**Emerging Diseases: a potential threat for the pig industry**

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The term emerging diseases includes infectious diseases that have recently been described or developed or diseases which, while were already known, recently increased their incidence or their expansion into new geographic areas or infect new hosts or employ new carriers.The concept of "emerging diseases" developed by scientists who were trying to document and explain the sudden increase in the number of new and important diseases during the past two decades.

The procedures and factors that led to the rise of emerging diseases are: 1) changes concerning the pathogens themselves or their range of hosts (breaking the barrier of the kind),2) changes of the ecosystem due to natural or anthropogenic causesalong with climatic and geographical influences to pathogens and their carriers,3) intense movements of the human population and their increased contact with animals or their products, 4) increased movement of animals and animal products, 5) the improvement of diagnostic and epidemiological techniques resulting in the detection of existing or emerging pathogens.

Among emerging pig diseases, a lot of them have already a major impact on Greek pig production, while others may affect it in the future.The main emerging diseases which had an increased incidence in previous years in Greece, as well as those which may occur in the near future, are discussed below. These diseases are Swine Encephalomyocarditis, Porcine Reproductive and Respiratory Syndrome, Swine Influenza and African Swine Fever.

**Encephalomyocarditis** was first reported, as a clinical disease in pigs, in Panama in 1958 and Florida in 1960.The disease described was characterized by sudden deaths in young animals without prodromal symptoms. In the following years cases were reported in Australia, Belgium, North America, Brazil, Greece, Italy, Cuba, Cyprus, New Zealand and several Asian countries. Apart from the sudden deaths in young animals, it was found that the virus of encephalomyocarditis was the causative pathogen of reproductive problems reported in America, Australia, Belgium, Canada and Cuba. The disease first appeared in Greece during the period 1986-1989 in the cardiac form. The occurrence of these outbreaks coincided with the presence of large numbers of rodents in the areas around the farms. In the following years sporadic cases of the cardiac form of the disease continued to appear in herds of Northern Greece. Dead animals showed the typical lesions of the disease in the heart. Cause of the disease is the virus of encephalomyocarditis belonging to the Picornaviridae family. The disease is often characterized by acute onset of sudden deaths due to heart failure. Infected pigs die suddenly or are found dead without premonitory symptoms.In some of the infected animals it may be observed lethargy, anorexia, tremor, paralysis, vomiting and dyspnea. Mortality is high up to 100% for nursing piglets and then is restricted at the age of weaning. In pregnant sows may occur reproductive problems, which are characterized by reduced fertility rate, fetal absorption abortion, birth of stillborn and mummified piglets and deaths in newborns. The most characteristic macroscopic lesions found in the heart. The heart is flabby, discolored with piebald areas, most commonly found in the myocardium of the right ventricle near the pulmonary artery, the interventricular septum and the papillary muscles. The lesions may be located at any depth of the myocardium, and sometimes exhibit deposition of calcium salts in their center. The right ventricle and the right atrium of the heart appear enlarged. Rodents, especially rats, are described as a reservoir of the virus and are considered responsible for the observed outbreaks. The virus is excreted via their faeces and urine, and is found in high titers in their tissues. Therefore, the exposure of pigs to infected with the virus feed or water, as well as in infected rodent corpses plays an important role in disease transmission. The infected pigs shed the virus for a short period of time and the virus is transmitted from pig to pig by contact. Relating to Public Health: Encephalomyocarditis virus has been isolated from cerebrospinal fluid, blood, feces and ear rinse of people, especially children, with aseptic meningitis, acute idiopathic polyneuritis (Guillain-Barré syndrome), encephalomyelitis, fever of unknown cause and a disease with poliomyelitis symptoms. Usually, the infection in humans is rather common, but typically asymptomatic or undiagnosed. The detection of the virus is achieved by inoculating appropriately prepared suspension from pathological material in cell cultures. Detection of the virus is also achieved with the inoculation of pathological material in white muscles. Also the method of the polymerase chain reaction (PCR) is applied for the detection of encephalomyocarditis virus. Detection of antibodies to EMC virus is primarily performed with serum neutralization test. Differential diagnosis of the cardiac form of the disease should be carried out for diseases that occur with sudden death as the edema disease in weaned piglets, lack of selenium and vitamin E, foot and mouth disease and swine fever. For the reproductive form of the disease differential diagnosis should be done from diseases with similar symptoms, such as PRRS, Aujeszky's disease and Parvovirus. There is no treatment for the infection from encephalomyocarditisvirus. However, avoiding or reducing animal stress may reduce mortality. To prevent the disease, it is recommended to apply biosecurity measures, especially concerning hygiene with frequent disinfection and rodent control. Commonly disinfectants based iodine or mercury chloride are used. Also, the virus gets inactivated in water by adding 0,5 ppm.

**Porcine Reproductive and Respiratory Syndrome, (PRRS)** is a viral etiology disease. The virus belongs to the genus Arterivirus, of the Arteriviridae family. The virus causes death in newborn piglets, respiratory symptoms with growth retardation in growing and finishing pigs and reproductive problems in pregnant sows. The disease first appeared in 1987 in the USA. In Europe, the disease first appeared in Germany in 1990 and then spread to all countries. In Greece the disease first appeared in 1993. In the following years strains of the virus of different virulence appeared. The severity of symptoms of the disease depends on the virulence of the virus strain, and the health status of the infected farm. The virus strains differ in both antigenically and virulence. More specifically, there are two groups of strains. The first group includes strains of the virus that have been isolated in the USA and Canada (Americans strains) and the second strains isolated in Europe (European strains). Infection of pigs primarily occurs from the respiratory tract and rarely can occur through the genital tract. Target of the virus are mainly the alveolar lung macrophages, the macrophages in various tissues and monocytes. In chronic virus infection the virus is detected in the lymph nodes and the tonsils. The viral extensive proliferation leads to the destruction of the alveolar macrophages, resulting in the reduction of the defense mechanism of the animals. This fact leads to an increase of their susceptibility to other viral or bacterial infections. Damages of the endothelium of capillaries and increased intravascular coagulation are observed, resulting in cyanosis of the ears, tail and limbs. In **breeding animals** initially general symptoms are observed such as depression, lethargy, shortness of breath and temperature rise. In a small percentage of sows (1-2%) vascular disorders may occur (hyperemia or cyanosis) located in the skin, vulva, breast and ears (blue ear). In sows an increase in the percentage of returns to oestrus, abortions usually the last third of gestation, and especially premature births between the 107th and 112th day of pregnancy is noted. Often the birth of stillborn, mummified and weak piglets also noted. The boars during the acute syndrome exhibit anorexia, lethargy, respiratory symptoms (transient coughing and sneezing), reduced libido, mild fever and edema of the eyelids, ears and testicles. But in most cases exhibit a subclinical infection without apparent externally clinical symptoms, dispersing the virus via the semen. Also, the PRRS virus have a negative effect on macroscopic and microscopic characteristics of sperm, causing a decrease in semen volume, decreased of mobility and vitality of sperm and increase of the numbers of spermatozoa with morphological abnormalities leading eventually to a decrease in fertility. **In newborn piglets** the mortality rate can reach 40% and it is noted not only to the piglets born underweight, but also to those that are born with normal vigor. Mortality is higher during the first week after birth, but may continue until weaning. Piglets born weak or with dissipation of the hind limbs (splay-leg), they have difficulty to nurse and therefore consume a small amount of colostrum. This results in both the occurrence of hypoglycemia, and also increased susceptibility to secondary infections. These pathological conditions exacerbated by the appearance in the affected sows postpartum hypogalaxia / dysgalaxiasyndrome. In older piglets’ dyspnea, depression, inability to support the limbs and bruising which are characteristic in the eyelids and conjunctiva,are noted.**In growing - finishing pigs’** respiratory symptoms are observed.Infected animals have cough, abdominal breathing, fever, depression, anorexia and growth retardation.Affected pigs often have overgrowth of hair and varying degrees of reduction in the average daily weight gain and feed conversion ratio as a result a disparity to growth between the same age animals is noted. PRRS virus enters a farm with the importation of infected replacement breeding animals (boars, gilts).The virus can also be transported airborne over short distances between neighboring farms. Sows can also become contaminated during natural service by an infected boar and / or by infected semen during artificial insemination. Mechanical vectors of the virus can be various insects (flies, mosquitoes), the farm’s staff (boots, clothing) and various visitors (eg veterinarians, visitors, etc.), that are not taking the right biosecurity measures. The clinical diagnosis is based on the appearance at the same time in a farm, increasing proportion of deaths in newborn piglets, together with respiratory symptoms in growing / finishing pigs, as well as, the appearance of reproductive problems in pregnant sows.The differential diagnosis should include Aujeszky's disease, Parvovirus, Transmissible Gastroenteritis, Classical and African Swine Fever, Leptospirosis and Erysipelas.Definitive diagnosis is done only by a laboratory. The laboratory diagnosis is done primarily by detection of antibodies as well as the isolation and identification of the virus.The detection of viral nucleic acid by the technique of polymerase chain reaction is the fastest and most accurate method of diagnosis. Prevention measures for PRRS include both sanitary measures and vaccinations. On farms that are free from the disease checks are performed both on animals entering the unit and to the semen used for artificial insemination. On farms that are considered infected additional measures to improve animal welfare should be taken. To prevent the disease vaccines are also used. The vaccines used to immunize pigs contain either inactivated virus strains or live modified minimum virulence strains.

**Swine influenza** is a disease of viral etiology of particular importance for public health. The disease can occur in a farm with epizootic and enzootic form.In the epizootic form the virus spreads rapidly in all groups of pigs in the farm displaying classic respiratory symptoms. Conversely, in enzootic form the impact of influenza is not evident and the clinical picture is not the classic of influenza. Morbidity is very high and can reach 100%, but mortality is very low. In recent years’ influenza has become particularly important for both pigs and public health because of the potential for the appearance new types of viruses. According to the classical theory for the creation of a new influenza virus capable of causing a pandemic, the presence of an intermediate host is needed, which will be the "mixing vessel" through which a new influenza virus with genes from avian viruses could be transmitted in humans. Most experts agree that this role could be played by the pig. The above theory was confirmed in 2009 with the emergence of the 'novel influenza' strain H1N1. This new virus was derived from recombinant viruses of pig, avian and human flu. According to the World Health Organization, millions of people worldwide infected with the virus, but the mortality rate was extremely low. It turned out that although the new H1N1 virus met the formal criteria for declaring it pandemic, it is not multiplied in high rates in the human respiratory system. The virus of swine influenza belongs to the genus Influenza virus A, of the *Orthomyxoviridae* family. Influenza A viruses are further characterized into subtypes based on two surface glycoproteins that have hemagglutinin and neuraminidase. In recent years, influenza viruses that infect pigs, contain sections of genetic material of avian and human influenza viruses. Infection of pigs takes place from the respiratory tract by inhalation of microdroplets. The swine influenza virus enters a farm with the introduction of an infected animal.When a farm is infected for the first time, all the animals are getting ill (100% mortality), but most recover 3-7 days in the absence of secondary complications. Where there are no secondary complications the mortality rate is very low, ranging from 1-2%. On farms where the virus is endemic, infection is subclinical.In these cases, typical symptoms of the disease occur in 25-30% of animals. Influenza is one of the major causes of respiratory syndrome in growing / fattening pigs worldwide. Approximately 25-33% of pigs aged 6-7 months and 45% of breeding pigs have antibodies against the virus. The laboratory diagnosis includes the isolation and identification of the virus, the detection of viral nucleic acid and the detection of antibodies against the virus. As for the differential diagnosis, it should be distinguished from all the diseases involved in the etiology of the respiratory syndrome as the Porcine Respiratory and Reproductive Syndrome (PRRS), Aujesky disease, Circovirus type 2, Pleuropneumonia, Pasteurellosis and Enzootic Pneumonia. To prevent swine influenza, strict biosecurity measures should be applied to prevent the introduction and spreading of the virus within the farm. Reducing the density of animals, early weaning of piglets, total application of all in - all out system, in combination with good hygiene are the measures that can be taken to reduce financial losses in livestock farming.Vaccines are also used for the prevention of the disease. The presence of secondary bacterial complications worsens the clinical picture of influenza.

**African Swine Fever** is a human orientated and very contagious disease of viral etiology, with clinical symptoms similar to those of classical swine fever. African Swine Fever belongs to the list A of the International Office for Epizootics and is a notifiable disease in Europe. The appearance of the disease causes great economic losses due both to the high mortality rates, and secondly to the restriction of animals and products movement and the compulsory slaughter of infected pigs. African Swine Fever was first described in Kenya in 1921. The disease remained localized in Africa until 1957, the year in which the disease began spreading in Europe. The virus was detected for the first time in Eastern Europe in 2007 and since then has expanded to Central Europe. The African Swine Fever belongs to the Asfivirus genus of the Asfarviridae family. He is the only DNA virus transmitted by arthropods. Soft ticks of the genus Ornithodoros are the biological vectors of the virus, in which is multiplied and transmitted from a tick development stage to another and also with transovarial transmission. The virus strains differ in their virulence, but belong to the same serotype. The virus initially installed and multiplies in the tonsils. Viremia and spreading of the virus throughout the body follows. Target of the virus are the endothelial cells of the blood vessels, the blood monocytes and the macrophages of various organs such as the liver, spleen and kidneys. Additionally, a blood clotting disorder is noted. The destruction of the endothelial cells of the blood vessels results in the creation of lesions in their walls, which leads to edema and hemorrhage. The virus spreads with all the secretions and excretions of diseased animals while substantial amounts of virus are found in the blood and tissues, including the muscle tissue. In the blood of animals, the virus continues to circulate and after their recovery. The virus is sufficiently robust and has a remarkable long-term preservation in meat and meat products, which contribute to the dispersing in remote areas. Specifically, the virus survives for 3-6 months’ time in uncooked pork products. Also the virus survives at extremes pH values(3.9-13.4) while it remains infectious in contaminated animal faeces at room temperature for about 10 days. Virus inactivation requires heating at 56oC for 70 minutes or at 60oC for 20 minutes. The diagnosis of African Swine Fever can be done only with laboratory tests. With clinical examination somebody can only suspect the disease and only for the acute form, which will be based on the symptoms observed similar to classical swine fever, which includes attack of pigs of any age who experience extensive hemorrhages in the skin and various internal organs and high mortality rates. Differential diagnosis should also be made from classical swine fever, PRRS, encephalomyocarditis virus, erysipelas, salmonellosis, Aujeszky's disease, pasteurellosis, and poisoning by anticoagulants. For laboratory diagnosis the mainly methods used are designed to detect and identify the virus. Suitable tissues for the isolation and identification of the virus are the lymph nodes, spleen, tonsils and kidneys. Also blood samples with anticoagulants should be taken in the early stages of the disease. Serological tests are performed in cases of epidemiological investigation of the disease. Antibodies are developed in the third week after infection. As already mentioned African Swine Fever belongs to the list A of the International Office for Epizootics and is a notifiable disease. Until now the prevention of the disease is based solely on hygiene measures. Special attention should be given, when implementing sanitary measures, to the fact that pigs survived the infection remain carriers of the virus throughout their lives and that boars remain asymptomatic carriers of the virus, thereby helping to maintain the disease in an area. In case of African Swine Fever occurrence, in areas free of the disease, eradication measures are implemented by the method of stamping out the infected farm.