizootic peak can be easily explained in the following way – the entire process, i.e. illegal burial, eating carcasses of infected pigs by wild boars, infection and the incubation period (10–14 days) fits into this period of time.

A significant number of outbreaks (12 outbreaks – 21% of the annual disease occurrence level) occurred in January and February. This is explained by wild boar biological characteristics and is confined to the mating season.

The number of ASF cases in the wild pig population in 2018 compared to 2017 is indicated in Figure 3.

As it can be seen in the histogram (Fig. 3), a significant number of outbreaks were reported in November and

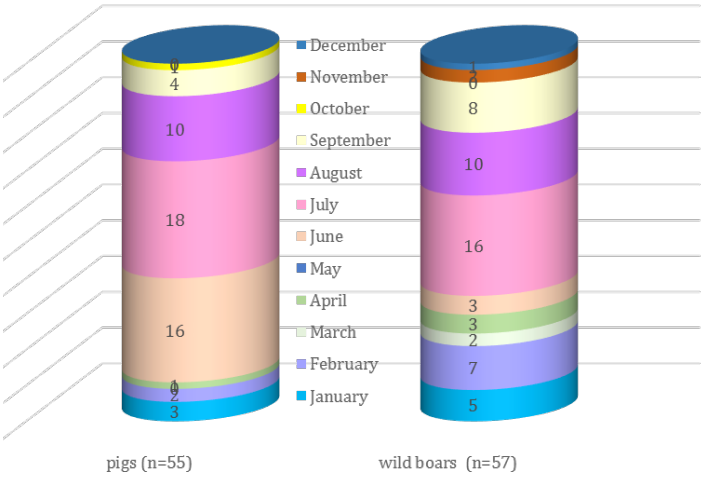

Fig. 2. Number of ASF outbreaks reported in two populations by month (2018)

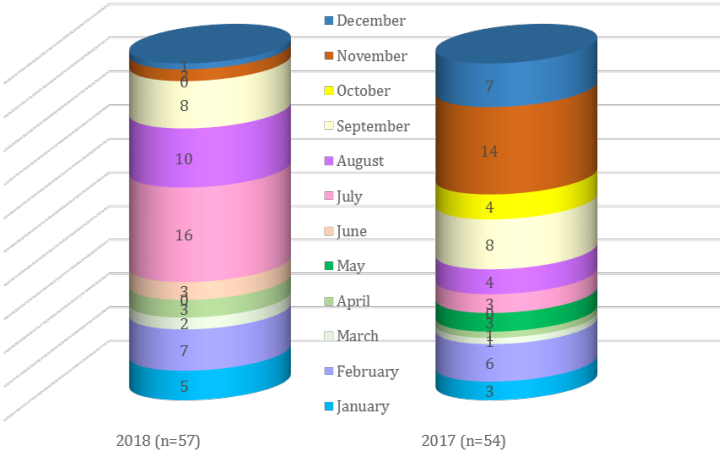

Fig. 3. Number of ASF outbreaks in wild animals by month (2017–2018)

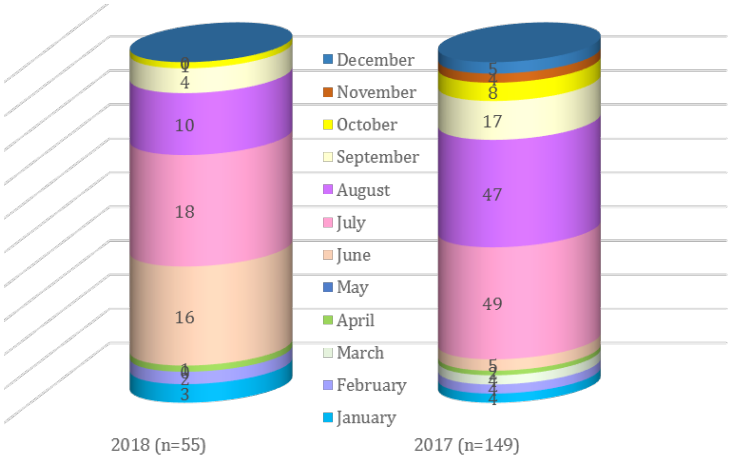

Fig. 4. Number of ASF outbreaks registered in the domestic pig population by month (2017–2018)

December (on the 14th and 7th, respectively) in 2017. This is easily explained by the biological and behavioral characteristics of wild boars. In 2018 the majority of outbreaks were detected in July (16 cases) and August (10 cases) (the peaks of the disease in this period correspond to the number of outbreaks in domestic pig population), which indicates the leading role of the anthropogenic factor in the ASF spread in the Russian Federation.

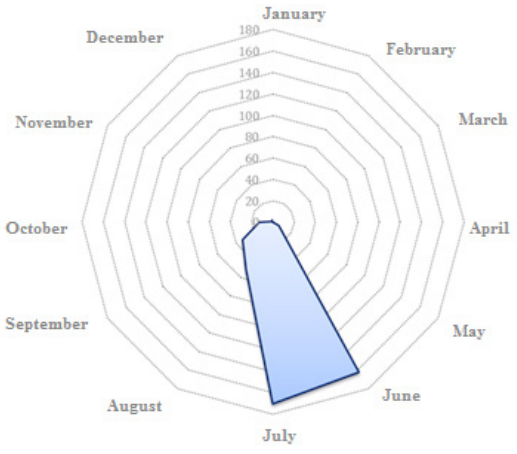

Fig. 5. LSD seasonality in the Russian Federation (2015–2018)

Figure 4 presents a histogram demonstrating the disease occurrence in domestic pig population in 2017 and 2018 by month.

As mentioned above, 55 ASF outbreaks were recorded in domestic pig population in the Russian Federation in 2018. This parameter is 2.7 times less than previously in 2017 when 149 outbreaks were registered in the country. Geographic boundaries of the epidemic did not expand in 2018 either: ASF was detected only in previously infected regions, compared to 2017, when the infection escaped far beyond the endemic zone, which was previously localized within the European part of the Russian Federation. In 2018 the Kaliningrad Oblast became the ASF most infected area where the infection was first introduced in November 2017. Thus, 57 outbreaks were recorded in the region in 2018 (including 35 in wild and 22 in domestic pigs), that makes more than half of all outbreaks identified in the Russian Federation in 2018.

Thus, the ASF epidemic situation in 2018 remained tense despite the fact that the number of outbreaks and infected areas decreased significantly compared to the previous year.

Lumpy skin disease

The disease was first detected in the Russian Federation in July 2015, when 17 outbreaks of lumpy skin disease (LSD) were recorded in three Subjects of the North Caucasian Federal District. In 2016 the disease was unprecedentedly widespread – 313 outbreaks were notified to the OIE. Not only the number of outbreaks significantly increased (compared with the previous year), but also the number of infected areas. So, infection was recorded in 17 regions of the Southern, North Caucasian, Central and Volga Federal Districts. The disease is characterized by pronounced seasonality. Outbreaks are detected annually, mainly in the summer period (Fig. 5).

In 2018 64 LSD outbreaks were detected, that is 1.5 times more than in 2017. The infection was recorded in six regions of the Russian Federation. Data on the geographic distribution of the disease are presented in Table 2.

In 2017 44 LSD outbreaks were recorded in 6 regions of the Russian Federation, more than half of which (24 cases) occurred in the Saratov Oblast. In 2018 the trend for inland infection movement continued and the new territories of the Volga and Urals Federal Districts got affected. At the same time, the disease has been very seldom registered in the initially infected areas of the North Caucasian and Southern Federal Districts in recent years. In this case, it is probable that the owners of animals conceal the information on the disease. In 2018 LSD was first detected in the Kurgan, Chelyabinsk, Sverdlovsk and Omsk Oblasts.

Highly pathogenic avian influenza (H5N8, H5N2)

In 2018 the Russian Federation reported to the OIE about 82 highly pathogenic influenza outbreaks in poultry population, including one outbreak caused by the H5N2 virus, and 81 – by the H5N8 virus. It should be noted that H5N2 highly pathogenic avian influenza virus was first registered in the Russian Federation in December 2017. Prior to this outbreak, the infection had been caused by the H5N8 virus (2016–2017) and the H5N1 virus (2005–2008, 2014). The last cases of H5N1 subtype avian influenza in wild bird population were detected in 2015 in four RF Subjects: Republic of Tuva, Zabaykalsky Krai, Astrakhan and Novosibirsk Oblasts.

The disease outbreaks in poultry population were recorded in 15 regions in 2018, primarily the Volga and Central

Federal Districts. Herewith, the disease was first detected in seven of them: Penza, Ulyanovsk, Saratov, Oryol, Smolensk, Kursk Oblasts and the Chuvashia Republic (Table 3). In total 852,275 birds got diseased in all infected settlements, of which 852,128 died. Within implementation of the anti-epidemic measures, a total of 1,955,345 birds were destroyed. It is noteworthy that neither the facts of the infection and mass mortality of wild and synanthropic birds, nor the facts of the detection of the highly pathogenic avian influenza virus in 2018 were reported.

In 2017 35 AI outbreaks were detected in the Russian Federation in 12 regions of the country, including 4 in the wild bird population, one of them in the zoo, and 31 in poultry. The level of disease occurrence in 2018 (82 outbreaks) exceeded that in the previous year by 2.3 times, but the number of outbreaks in large poultry establishments remained the same (8 outbreaks).

H5N8 virus type A was the common subtype of avian influenza virus that caused the outbreak, and only in the Kostroma Oblast the disease was caused by the H5N2 virus, although both viruses belong to the same Eurasian genetic line 2.3.4.4b of the H5 hemagglutinin gene. The reassortant H5N8 virus of this clade was first detected in wild birds near Lake Ubsu-Nur in the Republic of Tuva in May 2016.

It is of particular concern that poultry establishments with a high biocontainment level and zoning of production premises were affected by avian influenza in 2018 (in the Rostov and Penza Oblasts). Eight poultry farms were quarantined after avian influenza virus was detected.

Sheep and goat pox

Twelve outbreaks of sheep pox were reported in the Russian Federation in 2018, including one in the Republic of Kalmykia in the Amur Oblast, eight in the Moscow Oblast, and two in the Tula Oblast. In all areas the disease cases were only reported in sheep.

In 2017 sheep and goat pox was not detected in the territory of the Russian Federation.

Classical swine fever

In 2018, the Russian Federation notified four outbreaks of classical swine fever (CSF) to the OIE, including one in domestic pig population in the Moscow Oblast, three disease cases in wild animals of Primorsky Krai. At the end of the year, all outbreaks were resolved.

In 2017, two CSF outbreaks were identified in the territory of the Primorsky Krai – one in both the domestic pig and wild boar populations.

CONCLUSIONS

The statistical data analysis revealed a trend for deterioration of the epidemic situation in the Russian Federation for almost all diseases under evaluation with the exception of African swine fever, showing persistent unfavorable epidemic situation for this disease:

- CSF: a new endemic area occurred in the Primorsky Krai where the disease had been registered for three years in a row, in wild animals as well.
- Sheep and goat pox – there is a geographical spread of epidemic covering the territory from the Central (Moscow, Tula Oblasts) to the Far Eastern (Amur Oblast) Federal Districts.
- Highly pathogenic avian influenza – the epidemic had a widespread character: 82 outbreaks in 15 Subjects of the Central, Southern and Volga Federal Districts. Introduction of infection into large poultry establishments is of particular concern (8 outbreaks in 2018).

Table 2
LSD epidemic situation in the RF in 2018

Region	Number of outbreaks	Date of the first outbreak reported	Date of the outbreak resolved
Samara Oblast	32	29.06.2018	04.03.2019
Kurgan Oblast	21	05.07.2018	10.09.2018
Chelyabinsk Oblast	4	08.07.2018	14.11.2018
Saratov Oblast	1	30.08.2018	15.10.2018
Sverdlovsk Oblast	1	04.09.2018	12.11.2018
Omsk Oblast	5	24.09.2018	09.11.2018

Table 3
Highly pathogenic avian influenza epidemic situation in the Russian Federation in 2018

Region	Number of outbreaks	Date of the first outbreak reported	Date of the outbreak resolved in the region
Kursk Oblast	6	07.06.2018	03.08.2018
Samara Oblast	13	08.06.2018	24.08.2018
Penza Oblast	9	17.06.2018	14.09.2018
Saratov Oblast	4	18.06.2018	17.08.2018
Oryol Oblast	7	20.06.2018	24.09.2018
Smolensk Oblast	2	28.06.2018	29.08.2018
Rostov Oblast	4	03.07.2018	11.02.2019
Republic of Tatarstan	16	05.07.2018	20.08.2018
Nizhny Novgorod Oblast	3	06.07.2018	07.09.2018
Chuvashia Republic	10	06.07.2018	24.08.2018
Ulyanovsk Oblast	1	20.07.2018	15.08.2018
Republic of Udmurtia	4	27.07.2018	27.08.2018
Republic of Mari El	1	30.07.2018	12.09.2018
Kostroma Oblast	1	09.08.2018	12.11.2018
Voronezh Oblast	1	31.10.2018	11.02.2019

- Lumpy skin disease – spread of epidemic with a shift of coverage to the east. No reliable information on the epidemic situation in the newly infected Subjects of the Southern and North Caucasian Federal Districts.

Conflict of interest. The authors declare no conflict of interest.

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