

## Review

# Epizootological analysis of PPR spread on African continent and in Asian countries

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**The paper presents the results of the study of the PPR spread over the territory of African and Asian countries and contains the overall estimate of its invasion to new territories on the globe via affection of more resistant breeds of small ruminants. Moreover the data reflect wide spread of PPR in the Republic of Tajikistan (Central Asia) among goats at the end of the 20<sup>th</sup> century.**

**Key words:** PPR (peste des petits ruminants), Africa, Asia.

## INTRODUCTION

Especially dangerous infectious diseases of birds, domestic, wild animals and people may be carried into a country from the neighboring territories. So, prevention of epidemics and epizooties is one of the key tasks in ensuring biological safety of a country.

During the recent 10 years the problem of infectious diseases among birds and animals has become very important. The pestholes of such viral infections as Avian influenza, FMD, PPR, bluetongue, rabies and others have been revealed.

PPR takes special place among diseases that affect goats and sheep. PPR - la peste des petits ruminants is a highly contagious viral disease characterized by necrotic stomatitis, diarrhea and bronchopneumonia. The pathogen is an RNA-containing is attributed to paramixoviruses family, morbilliviruses genus (Gibbs et al., 1979; Murthy et al., 1995).

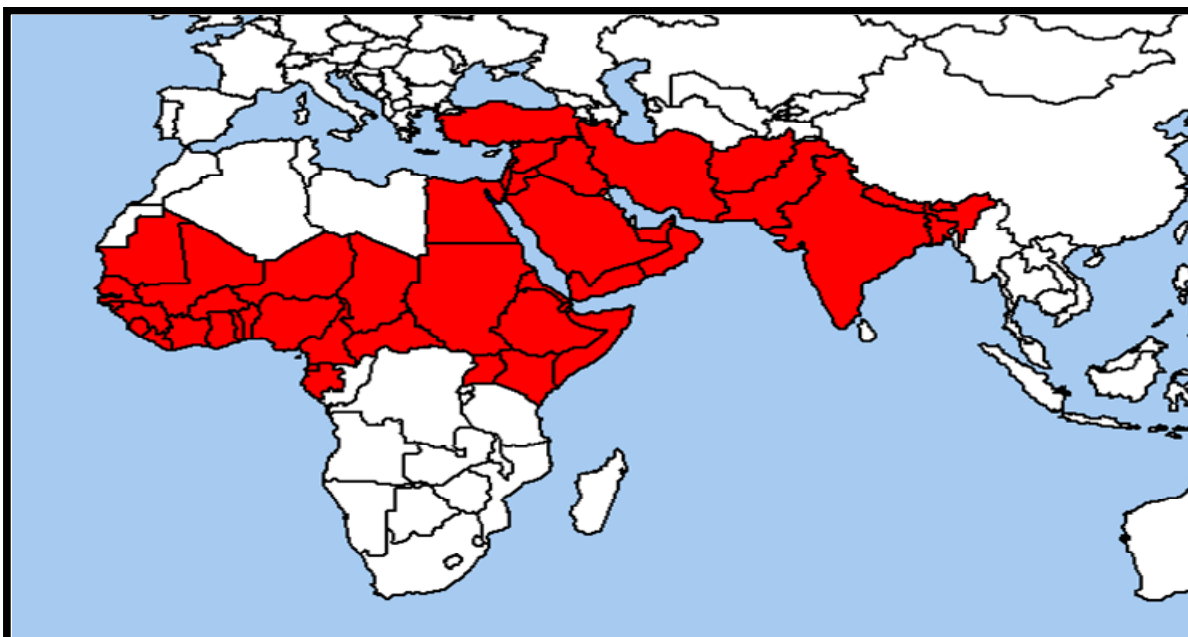
The disease was first identified and described in 1942 (Gargadennec and Lalanne, 1942). Since that time this disease was described by various scientists and had different names such as "Kata", "pseudo rinderpest" "syndrome of stomatitis-pneumoenteritis", "pneumoenteritis complex". The disease was named PPR because it has similar clinical, pathological and immuno-logical signs with rinderpest. Incubation period is about 4 - 5 days and then fever starts and lasts for 6 - 8 days and then goats die as they are more susceptible to his disease than sheep (Adetosoye and Ojo, 1981; Dardiri, 1978; Gibbs et al., 1977; Obi et al., 1983; Ojo et al., 1983; Onoviran et

al., 1984; Ugochukwu and Agwu, 1991; Wosu and Chineme, 1989).

PPR brings great economical loss to the countries which mainly breed small ruminants. For example, due to PPR outbreaks annual economical loss in Nigeria is around 1.5 millions of USD. Sickness rate is 100% and death rate is 90% among susceptible animals (OIE "Bulletin", 1984 - 2000, OIE "Disease Informatoon", 1997 - 2000). In Western African countries there are small ruminants of very small size which relate to "lagunes" or "guinean" breeds. Those animals are extremely susceptible to PPR virus.

During the recent 20 years PPR spreads to new territories of African and Asian countries (OIE "Bulletin", 1984 - 2000; OIE "Disease Informatoon", 1997 - 2000; Elzein et al., 1990; Akakpo et al., 1996; Ali and Taylor, 1984; Allawy et al., 1993; Amjad et al., 1996; Ata and Al-Sumry, 1988; Furley et al., 1987; Govindarajan et al., 1997; Ismail and House, 1990; Jochim and Jones, 1987; Lefevre et al., 1991; Lefevre and Diallo, 1990; Mouaz et al., 1995; Moustafa, 1993; Obi et al., 1984; OIE "World animal health", 1984 - 1997; Perl et al., 1994; Peste des petits ruminants, 1996; Shaila et al., 1989, 1990; Singh et al., 1996; Taylor, 1979; Taylor and Abegunde, 1979; Taylor et al., 1990).

Research and analysis of PPR epizootological data showed that from 1942 till 1979 this disease was registered in the west of Africa in such countries as Nigeria, Benin, Togo, Ghana and Senegal. In 1980 - 1982 PPR



**Figure 1.** PPR spread in the countries of Africa and Asia in 2004.

was registered in the east of African continent, in Sudan. In 1987 it spread to India and Abu-Dhabi, conquering more and more new territories.

The latest serological research which was conducted in 1998 in Tanzania revealed no antibodies to PPR. This fact allows supposing that the infection was spread to the south part of the continent. During the last years the disease was registered in the Middle East and in Arabian Peninsula in such countries as Iran, Iraq, Israel, Jordania, Kuwait, Lebanon, Oman, Saudi Arabia, United Arab Emirates, Yemen and there is serological prove of the disease in Syria and Turkey (Manual for PPR detection, 2005).

The development of trade relations, transport, tourism and migration of wild animals susceptible to PPR contribute to the spread of the disease beyond the boundaries of western Africa. For the last years PPR was registered in Arabian Peninsula. In the present time PPR is registered in almost all countries of Central, Middle and South Asia, in the countries of Middle East and African continent such as Nigeria, Benin, Togo, Ghana, Senegal, Sudan, India, Abu-Dhabi, Mali, Guinea, Liberia, Cot-Devoir, Cameroon, Ethiopia, Yemen, Oman, Turkey, Iran, Afghanistan, Pakistan, Saudi Arabia, Chad, Democratic Republic of Congo, Central African Republic. PPR spread data is presented in Figure 1.

The following data was obtained on the basis of the disease spread analysis during 1984 - 1999. At the present time PPR is widely spread in African continent and Asia (Middle East and Far East, Arabian Peninsula and South Asia). The worst situation with PPR epizootic out-

breaks was in 1986 - 1999 when there were 50 - 70 outbreaks per 10 millions of small ruminants. To the second part of 90's this index reduced to 10 - 30 outbreaks.

PPR epizootic situation is characterized by cyclic recurrence with the periods of 7 and 14 years. The disease seasonality in all geographic zones is not clearly apparent. The increase of morbidity rate is mainly observed during the years with unfavorable weather conditions and poor fodder. The disease mainly spreads to big commodity farms breeding thoroughbred small ruminants. This causes mass epizootic outbreaks and spread of infection. The disease stationarity is endemic for Western Africa, Arabian Peninsula and South Asia.

In the countries where PPR is registered for the first time or during little time the morbidity rate is about 80% with territorial coverage reaching from 1 to 100 cases per 1000 susceptible animals. In the infection pestholes the rates of morbidity and mortality may reach 80 - 100%. When the disease becomes stationary these indexes decrease significantly.

Epizootic process analysis conducted on the basis of OIE information and publications leads to the conclusion that the infection develops dynamically and that its spread data is late and incomplete. There is a tendency to increase of the amount of countries with PPR and nosoarea reaches gradually the southern Potential PPR nosoarea may cover North Africa, South Europe, Transcaucasia, Central Asia, South Ukraine, Kazakhstan, Mongolia and China (Knize et al., 2000).

The example of this is the presence of PPR in the Republic of Tajikistan. The presence of PPR in the Republic

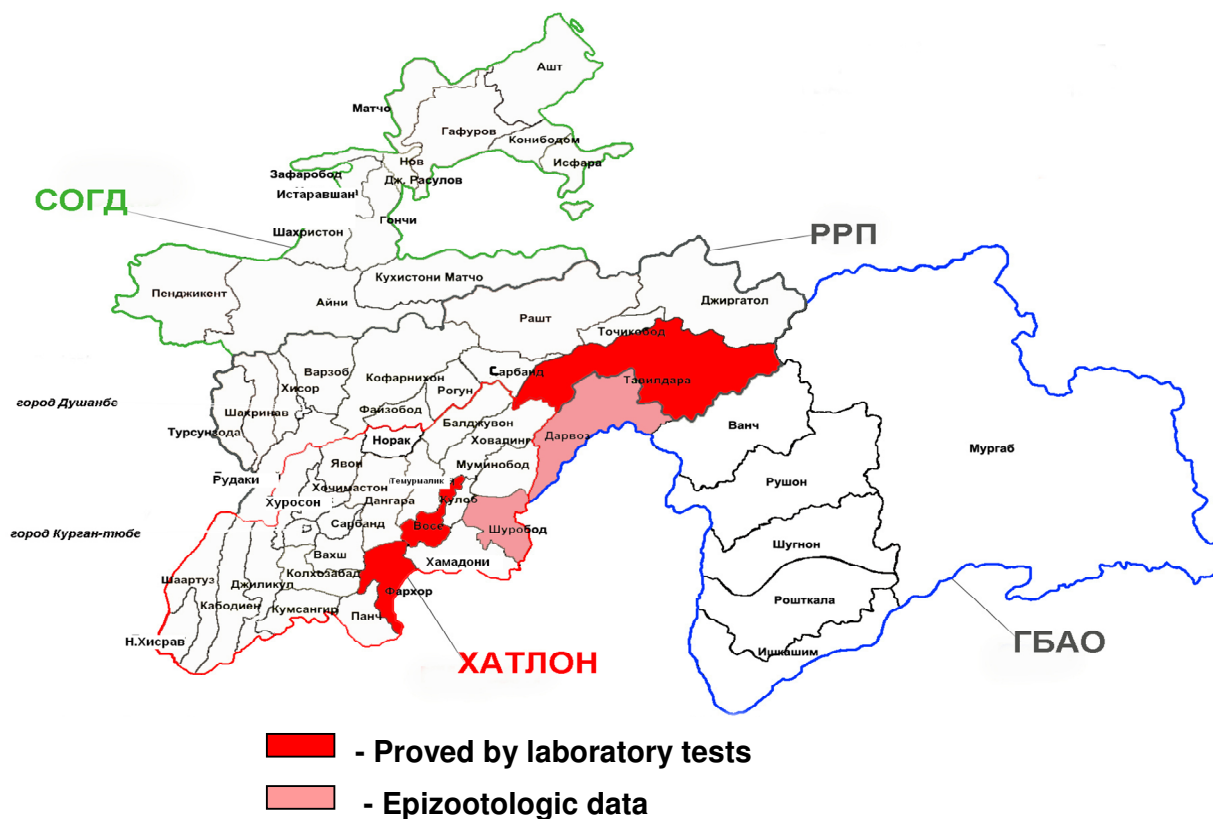


Figure 2. PPR spread in the Republic of Tajikistan.

of Tajikistan was proved during the epizootologic observation of the territory and by laboratory study of sera samples and pathological materials taken from sick animals. The map of PPR spread in the Republic of Tajikistan was composed as the result of epizootologic observation and laboratory research as shown in Figure 2 (Mamadaliyev et al., 2006; Orynbayev et al., 2005; Nurabayev et al., 2006).

From the data presented in the Figure 2 it is seen that PPR is widely spread in the Republic of Tajikistan. On the basis of epizootologic data study we ascertained that the disease is registered in Tajikistan during long time (more than 10 years) and it becomes stationary at the present time. The main reason for such a wide spread of PPR in Tajikistan is that veterinary specialists does not have PPR diagnostic means and does not conduct prophylactic measures. After scientists of Central Asian FMD Institute of the Republic of Tajikistan and Research Institute for Biological Safety Problems NBC of the Republic of Kazakhstan had found out that the cause of disease was PPR virus the veterinary service of Tajikistan began to conduct emergency measures for disease elimination on the territory of the country.

Modern epizootologic research results show that PPR spreads to more and more new territories. According to

Bakulov and Kotlyarov (2002) this disease is registered in Europe and in Afghanistan which borders to south regions of CIS countries. Afghanistan is neighboring country to Tajikistan and there PPR is a stationary disease. PPR virus is permanently maintained in the environment because of lack of control measures and outrun and migratory way of animal breeding.

According to monitoring data in 1987 PPR was registered among African goats including "sakhel", "guinean" and "Cameroon" breeds. During the recent 20 years PPR has been registered among local sheep and goats in the farms of Asian countries. This proves that PPR virus specializes progressively to more severe climatic conditions and to the organisms of less susceptible breeds of sheep and goats.

The above mentioned circumstances demand allocation of the territories under PPR threat and conducting purposeful prophylactic and monitoring studies on those territories.

#### REFERENCES

- Adetosoye AI, Ojo MO (1981). Characteristics of *E. coli* isolated from goats suffering from Peste des petits ruminants (PPR) and detection of enterotoxin and isolates from other causes of diarrhoea. // Book of abstracts, 18<sup>th</sup> Annual Conference of the Nigerian Veterinary Medical

- Association, September 23-27<sup>th</sup> p.11
- Akakpo AJ, Deconinck P, Amegatse K, Kaboret Y, Oudar J (1996). An outbreak of pest of small ruminants virus in periurban herds of Dakar, epidemiological and medical impo. Une epizootie de la Peste des Petits Ruminants (PPR) en élevage periurbain a Dakar: importance epidemiologique et medicale. *Rev. Med. Vet.* 147(6): 447-452.
- Ali B, Taylor WP (1984). The isolation of peste des petits ruminants virus (PPRV) from the Sudan. *Res. Vet. Sci.* 36: 1-4.
- Allawy TA, Laila SA, El Rahim IHA, Abd El Rahim IHA (1993). Serological studies on peste des petits ruminants (PPR) in Upper Egypt. Proceedings of the Second Scientific Congress Egyptian Society for Cattle Diseases, 5-7 December. Assiut – Egypt 2: 278-289.
- Amjad H, Qamar-ul-Islam, Forsyth M, Barrett T, Rossiter PB (1996). Peste des petits ruminants in goats in Pakistan. *Vet. Rec.* 139(5): 118-119.
- Ata FA, Al-Sumry HS (1988). Oman Pest of small ruminants (peste des petits ruminants). *World Anim. Rev.* 65: 53-55.
- Bakulov IA, Kotlyarov (2002) VM. World Epizootic Situation on Wild Animals Diseases. Materials of International Scientific - Practical Conference, 16 – 18 April, Pokrov, Russian Federation .
- Dardiri AH (1978). Peste des petits ruminants. Reference manual. Foreign animal disease courses. Plum island animal disease center, SEA, USDA pp. 92-102.
- Elzein EME, Hassani MM, Al Afaleq AI, Elhadi MA, Housawi FMI (1990). Isolation of peste des petits ruminants from goats in Saudi Arabia. *Vet. Rec.* 127: 309-310.
- Furley CW, Taylor WP, Obi TU (1987). An outbreak of peste des petits ruminants in a zoological collection. *Vet. Rec.* 121: 443-447.
- Gibbs EP, Taylor WP, Lawman MJP, Bryant J (1979). Classification of peste des petits ruminants virus as the fourth member of the genus morbillivirus. *Intervirology.* 2: 268-274.
- Gibbs EPJ, Taylor WP, Lawman MJP (1977). The isolation of adenoviruses from goats affected with peste des petits ruminants in Nigeria. *Res. Vet. Sci.* 23(3): 331-335.
- Gargadennec L, Lalanne A (1942). La peste des petits ruminants. // *Bull. Serv. Zoo. A.O.F.* 5: 16
- Govindarajan R, Koteeswaran A, Venugopalan AT, Shyam G, Shaouna S, Shaila MS, Ramachandran S (1997). Isolation of pestes des petits ruminants virus from an outbreak in Indian buffalo (*Bubalus bubalis*). *Vet. Rec.* 141(22): 573-574.
- Ismail IM, House J (1990). Evidence of identification of peste des petits ruminants from goats in Egypt. *Arch. Exp. Veterinarmed.* 44(3): 471-474.
- Jochim MM, Jones SC (1987). Monoclonal antibodies to epizootic hemorrhagic disease virus antigen, USA. Patent N.4678746.
- Knize AV, Stepanov AV, Strizhakov AA, Kolomytsev AA, Dmitrenko NV, Murueva GB, Stryglar LK (2000). "Analysis of Epizootic Situation on Morbilliviral Infections of Ruminants". Materials of scientific-practical conference, 15 – 16 August, Pokrov, Russian Federation, pp. 19 – 22.
- Lefevre PC, Diallo A, Schenkel F, Hussein S, Staak G (1991) Serological evidence of peste des petits ruminants in Jordan. *Vet. Rec.* 128: 110.
- Lefevre PC, Diallo A (1990). Peste des petits ruminants. Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux, Maisons-Alfort, France. *Rev. Sci. Tech. O.I.E. Dec.* 9(4) : 935-981.
- Murthy FA, Fauquet CM, Bishop DHL, Ghabrial SA, Jarvis AW, Martelli GP, Mayo MA, Summers MD (1995). Virus taxonomy classification and nomenclature of viruses. Sixth Report of the International Committee on Taxonomy of Viruses. *Arch. Virol. Suppl.* 10: 586
- Mouaz MA, Faid AA, Rawwhia ED, Kodeir MH (1995). Studies on peste des petits ruminants (PPR) in Egyptian sheep. *Vet. Med. J. Giza.* 43(4): 367-374.
- Moustafa T (1993). Rinderpest and peste des petits ruminants-like disease in the Al-Ain region of the United Arab Emirates. Department of Microbiol., Faculty of Veterinary Medicine, Banha, Zizgags University, Egypt. *Rev. Sci. Tech.* 12(3): 857-863.
- Manual for PPR detection. (2005) EMPRES (Livestock) Animal Production and Health Division Viale delle Terme di Cara-calla 00100 Rome, Italy.
- Mamadaliyev SM, Koshemetov ZK, Nurabayev SS, Matveeva VM, Azhibayev AZ, Khirullin BM (2006). "PPR Monitoring on the Territory of the Republic of Kazakhstan and Central Asia." Materials of international scientific- practical conference, 21 – 23 June, Ulianovsk, Russia pp. 313 – 316.
- Nurabayev SS, Koshemetov ZK, Mamadaliyev SM, Troitskiy YN, Matveeva VM, Azhibayev AZ, Katubayeva BS (2006) "Monitoring of Especially Dangerous Viral Diseases among Small Ruminants in the Republic of Tajikistan". Materials of Third international scientific-practical conference, 14 – 15 September, Samarkand, pp 235 – 238.
- Obi TU, Ojo MO, Durojaiye OA, Kasali OB, Akpavie S, Opasina DB (1983). Peste des petits ruminants (PPR) in goats in Nig. clinical, microbial. and pathological features. *Zentralbl. Vet. Reihe B.* 30: 751-761.
- Obi TU, Rowe LW, Taylor WP (1984). Serological studies with the peste des petits ruminants and rinderpest viruses in Niger. *Trop. Anim. Health. Prod.* 16(2): 115-118.
- Ojo MO, Durojaiye AO, Kasali OB, Akpavie S. Opasina DB (1983). Peste des petits ruminants (PPR) in goats in Nig. Clinical, microbial. and pathological features. *Zentralb Veterinarmed (B).* 30: 751-761.
- Onoviran O, Majiyagbe KA, Molokwu JU, Chima JC, Abegboye DS (1984). Experimental infection of goats with Mycoplasma capri and peste des petits ruminants virus. *Rev. elev. et Med. Vet. Pays Trop.* 37(1): 16-18.
- OIE "Bulletin" 1984-2000.
- OIE "Disease Information" 1997-2000.
- OIE "World animal health" 1984-1997. Paris 1984-1987.
- Orynbayev MB, Mamadaliyev SM, Koshemetov ZK, Nurabayev SS (2005). "PPR in the Republic of Tajikistan". Materials of international scientific-practical conference "Important Problems in Veterinary Medicine and Agric. Biotech.", 19-20 May, Pavlodar, Kazakhstan pp.66 – 71.
- Perl S, Alexander A, Yakobson B, Nyska A. Harmelin A, Sheikhat N, Shimshony A, Davidson N, Abramson M, Rapoport E (1994). Peste des petits ruminants (PPR) of sheep in Israel: case report. *Israel J. Vet. Med.* 49(2): 59-62.
- Peste des petits ruminants. (1996). OIE pp. 77-84.
- Shaila MS, Purushothaman V, Bhavasar D, Venugopal K, Venkatesan RA (1989). Peste des petits ruminants of sheep in India. *Vet. Rec.* 125: 602-602.
- Shaila MS, Venugopal K, Purushothaman V, Vencatesan RA (1990). Isolation and characterization of peste des petits ruminants virus from an outbreak in Tamilnadu sheep. *Indian Vet. J.* 67(4): 385-386.
- Singh VP, Chum VK, Mondhe KS (1996). Peste des petits ruminants: an outbreak in sheep in Rajasthan. *Indian Vet. J.* 73(4): 466-467.
- Taylor WP (1979). Serological studies with the virus of peste des petits ruminants in Niger. *Res. Vet. Sci.* 26: 236-242.
- Taylor WP, Abegunde A (1979). The isolation of peste des petits ruminant virus from Nig. sheep and goats. *Res. Vet. Sci.* 26(1): 94-96.
- Taylor WP, Al Busaidy, Barrett T (1990). The epidemiology of peste des petits ruminants in Sultanate of Oman. *Vet. Microbiol.* 22: 341-352.
- Ugochukwu EI, Agwu CO (1991). Aerobic bacteria from nasal discharge of goats suffering from clinical PPR: isolation and identification. *Microbios.* 65(263): 81-85.
- Wosu LO, Chineme CN (1989). Etiologic studies on the association of goat pox with PPR disease in Niger. *Arch. Roum. Path. Exp. Microb.* 48(1): 79-83.