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The C. Elegans fusion protein EFF-1 is homologous to viral class II proteins

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Class II proteins are viral membrane fusogenic molecules folded essentially as β-sheet and having an internal fusion peptide. In particular, they lack the characteristic central alpha-helical coiled coil present in the post-fusion conformation of all other viral fusion proteins. The regular, icosahedrally symmetric enveloped viruses that have been studied so far, such as flaviviruses, alphaviruses and phleboviruses have been shown to have class II fusion proteins, which in their pre-fusion conformation make an icosahedral shell surrounding the viral membrane. Yet despite having very similar envelope proteins, these viruses belong to three different viral families with totally different genome replication machineries. We have recently identified the rubella virus fusion a belonging to class II, although the virus particles appear pleomorphic and lack icosahedral symmetry. In spite of the lack of any detectable sequence conservation, the available structures indicate that class II proteins have undergone divergent evolution from a distal, ancestral gene. We have now discovered that the cellular fusion protein EFF-1, involved in syncytium formation during the genesis of the skin in nematodes (C. elegans) and in other multicellular organisms, is also folded as a class II viral fusion protein, thereby indicating common ancestry, highlighting an unprecedented amount of exchange of genetic information between viruses and cells. My talk will discuss the implications of this finding, which highlights the intricate exchange of genetic information that has taken place between viruses and cells during evolution. This analysis also suggests a mechanism for the homotypic cell-cell fusion process, which has not been studied so far.

Keywords: membrane fusion, C. Elegans development, Class II fusion proteins