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NEWCASTLE DISEASE - OVERVIEW AND ANALYSIS OF THE CURRENT SPREAD OF THE DISEASE IN BULGARIA AND EUROPE

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Abstract

Newcastle disease (ND) is a highly contagious and severe worldwide disease affecting birds. The infection is a mild zoonosis and can cause conjunctivitis in humans, but the condition is usually mild and self-limiting. ND is caused by virulent strains of avian paramyxovirus type 1. The disease occurs in five forms: velogenic viscerotrophic, velogenic neutrotropic, mesogenic, lentogenic Newcastle disease and asymptomatic enteric Newcastle disease. Lentogenic strains are very widespread, but are usually asymptomatic and do not cause outbreaks in poultry. Newcastle disease in its highly pathogenic form, is a WOAH listed disease and must be reported. It usually manifests as severe respiratory disease, depression, nervousness and/or diarrhea. The clinical picture is very similar to bird flu, so laboratory tests are important to confirm the diagnosis.

Key words: Newcastle Disease, poultry, wild birds, Bulgaria

Introduction

The disease was reported for the first time in 1926 in the United Kingdom and Indonesia and become panzootic within two decades after that. Now NDV is still endemic in many countries across the world. Strains of APMV-1 are phylogenetically separated into two classes (class I and class II) according to classification of Dimitrov et al., 2019. The classes are further classified into genotypes based on their genetic differences. Class I viruses are of low virulence, and usually are presented in wild waterfowl. Class II viruses have different range of virulence, and infect predominantly poultry, but they could be found in wild birds also. Genotypes I and II are with high and low virulence, the latter often being used as vaccines. Genotypes III and IX were the cause of epidemics in the past, now they are isolated rarely. Genotypes V, VI, and VII are virulent viruses and they are responsible for the majority of recent outbreaks in poultry and wild birds, and they are widespread. The other genotypes have limited geographic distribution, as follows: genotypes

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XI (Madagascar), XIII (mainly Southwest Asia), XVI (North America) and XIV, XVII and XVIII (Africa), and have been isolated predominantly from poultry (Dimitrov et al., 2016).

Newcastle disease (ND) is a highly contagious viral disease affecting domestic and wild birds caused by paramyxovirus (APMV-1). It belongs to the family Paramyxoviridae, in the order Mononegavirales. Paramyxoviruses are divided into seven genera: Aquaparamyxovirus, Ferlavirus, Respirovirus, Morbillivirus, Rubulavirus, Henipavirus, and Avulavirus. The genus Avulavirus includes 13 species of avian paramyxoviruses including avian paramyxovirus 1 (AVPM-1). APMV-1, based on their pathogenicity in chickens, can be classified into: low virulence (lentogenic), moderate (mesogenic) and highly virulent (velogenic) viruses, the latter being subdivided into viscerotropic and neurotropic strains (Spickler, 2016; OIE, 2018, 2020).

NDV is a pleomorphic, enveloped virus about 200–300 nm in diameter. The NDV genome is a non-segmented, negative-sense, single-stranded RNA. NDV strains isolated from different parts of the world fall into three groups by genome size: 15,186 nucleotides (nt) long in isolates before 1960; 15,192 nt long in the isolates found in China and 15,198 nt long in the avirulent strain from Germany Germany (Czegledi et al., 2006;).

All NDV isolates follow the “rule of six” (Calain and Roux, 1993), that is meaning the viral replication is most efficient when the nucleotide sequences in the genomes are multiples of six. In other words, the nucleocapsid protein binds efficiently to six nucleotides. The genome of NDV consists of genes encoding six proteins: nucleocapsid (N), matrix protein (M), phosphoprotein (P), fusion protein (F), haemagglutinin-neuraminidase protein (HN), and large polymerase protein (L). The N protein forms the core of the nucleocapsid with the genomic RNA, to which the P and L proteins remain bound, forming a ribonucleoprotein complex (Lamb and Parks, 2007). The non-glycosylated matrix protein (M) is responsible for virus assembly and replication. F and HN are the two surface glycoproteins that are virus neutralizing antigens and are responsible for the attachment of the virus and its fusion with the host cell membrane. The F and HN are surface glycoproteins. F protein mediates its fusion with the host cell membrane, and plays a major role in the virulence of the virus. HN is responsible for the infection and the pathogenesis of NDV and plays a role in receptor recognition in the host cell, receptor removal, and preventing self-assembly (Lamb and Parks, 2007). There are two additional accessory proteins, V and W. These are only present in virus-infected cells, with V thought to be an interferon (IFN) antagonist and also playing an important role in NDV virulence (Dortmans et al., 2011)

Newcastle Disease virus can infect more than 250 bird species, including domestic and wild birds. Chickens are more susceptible to ND than other species. Infection in geese and ducks is usually asymptomatic. Game birds (pheasants, partridges, peacocks, quail and guinea fowl) show different sensitivities, but ostriches and pigeons are susceptible. Infection has been reported in many species of wild birds such as waterfowl, gulls, pigeons, passerines or parrots, which could act as a potential reservoir. Most APMV-1 strains found in wild birds are lentogenic, but could mutate to velogenic and cause ND if transmitted to poultry. NDV can infect humans and cause mild conjunctivitis (Alexander, 2000; Spickler, 2016).

The virus is transmitted by inhalation or ingestion after close contact with infected animals, faeces and respiratory secretions. Transmission also occurs through fomites (water, feed, bedding, eggshells, human clothing). The severity of the disease depends on the host species, the virus strain and the immune status of the birds. The incubation period is usually 5–6 days (range 2–15 days), but can be as long as 3–4 weeks in some species. Infections with lentogenic strains of APMV-1

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are usually asymptomatic or cause mild respiratory signs (coughing, sneezing, dyspnea) without or with low mortality. Mesogenic strains are characterized by acute respiratory signs, reduced egg production and sometimes neurological signs; mortality is usually less than 10% in adult birds. Infections with velogenic strains usually cause severe disease in chickens and in some wild bird species, with mortality of up to 100% in unvaccinated poultry. The first signs are lethargy, lack of appetite, ruffled feathers and redness and swelling of the conjunctiva, greenish or white watery diarrhea, dyspnea, and cyanosis of the head and neck. Neurological signs may appear at a later stage, such as tremors, spasms, wing and leg paralysis and torticollis.

The viscerotropic forms are currently the most common strains and are characterized by severe diarrhea and hemorrhagic intestinal lesions, while the neurotropic forms show mainly neurological and respiratory signs. Sudden death without clinical signs could be observed in some cases. In laying hens, the disease causes a sharp drop in egg production; the eggs contain watery albumin and are deformed with abnormally colored, rough or thin shells. Surviving birds may develop neurological symptoms and stop egg production. In pigeons, PPMV-1 infection is characterized by anorexia, polyuria, polydipsia and neurological disorders; the incidence in adults is often less than 10% and subclinical infections are common (ESFA, 2021; OIE, 2018, 2020; Spickler, 2016).

Isolation of NDV occurs in samples from oropharyngeal or cloacal swabs (live birds) or organs (spleen, lung, intestine, cecum, liver, kidney, heart and brain) from dead birds (OIE, 2018). Conventional PCR or rRT-PCR can be used to identify NDV. The pathogenicity of APMV-1 strains was determined either by in vivo techniques by inoculating day-old chicks (ICPI: intracerebral pathogenic index: range 0.0–2.0) or by in vitro techniques to determine the presence of a specific amino acid sequence cleavage site in the Fusion protein. APMV-1 strains with ICPI $\geq$ 0.7 or with the presence of a specific sequence are considered NDV and must be declared. Serological tests include the hemagglutination inhibition (HI) test and the enzyme-linked immunosorbent assay (ELISA). They are used in surveillance programs or in the evaluation of antibody levels after vaccination (Alexander, 2000; EFSA, 2021; OIE, 2018; Spickler, 2016).

Materials and Methods

We analyzed all data published and unpublished concerning NDV outbreaks in Bulgaria since 1959. In our study, we include the information from the following articles: Hadzhiev, 1973, Czeglédi et al.., 2002, Alous et al., 2003, Zarkov. et al., 2005, Oreshkova et al., 2009, Goujgoulova et a., 2009, Tumbarski &. Marinova-Petkova, 2012, Goujgoulova et al., 2013. Collecting this data, we construct table 1.

The collected data for the outbreaks in Bulgaria for the period 1958-2020 and in Europe for the period 2023-2024 was processed and used to construct the maps. The Bulgarian map was created by Excel maps, and for the European one MapChart was used (https://www.mapchart.net/index.html).

We summarized the information about last outbreaks, according to Bulgarian Food Safety Agency (BABH, https://bfsa.egov.bg/wps/portal/bfsa-web/home).

Information for NDV outbreaks for 2023-2024 is published in ADIS and in Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe, https://www.izsvenezie.com/reference-laboratories/avian-influenza-newcastle-disease/workshops/**).**

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Results

Geographic distribution of NDV in Europe

According to the EURL reports, for 2020 the positive samples were 279, and for 2021 – 349 (IZSVe, workshop 2020-2021)**.**

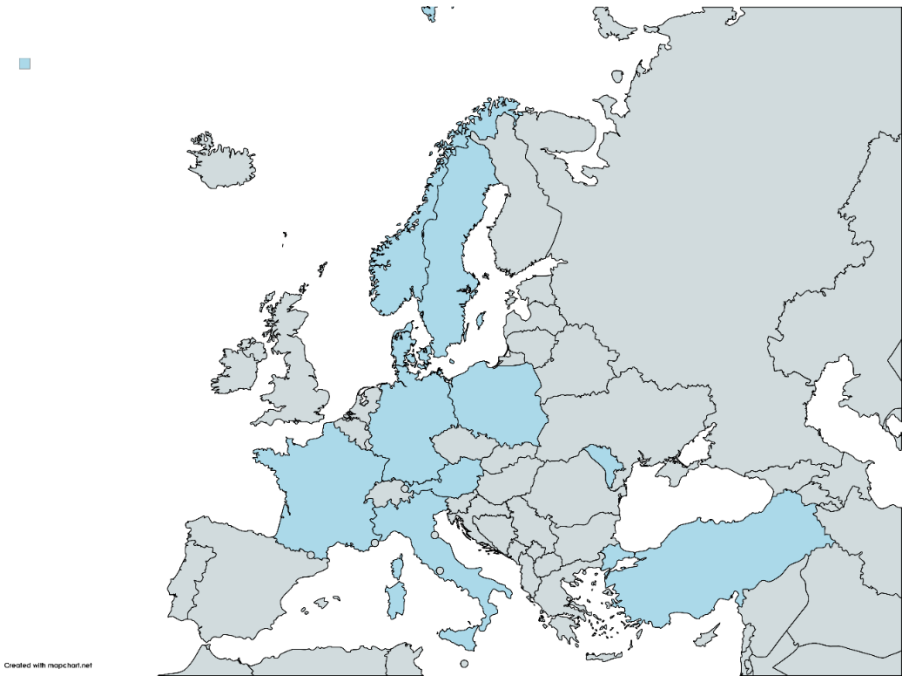

Figure 1. The recent situation with NDV outbreaks in Europe for 01.01.2023-29.10.2024 https://www.mapchart.net/world.html

For the period 01.01.2023-29.10.2024 10 countries in Europe report outbreaks – Sweden, Poland, Italy, Germany, Austria, Denmark, Moldova, France, Norway, Turkey (Figure 1, Table 1).

Table 1. The NDV outbreaks in Europe for 01.01.2023-29.10.2024 (ADIS)

Country/Territory	Submitted on	Administrative division level 1	Administrative division level 2	Killed
Sweden	2024-10-20	Ödeshög		18000
Poland	2024-10-01	Podlaskie	Mońki	33600
Italy	2024-06-07	Emilia-Romagna	Reggio Nell'Emilia	

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Sweden	2024-05-22	Helsingborg		231438
Italy	2024-05-10	Lazio	Roma	
Italy	2024-03-19	Toscana	Lucca	5
Italy	2024-03-06	Veneto	Vicenza	43
Germany	2023-08-15	Thüringen	Saalfeld-Rudolstadt	2671
Poland	2023-07-24	Podlaskie	Białystok	69
Poland	2023-07-24	Podlaskie	Białystok	3050
Poland	2023-07-24	Podlaskie	Białystok	28237
Poland	2023-07-12	Podlaskie	Białystok	13201
Austria	2023-07-05	Oberösterreich	Vöcklabruck	5
Denmark	2023-06-22	Veterinary Inspection Unit North	Skanderborg	1866
Moldova	2023-03-17	Chişinău		50
Sweden	2023-01-30	Ronneby		5000
France	2023-01-18	Nouvelle-Aquitaine	Pyrénées-Atlantiques	1430
Norway	2023-01-14	Innlandet	Sør-Odal	85
Türkiye	2023-01-03	Rize	Derepazarı	77
Türkiye	2023-01-03	Erzurum	Ilıca	27

Chronology of Newcastle disease in birds in Bulgaria, from the first confirmed case to the present day.

The first case of Newcastle disease (NB) in Bulgaria was diagnosed in 1943 around an airport occupied by the German military, from where the disease quickly spread. Finally, in 1951 was it controlled by immunizations with the mesogenic vaccine strain Hertfordshire – H. At the end of 50s of the 20th century, an epizootic appeared again (*Hadzhiev G*, 1973). The most important outbreaks from the past period are presented in Table 2.

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Table 2. Data for NDV outbreaks in Bulgaria for the period 1954 - 2013

Year	Pathogenicity/ Lineage (where it is available)	Host	Geographic origin
1959	Velogenic form	poultry	Plovdiv
1967	Lentogenic form	poultry	Gen. Toshevo, village Donchevo, region Dobrich; Razgrad; Vratsa
1967	Velogenic form	poultry	village Bukovets, reg. Vidin
1968	Velogenic form	poultry	village Dabravite, reg. Pazardzhik, Karshiyaka district, Plovdiv; Haskovo town; village Krepost, reg. Haskovo; Ardino, reg. Kurdzhali
1969	Velogenic form	poultry	Harmanli, villages Maslinovo, Karamantsi, Orlovo, reg. Haskovo; village Svetovrachane, reg. Sofia; village Ognyanovo, reg. Blagoevgrad
1970	Velogenic form	poultry	Haskovo; village Shiroka polyana, reg. Haskovo
1973	Velogenic form	poultry	village Ivanovo, Harmanli municipality; Bolyarovo quarter, Haskovo
1974	Velogenic form	poultry	Jebel, reg. Kurdzhali; Nikolovo village, Golemantsi village, Shtit village, reg. Haskovo
1975	Velogenic form	poultry	villages Malko Gradishte, Rodopi, reg. Haskovo; Rosa, reg. Yambol; Tutrakan, reg. Silistra; Bregovo, reg. Vidin
1977	Velogenic form	poultry	Pavlikeni, reg. V. Tarnovo
1978	Velogenic form	poultry	village Septemvriitsi, reg. Montana
1979	Velogenic form	poultry	village Yasen, reg. Vidin
1980	Lentogenic form	poultry	village Yakimovo, reg. Montana
1980	Velogenic form	poultry	village Glozhene, reg. Vratsa; Valchedrum, reg. Montana

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1981	Velogenic form	poultry	Sofia city; village Elov dol, region Sofia
1982	Velogenic form	poultry	villages Mokresh, reg. Shumen; Septemvriitsi, reg. Montana, Shishkovtsi, reg Kyustendil
1984	Mesogenic form	pigeons	Sofia and Pernik
1986	Velogenic form	poultry	Mizia, reg. Vratsa; village Chereshovo, reg. Blagoevgrad
1988	Lentogenic form	poultry	village Furen, reg. Vratsa
1991	Velogenic form lineage 3b	poultry	Haskovo (Alous et al., 2003)
1992	Velogenic form	poultry	Village Dolno linevo, reg. Montana
1993	Velogenic form	poultry	Bregovo, reg. Vidin
1993	Velogenic form lineage 5b	poultry	village Stremtsi, reg. Kardzhali (Alous et al., 2003)
1995	Velogenic form lineage 4d	pigeon	village Novo selo, reg Vidin, (Alous et al., 2003)
1995	Velogenic form Lineage 5b	poultry	Montana (Alous et al., 2003)
1996	Velogenic form	poultry	village Kovachitsa, reg. Montana
1996	Velogenic form lineage 5b	poultry	Silistra town, (Alous et al., 2003)
2002	Lentogenic form	poultry and pigeons	village Govedartsi, reg. Sofia
2004	Velogenic form	poultry	Village Ridino, Jebel municipality, reg. Kurdzhali
2005	Velogenic form lineage 5d	poultry	v. Skrat and Gabrene, reg. Blagoevgrad, (Oreshkova N. et al., 2009)
2005	Lentogenic form	mallard (Anas platyrhynchos)	Poda protected area, Burgas lakes (Zarkov I. et al., 2005)

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2006	Velogenic form lineage 5d	poultry	villages Zaychar, reg. Burgas, Slanchogled, reg. Kardjali, Yuper, reg. Razgrad, Vodnantsi, reg. Dobrich (Oreshkova et al., 2009)
2006	Lentogenic form lineage 2	swan (Cygnus olor)	v. Ravna gora, reg. Burgas, (Oreshkova et al., 2009)
2006	lentogenic form	swan (Cygnus olor) and wild waterfowl	Malko Tarnovo, reg. Burgas, and town Varna (Tumbarski Y., A. Marinova-Petkova, 2012)
2006	Velogenic form	poultry	village Golyam Varbovnik, reg. Kyustendil
2007	Velogenic form lineage 5d	poultry	villages Gigen, reg. Pleven, Kostalevo, Borovan, Ohoden, Galatin, Radovene, Pudria, Kravoder, Galatin, Moravica, Krapets, Ruska Bela, reg. Vratsa, Medeni poliani, reg. Pazardzhik, Smolianovtsi, reg. Montana; Vidno, reg. Dobrich (Oreshkova et al., 2009)
2007	Lentogenic form lineage 2	mule ducks and poutry	Simeonovgrad, reg. Haskovo; village Hubavene, reg.Vratsa (Oreshkova et al., 2009)
2007	Lentogenic form lineage 1	pigeon	Shabla, reg. Dobrich (Oreshkova et al., 2009)
2008	Velogenic form	poultry	"Lilyashka hill" locality, reg. Vratsa, villages Kardam, reg. Dobrich; Kazatsite, reg. Kurdzhali
2009	Velogenic form	poultry	villages Vodach, Varben, Pleshintsi, Rudina, Vozhdovo, reg. Kardzhali ; Mamarchevo, reg. Yambol
2009	Velogenic form	pigeon	village Novo Yankovo, reg. Shumen
2010	Lentogenic form lineage 1	Partridges (Perdix perdix)	village of Gorno Uyno, Bourgas (Tumbarski Y.et al., 2011)
2011	Lentogenic form lineage 6	White-fronted geese (Anser albifrons) and Redbreasted	Durankulak village, reg. Dobrich (Tumbarski & Marinova-Petkova, 2012)

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		geese (Branta ruficollis)	
2012	Velogenic form	poultry	village Beli Lom, reg. Razgrad
2012	Velogenic form lineage 4b	pigeon	Haskovo
2013	Velogenic form lineage 5a	poultry	village Zvinitsa, reg. Kardzhali, (Goujgoulova et al., 2013)

NDV isolates from Bulgaria - from 1959 to 1998, belonged to very different genetic lineages: 2, 3b, 3c, 4 and 5b, and the NDV isolates from chickens from 2004 to 2012 belonged to genetic lineage 5d, according to the Aldous classification (Aldous et al., 2003). The first appearance of 5a lineage was in backyard flock in village of Zvinitsa, Kardzhali (Goujgoulova G., 2013).

After the outbreak in 2013, the country was free from the Newcastle Disease virus until 2016. In the next two years, there are 6 outbreaks in 5 regions of Bulgaria:

- region Kardzhali: village Nenkovo- lineage 5d, village Rudina - lineage 5a;
- region Haskovo: village Balkan – lineage 5d;
- region Montana: town Lom – lineage 5d;
- region Vidin: village Gomotartsi– unknown lineage;
- region Smolyan: village Rudozem – unknown lineage.

In 2019 there is only one occurrence in backyard chickens in village Panchevo, Kardzhali region, with a total of 205 laying hens. The NDV belongs to lineage 5a (Aldous et al., 2003), or VII.2, old VIIi (Dimitrov et al., 2019) and clusters with viruses of 2011 – 2018, identified in Israel, Pakistan, Indonesia, Iran, Jordan and Belgium

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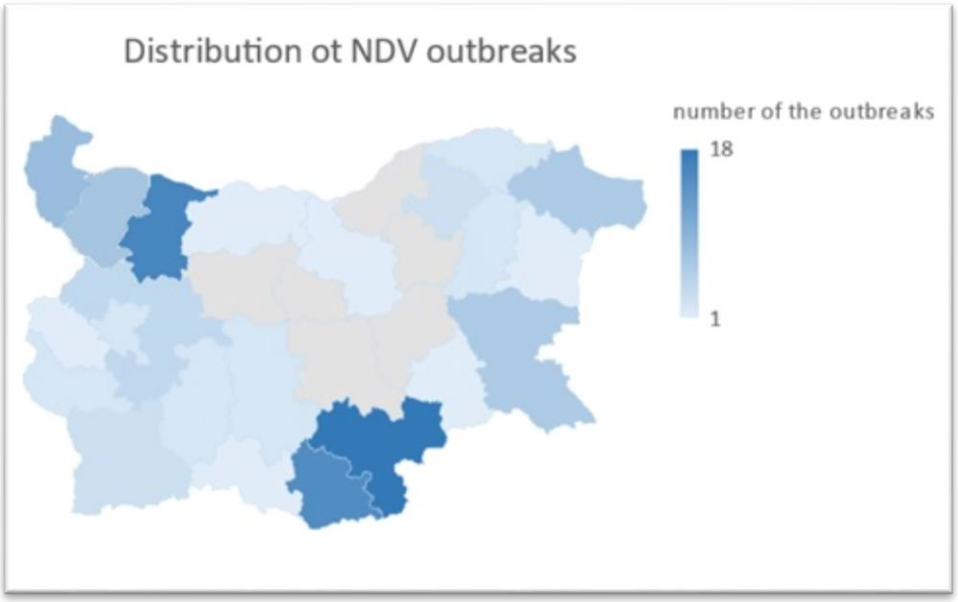

Figure 2. The distribution of NDV outbreaks in the territory of Bulgaria.

The last reported outbreaks in the country were in 2020 in region Vidin. Since then, there have been no cases. On 07/09/2020, the Bulgarian Food Safety Agency (BFSA) detected an outbreak of Newcastle disease in birds in two livestock facilities - a private farm, in the village of Gyurgich, municipality Ruzhintsi, region Vidin. The disease was confirmed in two neighboring private holdings where hens, chickens, turkeys and geese were kept mixed, after being suspected because of increased mortality and clinical symptoms. A total of 117 birds were raised in the two sites, 102 died as a result of the disease. A 3-kilometer safety zone was defined around municipality Ruzhintsi, region Vidin. The 10-kilometer monitored area includes settlements from the region Vidin: village Cherno Pole, village Drazhintsi, village Ruzhintsi, village Pleshivets, all in the municipality Ruzhyntsi; Protopopintsi village, Sredogriv village, Dolni Lom village, municipality Chuprene. In the region Montana, the zone includes the settlements: village Prevala, municipality Chiprovtsi; Belotintsi village, Odorovtsi village, Bukovets village, municipality Broussarci. There are no industrial poultry farms located in the restricted areas.

On 18.07.2020, the BFSA found a second outbreak for the year 2020 of Newcastle disease in birds, this time in hens, in a livestock facility of the "private farm" type in the village of Podgore in the municipality of Makresh in the Vidin region. 34 hens were raised in the facility, 12 of them died as a result of the disease. A 3-kilometer safety zone was defined around the outbreak, which includes Podgore and the village Rakovitsa from Makresh municipality. The 10-kilometer monitored area includes the villages Kireevo, Tolovitsa, Tsar Shishmanovo from the Makresh municipality, village Staropatitsa, Kula municipality, as well as Rayanovtsi, Rabisha and Oshane from the Belogradchik municipality. There are no industrial poultry farms located in the restricted areas.

Discussion

The virus is widespread on all continents, affecting a wide variety of birds with varying degrees of susceptibility (Kaleta and Baldauf, 1988). The virus probably circulates in the wild bird population and periodically enters flocks. It is known that lentogenic viruses can be found in

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waterfowl, gulls and shorebirds, and pigeons, cormorants and some wild birds are natural reservoirs of all APMV-1, except viscerotropic velogenic viruses. Birds in zoos and live bird markets often carry highly virulent viruses. However, the natural reservoirs of viscerotropic velogenic viruses have not been identified, and there is no evidence whether highly virulent viruses have entered the wild population following poultry outbreaks or are maintained in wild and domestic birds (Dimitrov et al., 2016).

In recent years, several genetic lineages within APMV-1 have been reported in the European Union (EU). Among the virulent strains are genotypes VII (or line "5"), XIII (line 5b) and VI (line 4), which are associated primarily with pigeons. A previously unknown subgroup of genotype VII appeared in Europe in 2013 and subsequently spread, being associated with outbreaks in Bulgaria, Romania and the Republic of Cyprus. The rapid spread of lineage 5a, which is probably originated from the Middle East, is thought to be the result of human activity and movement of infected poultry, rather than being distributed by migratory ticks (Fuller et al, 2015), and is also associated with the birds in backyards.

In 2022, Switzerland and Spain reported outbreaks. In February 2022, the first outbreak was reported in Niederglatt, Zurich in flock of laying hens (approx. 500 animals). The Genotype is VI.2.1.1.2.2à PPMV-1 (Dimitrov et al., 2019, 4 according to Aldous et al., 2003). In March 2022, in Develier, Jura was detected the second outbreak in flock of laying hens (approx. 14,000 animals). The Genotype is VI.2.1.1.2.2 PPMV-1, but it is not identical with case #1 (96.6% sequence similarity).

After almost 13 years as a ND free country, Spain reports its first case in June 2022 in Almería-Andalusia. On the 24 June 2022 were reported the first signs (fall consumption, respiratory signs, sinusitis, facial edema, diarrhea, nervous signs) followed by an increase in mortality in the following days. 9,500 broilers of 6 weeks were affected. In July 4, 2022 was the second outbreak in a broiler farm with 9,980 birds, located in the municipality of Huércal-Overa, province of Almería. On the next day, the third outbreak was confirmed, again in a broiler farm, (26,900 birds) located in the municipality of Huércal-Overa, province of Almería. The Genotype is VII.2 (Dimitrov et al.,2019) (5a according to Aldous et al., 2003), it clusters with European viruses collected in 2018-2020 in Belgium, Bulgaria (2019) and Macedonia. Specifically, Genotype VII.2 has been extensively circulating in Pakistan, Israel as well as in some African countries. In Europe, this sub-genotype has been identified in the outbreaks in the Netherlands (1993), Belgium (2018), Bulgaria (2019) and Macedonia (2020) **(IZSVe, workshop 2022)**.

On the 19th June 2023, Denmark detected NDV in Summer-house community, Aalborg in 1850 birds: pigeons, chicken, ornamental birds etc. There was high mortality detected in a flock with 40 pigeons. The Genotype is XXI.1.1 according to Dimitrov et al., 2019 **(IZSVe, workshop 2023).**

On the 19th of October 2024, Sweden confirmed ND in laying hens at a poultry farm in the municipality of Ödeshög. The affected farm is an establishment with approximately 18 000 laying hens. The birds were reported to have decreased egg production, as well as egg abnormalities.

The retrospective analysis of NDV outbreaks in Bulgaria, showed that there are NDV free regions, and there are regions with many cases- Vratsa, Haskovo, Kardzhali. These regions are close to borders with Romania and Turkey, and this is the probable reason of frequent appearance

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of the disease. The other thing that stands out is that the positive wild birds are in the region of Burgas and Varna, and this is probably due to the fact that the migration route V passes from there.

The last outbreaks in Bulgaria were in 2020. The reason for the lack of NDV outbreaks is probably due to the vaccination program as well as the enhanced biosecurity measures taken in relation to Influenza A. The last three years have been disastrous for the poultry industry due to the epidemic of HPAI. The birds are reared indoors, the contact with wild birds is quite limited, and exclusionary measures are applied very strictly.

All European member states, except Sweden, Finland and Estonia, have a prophylactic vaccination policy. In the UK vaccination of poultry against ND is recommended (Defra, 2019).

According to the Program for the control and supervision of Newcastle disease in birds in the Republic of Bulgaria, the poultry and pigeons are vaccinated in the following conditions:

- Compulsory general vaccination of laying hens, parent flocks and broilers, pheasants, turkeys and sport pigeons and pigeons for shows, on the basis of Art. 5 of Ordinance No. 31 of 29.12.2005, in all industrial poultry facilities in the country and for birds raised in settlements falling within a 10-km area around industrial facilities:

- Vaccination on the 1st day of day-old broilers in hatcheries in the country;

- Revaccination of the feathered game grown in farms (aviaries) with the "lentogenic" strain vaccine, according to the manufacturer's instructions, two weeks before its relocation;

- Revaccination of sports pigeons and those intended for competitions and exhibitions with an "inactivated" vaccine at 4 weeks of age and revaccination 4 to 6 weeks before the start of the racing season or the event in which they will participate.

Outbreaks of the past four years in Europe have shown that lineage 5a is still circulating in poultry. Outbreaks are fewer, probably due to vaccination, biosecurity and rapid disease control measures. But the fact that NDV still occurs means that a reservoir exists in wild birds. Therefore, there is a constant, though variable, risk of the disease occurring wherever poultry is kept.

The appearance of VI.2.1.1.2.2à (lineage 4) PPMV-1 in laying hens in Switzerland could be explained with the fact that the vaccination of poultry against Newcastle disease is prohibited in the country. Only racing pigeons, participating in events such as markets or races, must be vaccinated with an inactivated vaccine.

In conclusion, the fact that NDV continues to appear in Europe, albeit at a lower intensity, indicates that the disease still needs to be closely monitored and controlled. The absence of outbreaks in a given period does not mean that the virus is not hidden in some natural reservoir and is not waiting for favorable conditions to manifest itself. Veterinary authorities and people involved in poultry farming must continue to monitor responsibly and at the first suspicions of NDV, to take the necessary measures to prevent the spread of the disease.

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