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## The genome of *Sinorhizobium meliloti*

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Many plants have evolved symbiotic relationships with bacteria that result in the development of root nodules called rhizobia, which enable the plants to obtain nitrogen compounds by bacterial reduction of nitrogen to ammonium. In the 27 July issue of *Science*, Galibert and colleagues from the Laboratoire de Génétique et Développement, CNRS, Rennes, France revealed the sequence of the  $\alpha$ -proteobacterium *Sinorhizobium meliloti*, the bacterium involved in a rhizobial association with the crop plant alfalfa (*Medicago sativa*).

Galibert *et al.* reported that *S. meliloti* strain 1021 has a tripartite genome; a 3.65 megabase (Mb) chromosome, and 1.35 Mb pSymA and 1.68 Mb pSymB megaplasmids. Further analysis of the genome suggests that all three genetic elements are involved, to a greater or lesser degree, in the establishment and maintenance of the plant-bacterium symbiosis (*Science* 2001, **293**:668-672).

They predicted that the genome contains 6,204 protein-coding genes, of which the largest proportion (12.5%) are thought to encode transport system proteins. Regulatory genes occupy 9% of the genome. The three *nod* genes required for the initiation of the rhizobium (*nodM*, *nodPQ* and *nodG*) are located on pSymA.

Understanding the genome of this bacterium could enable specific genes to be manipulated to increase the yield of alfalfa. It may also enable the bacteria to be altered such that they can be used to infect other non-leguminous species. In addition, as *S. meliloti* is an  $\alpha$ -proteobacterium, understanding its genome could provide important information about plant and animal pathogenic bacterial species such as *Agrobacterium* and *Brucella*.

## References

1. Galibert F, Finan TM, Long SR, Puhler A, Abola P, Ampe F, Barloy-Hubler F, Barnett MJ, Becker A, Boistard P, *et al.*: The composite genome of the legume symbiont *Sinorhizobium meliloti*. *Science* 2001, 293:668-672., [<http://www.sciencemag.org/content/current/>]
2. The Alfalfa Council, [<http://www.alfalfa.org/>]