X-ray mag

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NEWS

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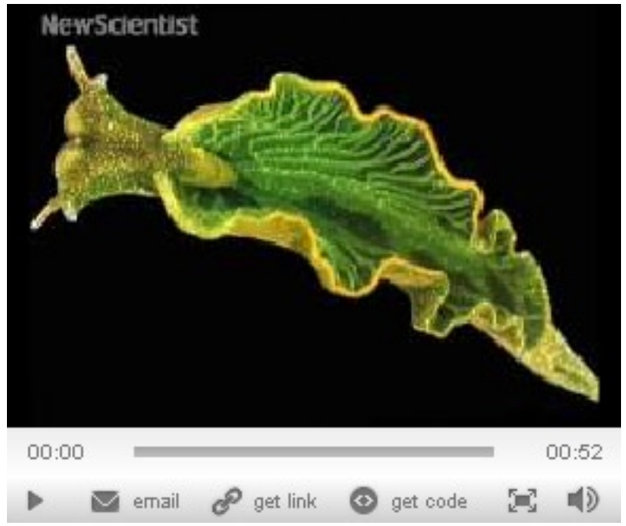

A hybrid plant-animal?

This sea slug is solar powered

This sea slug resembles a nudibranch, but does not belong to that suborder of gastropods. It is instead a member of the closely-related suborder *sacoglossa*

Elysia chlorotica is a green sea slug, with a gelatinous leaf-shaped body, that lives along the Atlantic seaboard of the US. What sets it apart from most other sea slugs is its ability to run on solar power.

The slug feeds by sucking the cell contents from the intertidal algae *Vaucheria*. Most of the cell contents are simply digested by the slug. But the slug is also able to keep the chloroplasts—the photosynthesising "factories" from the algae—alive and operating and functioning within its own body by storing them in the cells that line its gut.

But that is not all. Here is the really interesting twist: Young *E. chlorotica,* which were fed with algae for only two weeks, have been shown to survive for the rest of their year-long lives without eating, apparently surviving on the photosynthetic production from the assimilated chloroplasts. But how can than be possible when the isolated chloroplasts only contain enough DNA to encode about ten percent of the proteins needed to keep themselves running? The other necessary genes are found in the algae's nuclear DNA.

"So, the question has always been, how do they continue to function in an animal cell missing all of these proteins," says Dr Mary Rumpho of the University of Maine and an expert on *E. chlorotica*. The answer she found is as simple as it is stunning. The sea slug has acquired its photosynthetic capabilities thanks to genes it has "stolen" from the algae it eats. (SOURCE: PUBMED CENTRAL)

"Stolen" genes

In their latest experiments, Rumpho and colleagues sequenced the chloroplast genes of *Vaucheria litorea*, the algae that the sea slug feed on. They succeeded in demonstrating that if the sea slug used the algal chloroplasts alone, it would not have all the genes needed to photosynthesise.

They then turned their attention to the sea slug's own DNA and discovered it contained one of the vital algal genes. Its sequence was identical to the algal version, indicating that the slug had probably acquired the gene from its food.

"We do not know how this is possible and can only postulate on it," says Rumpho, who told New Scientist that the phenomenon of stealing is known as kleptoplasty.

One possibility is that, as the algae are processed in the sea slug's gut, the gene is taken into its cells along with the chloroplasts. The genes are then incorporated into the sea slug's own DNA, allowing the animal to produce the necessary proteins for the stolen chloroplasts to continue working.

Another explanation is that a virus found in the sea slug carries the DNA from the algal cells to the sea slug's cells. However, Rumpho says her team does not have any evidence for this yet.

In another surprising twist with far reaching implications, the researchers also found the algal gene in *E. chlorotica*'s sex cells, meaning the ability to maintain functional chloroplasts could be passed to the next generation. The researchers believe many more photosynthesis genes are acquired by *E. chlorotica* from their food, but still need to understand how the plant genes are activated inside sea-slug cells.

Further reading: **Solar-Powered Sea Slugs** ■

There are two major groups of solar-powered slugs. One group, the sacoglossans, are essentially herbivores who remove intact plastids from the plants and keep them alive and functioning in their own bodies.

The second group are essentially carnivores, or related to carnivores, and they nurture single-celled plants [*zooxanthellae*] in their bodies. In most cases they have 'stolen' the zooxanthellae from their original cnidarian hosts, such as sea anemones or soft corals. SOURCE: SEA SLUG FORUM ■