

## Eukaryotic life, but not as we know it

By [Rebecca Hall](#)

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A team of scientists from Charles University in Prague have discovered a living organism that appears to be missing mitochondria, a cellular organelle thought to be essential for life.

Mitochondria are the so-called powerhouses of living cells – they are responsible for making all of the energy for the organism. They are involved in the production of ATP as a final step in the metabolism of glucose and other energy molecules. It has long been thought by biologists that they are found in all eukaryotes.

Eukaryotes are organisms which, unlike prokaryotes, for example bacteria, contain a nucleus and other membrane bound organelles.

It has been suggested that mitochondria were acquired by eukaryotes way back in evolutionary time by a process called endosymbiosis.

Symbiogenesis theory is thought to explain the origin of eukaryotic cells from prokaryotic cells. It suggests that an ancient ancestor of eukaryotes engulfed a single celled bacterium that managed to survive within its host. A beneficial relationship for both cells developed, allowing both organisms to survive. This is unlike predatory-prey or parasite relationships where one organism's fitness suffers.

This organism was more successful than those without the engulfed bacterium and so the relationship stuck around. Eventually the bacterium integrated into the host's cell and became the mitochondria present in hundreds of eukaryotes, including humans. The fact that mitochondria have their own DNA, RNA and ribosomes supports the theory.

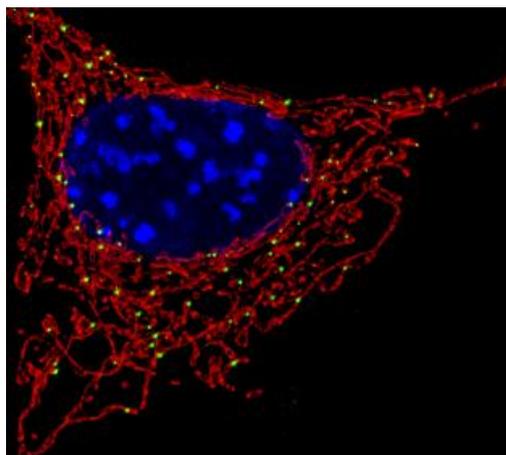


Image: NICHD

As this theory has been established for many years, it must have come as quite a shock when Anna Karnkowska's team discovered a eukaryotic microbe that appeared to manage just fine without mitochondria. This finding has the potential to really shake up what are the most convincing and widely accepted evolutionary ideas.

The scientists looked into the DNA of this microbe, *Monocercomonoides*, and found no genes associated

with the presence of mitochondria, including a lack of those to build the organelle.

They believe that the microbe manages to get around the need for the energy producing organelle by acquiring a second system from bacteria in its surroundings. The energy producing system is thought to be acquired by lateral gene transfer. This system does such a good job of making energy that the mitochondria are dispensable.

So what does this mean for our view on how life evolved? This discovery emphasises the need to continuously question accepted 'facts' in science.

Further investigation needs to be done into how the microbe survives, and the search for similar organisms has begun. It is possible that clusters of organisms are not as closely related as previously thought and that more systems may be acquired via lateral transfer.

The finding raises the possibility that there are other microbes that have also jettisoned seemingly essential components. This finding and the huge diversity of life on earth highlights the fluid nature of evolution.



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