Genetic short cuts: Horizontal gene transfer

Rhizobia are little bulbs full of bacteria that live in the roots of lots of kind of plants, many of which are important bumper crops for humans. And just as we rely on peas and legumes to eat, so doe these bacteria. But, they also offer something in exchange for the plant. They breakdown nitrogen into amino acids that hang around the roots so the plants can use them to grow.

In traditional evolutionary theory, one might thing all these bacterial nodes evolved separately to do the same job, just as tea and coffee plants evolved caffeine production separately. But new research confirms this is not the case. These bacteria shared the 'symbiosis genes' that make them valuable to plants in an instant upload. Ed Yong explains at National Geographic:

> From these groups of undertakers and disease-makers, several members have repeatedly and independently evolved into plant partners. They did it by picking up large packages of genes from other microbes that had already colonised roots. These "horizontal gene transfers" are everyday events for bacteria, allowing them to instantly pick up new skills without having to evolve them from scratch.

The transferred genes don't work instantly. There is still a learning curve. The plants have to tailor those genes to their particular plant host. But the symbiosis package also has an 'app' for that. It contains genes that rapidly accelerate mutation to speed up the chances new changes will arise that make the bacteria a good fit for the plant.

The process of sharing large chunks of genes is called horizontal gene transfer, and it's a big deal in the single-cell organism world. We know that this process is also responsible for antibiotic resistance, a huge problem for our healthcare system, and it probably happens with the microbes that line our gut.

We don't know if these same type of transfers happen in higher level organisms, beyond bacteria and viruses. But it t is a remarkably quick and dirty way of sharing and changing genetic material.

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Additional Resources:

- Interspecies RNA Shuffle, Scientist
- Humans are at least 8% virus, Discover
- Extensive Gene Transfers Occur in Complex Cells Way More than Expected, Nature