The genetic secrets to jumping the species barrier

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Scientists have pinpointed specific mutations that allow a common plant virus to infect new species, according to research published in the March issue of the *Journal of General Virology.* Understanding the genetics of the key interactions between viruses and hosts could provide insight to how some viruses manage to jump the species barrier and even give us a better idea of how animal diseases are generated.

Researchers from Saga University, Japan studied the genetic changes that took place when turnip mosaic virus (TuMV) - a plant mosaic disease spread by aphids - adapted to infect a new species. Genetic analysis showed TuMV had acquired an average of 140 significant mutations, on its evolutionary pathway from Brassica rapa (turnip), a host to which it is well adapted, to a new host *Raphanus sativus* (radish).

Interestingly, many of the mutations were found clustered in genes that code for two key viral proteins, P3 and CI. These two proteins are already known to interact with genes that help plants resist TuMV infection. Researchers think that a kind of molecular tug of war between these proteins and plant resistance mechanisms takes place, that determines not only the severity of disease following infection, but also whether the virus can infect its host in the first place.

Both plant and animal viruses are specifically adapted to infect and replicate in particular types of host. To ensure their spread and survival, viruses can adapt to their environment by mutating. Mutations may alter the severity of infection in existing hosts, change how contagious a virus

is, or allow the virus to infect new hosts. Viruses such as TuMV that use RNA (rather than DNA) as their genetic material mutate especially easily as they use a copying method that is far more error-prone.

Professor Kazusato Ohshima who led the study believes that research into the virus-host interface in plants could have far-reaching benefits. "Revealing the subtleties of the interaction between viruses and plant resistance mechanisms could help breeders produce better crops, for example by selecting strains that block changes to TuMV." He also said the work could help the study of animal viruses. "We are trying to understand how novel viruses emerge - particularly how viruses are able to cross the species barrier. This in turn gives us a better idea of how pandemics are generated and how best to stem their spread."

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