

Oral presentation

**LJUNGAN VIRUS, A CANDIDATE VIRUS IN ASSOCIATION WITH SEVERAL HUMAN DISEASES, FOUND IN BANK VOLES AND YELLOW-NECKED MICE FOR THE FIRST TIME IN NORTHERN ITALY**

**HEIDI C. HAUFFE**<sup>1,7</sup>, **BO NIKLASSON**<sup>2,3</sup>, **THERESE OLSSON**<sup>2</sup>, **ALESSANDRO BIANCHI**<sup>4</sup>, **ANNAPAOLA RIZZOLI**<sup>1</sup>, and **WILLIAM KLITZ**<sup>5,6</sup>

<sup>1</sup>Fondazione E. Mach, Centro di Ecologia Alpina, Viote del Monte Bondone, 38100 Trento, Italy; <sup>2</sup>Apodemus AB, Grevgatan 38, SE-114 53 Stockholm, Sweden; <sup>3</sup>Department of Medical Cell Biology, Uppsala University, Box 571, SE-751 23 Uppsala, Sweden; <sup>4</sup>Ambulatorio Veterinario Tavernerio, via Salvo d'Acquisto 8, 22038 Tavernerio (CO), Italy; <sup>5</sup>School of Public Health, University of California, 140 Warren Hall, Berkeley, CA 94720-7360, USA; <sup>6</sup>Public Health Institute, Oakland, CA 94607-4046, USA; <sup>7</sup>Corresponding author (e-mail: [hauffe@cealp.it](mailto:hauffe@cealp.it))

The Ljungan (picorna) virus (LV) was first isolated in 1998 from Swedish bank voles (*Myodes glareolus*) after clinically recognizable type-1 diabetes-like symptoms were noted in this species in Denmark. LV has subsequently been shown to induce type-2-like diabetes, as well as uterine resorptions, malformations, and neonatal death in CD-1 laboratory house mice, and has been found in wild voles in the USA, as well as in lemmings and laboratory rats. Intriguingly, the incidence of type-1 diabetes, Guillain-Barré syndrome and myocarditis in the human population is correlated with rodent population cycles in Sweden. In addition, LV has been associated with intrauterine fetal death in Sweden, and a preliminary study showed that children newly diagnosed with type-1 diabetes have significantly increased levels of LV antibodies compared to controls. It has been hypothesized that the bank vole as well as other small rodents could act as reservoirs and/or vectors of LV that may be a zoonotic agent several human diseases or pathologies, including economically important type-1 diabetes. Consequently, knowledge of the distribution LV among wild and domestic mammal species is crucial to assess its potential importance as a human pathogen, identify possible zoonotic sources of the virus and lay groundwork for possible vaccine development. Here we provide a review of the current understanding of the ecopathology of LV and present the first results from southern Europe. Using Real Time RT PCR, LV was confirmed in 50% (10/20) of bank voles and in 10% (2/20) of yellow-necked mice (*Apodemus flavicollis*) collected from an alpine meadow in northern Italy during 2006. LV-positive animals included males and females, adults and subadults. This is the first time LV has been reported in Italy and in yellow-necked mice. These results significantly increase the geographical and species range of LV. We believe the global distribution of this picornavirus, and its role as a zoonotic agent, deserve further attention.