



The bank vole (*Clethrionomys (Myodes) glareolus* Schreb., 1780) is the main reservoir of Puumala (PUUV) Hantavirus, which causes hemorrhagic fever with renal syndrome (HFRS) in humans.

# STATISTICAL MODELLING OF PUUMALA HANTAVIRUS RESERVOIR ACTIVITY AND PREDICTION OF HFRS INCIDENCE IN UDMURT REPUBLIC



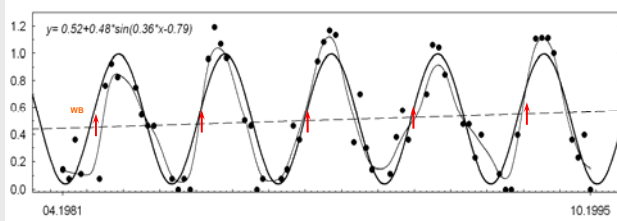
Kshnyasev I.A.<sup>1</sup>, Bernshtein A.D.<sup>2</sup>, Zhigalski O.A.<sup>1</sup>

1. Institute of plant and animal ecology UB RAS, Yekaterinburg, Russia; ([kia@ipae.uran.ru](mailto:kia@ipae.uran.ru)).
2. Institute of Poliomyelitis and Viral Encephalitis, RAMS, Moscow, Russia; ([centerglps@rambler.ru](mailto:centerglps@rambler.ru))

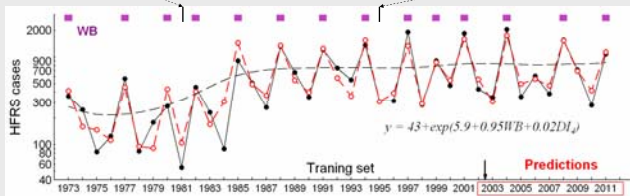
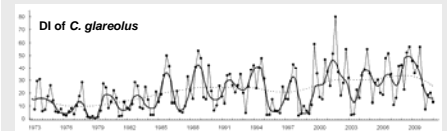
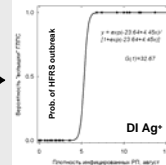
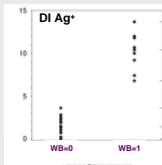


Puumala Hantavirus (PUUV) is agent that causes hemorrhagic fever with renal syndrome (HFRS) in humans. HFRS is widespread within temperate/boreal zone of Europe and ranked first on incidence among all zoonotic disease in Russia. Udmurt Republic (UR) is situated in zone of mixed coniferous–deciduous subtaiga forests, and HFRS is highly endemic here with annual incidence up to 56.1 per 100,000 inhabitants, which is an order of magnitude higher than average in Russia.

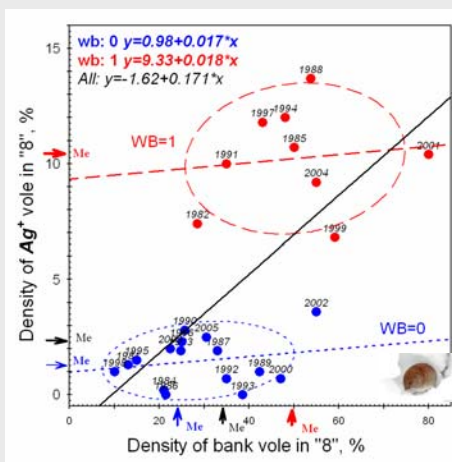
Based on data of *Myodes glareolus* (the main carrier of PUUV) dynamics, antigen-positive ( $Ag^+$ ) voles prevalence (1981-2004) and human HFRS incidence (1973 –2011) we built a set of statistical models that simulate PUUV activity (prevalence\*host density) and provide early prediction of HFRS rate in humans.



There is strong 3-year periodicity (+weak seasonal pulse) of PUUV activity = log(density of  $Ag^+$  vole + 1).

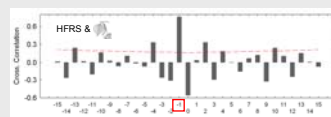
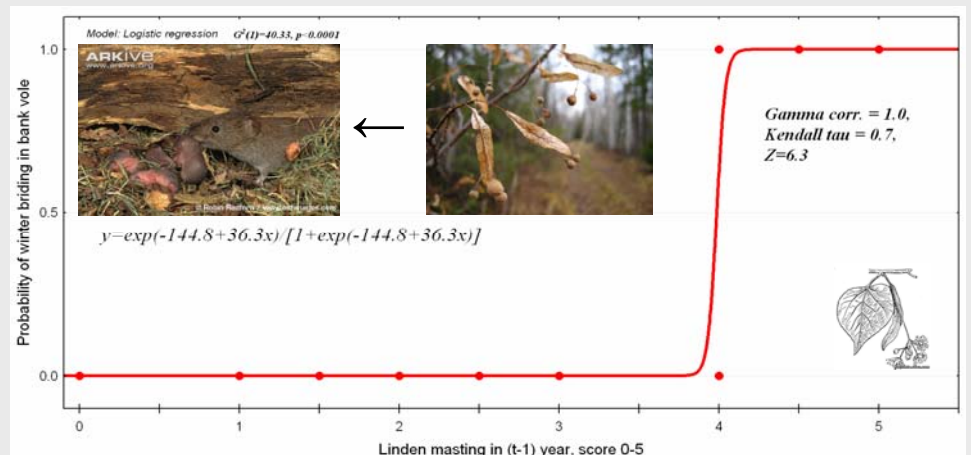
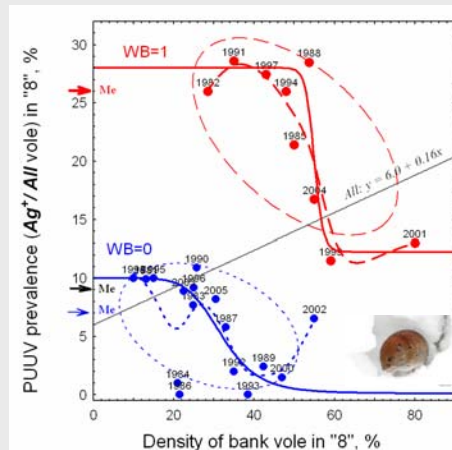


There is about 3-yr periodicity (on the background of s-shape trend) of HFRS incidence in humans in UR.



Both PUUV activity (but see the prevalence in bank vole) and human HFRS incidence are in strong association with timing of vole breeding (WB=1). In turn the last is in strong dependence upon food supply in winter.

Thus the linden (*Tilia cordata*) masting may be used for the earliest and sufficiently accurate prediction of HFRS outbreak in UR.



RFBR 10-04-01657

