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Hantaviruses in the Americas: A growing problem

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Hantaviruses (genus *Hantavirus*, family *Bunyaviridae*) are associated with specific rodent hosts, in which they cause a chronic, asymptomatic infection, involving the shedding of infectious virus into the environment in urine, feces, and saliva. Hantaviruses are associated with three subfamilies of murid rodents: (1) The Murinae (old world rats and mice) host viruses that cause hemorrhagic fever with renal syndrome (HFRS) in Asia and Europe; (2) the Sigmodontinae (New World rats and mice) host viruses that cause hantavirus pulmonary syndrome (HPS) in the Americas; (3) the Arvicolinae (pan-arctic voles and lemmings) host viruses causing mild HFRS in Europe and Asia, but no disease in the Americas. Prior to 1993 only one hantavirus was known from the Americas. It is associated with an arvicoline rodent and is not associated with any human disease. Since the initial recognition of HPS in the western U.S. in 1993, cases have been recognized in other countries in the Americas, including Argentina, Chile, Paraguay, Uruguay, Brazil, Bolivia, and Panama. While 400 HPS cases have been recognized in North America, more than 1200 have been recognized in South America. Hantavirus antibody-positive rodents have been found in several other countries, including

Venezuela, Peru, Costa Rica, and Mexico. HPS now appears to be a Pan-American disease. Over 30 hantaviruses, each generally associated with a single rodent host have been described throughout the Americas. More virus-host pairs are discovered each year, and there is evidence that most remain to be discovered. The natural associations of hantaviruses with three closely related subfamilies of rodents, the existence of numerous host-specific relationships, and the characteristic benign, chronic infection with highly efficient host-to-host transmission suggest an ancient, highly co-evolved relationship. Molecular evidence (the close similarity between the phylogenetic trees of rodent hosts and those of the viruses) strongly corroborates this hypothesis of co-evolution. Important implications of this hypothesis are: (1) hantaviruses are not new; it is only our recognition of them that is new; (2) the potential for the discovery of new hantaviruses in the Americas is limited only by the number of sigmodontine rodent species in the Americas (approximately 423). As the center of diversity for sigmodontine rodents, tropical South America is likely to be home to a large number of hantaviruses.