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## Workshop Rodent-Borne Diseases

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### Ecology of Puumala hantavirus in Europe

**Heikki Henttonen<sup>1</sup>, Liina Voutilainen<sup>2</sup>, Eva Kallio<sup>3</sup>, Jukka Niemimaa<sup>1</sup>, Tarja Sironen<sup>4</sup>, Olli Vapalahti<sup>4</sup>**

<sup>1</sup>Natural Resources Institute Finland, Helsinki, Finland, Heikki.Henttonen@luke.fi

<sup>2</sup>Centre for Military Medicine, Helsinki, Finland

<sup>3</sup>University of Oulu, Oulu, Finland

<sup>4</sup>Virology, Medicum, University of Helsinki, Helsinki, Finland

Understanding the dynamics of zoonotic hosts and zoonotic pathogens in their reservoir host populations is a prerequisite for predicting and preventing disease epidemics. The infection risk of humans by Puumala hantavirus (PUUV) is high in northern Europe, where like in Finland bank voles (*Myodes glareolus*) undergo cyclic fluctuations. During 1995 - 2017 about 35,000 human cases of NE (nephropathia epidemica) were diagnosed in Finland. We analysed the annual NE incidence in various parts of Finland, from coastal areas to inland and from south to north, reflecting declining proportion of agricultural land and forest fragmentation. There was a trend for one year NE peaks in coastal and southern regions while two year peaks occurred inland, possibly indicating more restricted dispersal of host and virus in the increase phase in former ones. We review a detailed 7-year longitudinal capture-mark-recapture study, mostly at monthly intervals, on seasonal and multiannual patterns of the PUUV infection in the highly endemic area in Central Finland. Infected bank voles were most abundant in mid-winter months during years of increasing or peak host density. Seroprevalence of PUUV in bank voles exhibited a regular, seasonal pattern reflecting the annual population turnover and accumulation of infections within each cohort. In autumn, the PUUV transmission rate tracked increasing host abundance, suggesting a density-dependent transmission. However, prevalence of PUUV infection was similar during cyclic increase and peak years despite a twofold difference in maximum host density. This may result from the high proportion of young individuals carrying maternal antibodies in summer of the peak year delaying transmission during the cycle peak years. This increase/peak dilemma is reflected in the human NE incidence: even though the bank vole density is clearly higher in the peak year, the number of NE cases can often be similar or even higher in the increase year.