What the smallest infectious agents reveal about evolution

May 22 2013

Radically different viruses share genes and are likely to share ancestry, according to research published in BioMed Central's open access journal *Virology Journal* this week. The comprehensive phylogenomic analysis compares giant viruses that infect amoeba with tiny viruses known as virophages and to several groups of transposable elements. The complex network of evolutionary relationships the authors describe suggests that viruses evolved from non-viral mobile genetic elements and vice versa, on more than one occasion.

The recent discovery of virophages inside the giant viruses, which in turn infect amoeba, has led to speculation about their origin and their relationship to other viruses and small transposable genetic elements. To try to answer this question a research team including Eugene Koonin from the NIH and Didier Raoult from URMITE compared the genetic material from virophages, such as the Mavirus, Sputnik, or OLV (which was isolated from an Antarctic organic lake), to eukaryotic self replicating transposable elements known as Polintons or Mavericks.

Eugene Koonin explains: "Between the known virophages there are six conserved genes, arranged in a similar way. Five of these have counterparts in the Polintons, but their sequence and arrangement are sufficiently different to discount suggestions that Polintons evolved directly from a Maviruse-like ancestor. Rather our data suggests that Maviruses have evolved from a fusion between a Politon/Maverick-like transposable element and an unknown virus."

Including information about other viruses and virus-like elements: adenoviruses that infect animals and are one of the causes of the common cold; certain bacteriophages that infect bacteria; transpovirons which infect giant viruses; and a Tetrahymena transposable element (Tlr1), the virus "evolutionary tree" appears as a network of swapped genes.

Didier Raoult, whose team discovered the transpovirons, says: "It appears that viruses have evolved from non-viral genetic elements and vice versa on more than one occasion. Viral evolution is more complex than we thought."

More information: Virophages, polintons, and transpovirons: a complex evolutionary network of diverse selfish genetic elements with different reproduction strategies Natalya Yutin, Didier Raoult and Eugene V Koonin *Virology Journal* 2013, 10:158 doi:10.1186/1743-422X-10-158

Provided by BioMed Central