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Letters to the Editorial

Distribution Trends of African Swine Fever Virus (ASFV) through Water

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Abstract

The places for spreading of viruses in ground water are mostly in non-porous media aquifers. They are karst (limestone) aquifers and fractured bedrock (metamorphic rock) (Fong et al., 2007). Different authors have proved the spreading of the viruses in ground water. The Berger's study has dealt with Enteric virus (Berger, 2007). Norwalk-like virus has detected in ground water (Anderson, 2001).

The African swine fever (ASF) is contagious and rapidly spreading swine disease. The great virulence and continuous resilience in the environment, including in the natural water sources as an activator of African swine fever virus (ASFV), are a prerequisite for a seamless cross-border transmission of the disease, defining it as a main threat for the world's pig meat production. In 2007 ASFV infected pigs in Georgia, and in 2014 it reached the European Union (Boklund et al., 2018). In 2019 it has been observed in Bulgaria and has had serious economic consequences. The Tissue Culture Infectious Dose (TCID) for pigs is $10^{1.0}$ $TCID_{50}$ in liquids, and is $10^{6.8}$ $TCID_{50}$ in dried fodder (Niederwerder et al., 2019).

Contaminated water from the Danube River has been implicated in introducing ASF onto the ≈140,000 pig-breeding farms.

Keywords: virus, water, swine disease, hydrodynamic and antibacterial effect.

1. Introduction

In 2019 the African swine fever virus (ASFV) was registered in Bulgaria. The first farms infected with it were in the region of Ruse which borders Romania on the Danube. There are numerous small surface and underground rivers and streams on the territory of Bulgaria. A significant part of the farms are using their own water sources which is precondition for a possible breach with the technological bio-security, and as a consequence could infect the animals with doses larger than $10^{1.0}$ $TCID_{50}$.

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The possibility for this are as follows.
1. Groundwater for closely positioned farms.
2. Excrements and decomposing carcasses of feral pigs.
3. Rainfall and run-off flows that leach into the soil.
4. Infected meat of wild boars carried by jackals.
5. Rats and other rodents.

2. Materials and methods

Research of drinking water in pig holdings is conducted. The physical parameters pH and ORP (Oxidation Reduction Potential) of the water are measured using HANNA Instruments HI221 meter equipped with Sensorex sensors. Analysis of the infection of closely positioned pig-breeding complexes is prepared.

Range of HANNA Instruments HI221 meter:

2.1. Parameters of pH

pH - (2.00-16.00)
For pH range the statistical error is 0.01

2.2. Parameters of Oxidation Reduction Potentail

ORP (±699.9- ±2000) mV
For ORP range (±699.9) the statistical error is ±0.01 mV
For ORP range (±2000) the statistical error is ±0.1 mV

3. Results

The potable waters in the pig-breeding farms are with pH from 6.5 to 8, and ORP from +230 to +350 mV. With such parameters the water is a conductive medium for the development of micro-organisms, including ASFV. (Karadzov et al., 2014; Popova, 2016).

Figure 1 shows the area of the bio-sphere of microorganisms as a function of pH and ORP. It is defined with the intervals from 3 to 10 for pH and -400 mV to +900 mV for ORP. The microorganisms will hardly survive outside these ranges (Karadzhov et al., 2015).

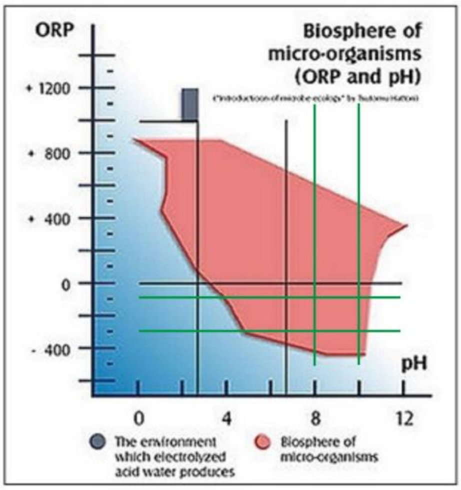

Fig. 1. Biosphere of microorganisms depending on pH and ORP of the water

The above data determine the water as a possible factor for the distribution of ASFV. In order to protect the animals from diseases transferred through water, there is a need for thorough antimicrobial control on each drop of water.

4. Conclusion

The authors point to the possibility of ASFV spread through water, which requires taking of emergency measures for its elimination as a risk factor for the appearance and transmission of African swine fever. The disinfectants in the drinking water for animals cannot guarantee its full bio-safety. Furthermore, they alter the organoleptic properties of the water and the animals drink it reluctantly.

There is a possibility of using the installations for bio-safety assurance of the water by its structuring (Ignatov, Mosin, 2013), where its organoleptic properties improve substantially, and at the same time the pathogenic micro-organisms get disintegrated as a result of the hydrodynamic effect (Suslick et al., 2004; Dular et al., 2016; Bandala, Rodriguez-Narvaez, 2019).

According to (Ignatov, Mosin et al., 2013) the combination of hydrodynamic and antibacterial effect, expressed by local extremum at (E = -0.1212 eV)(λ=10.23 μm)($\tilde{\nu}$=978 cm^{-1}) enables the bio-safety of the water.

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