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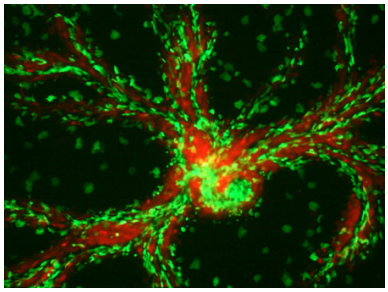

Strangers. A laboratory strain of *D. discoideum* (red) and a distantly related wild strain (green) segregate into streams during the formation of multicellular slugs.

CREDIT: MARIKO KATOH/BAYLOR COLLEGE OF MEDICINE

Amoebae Family Values

By Lizzie Buchen
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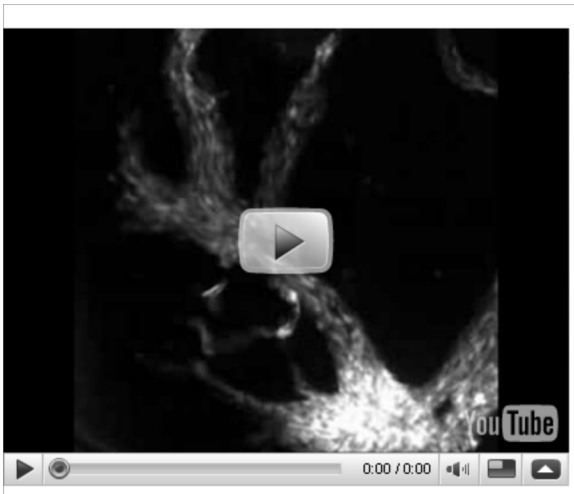
Tony Soprano and social amoebae have one thing in common: They only trust family. When things get tough, the single-celled organisms gang up with their closest relatives like any cutthroat mobster would, a strategy that may protect them from swindlers, new research shows. Scientists say the slimy cooperation may shed light on how some of the earliest social behavior first evolved.

The social amoeba *Dictyostelium discoideum* usually lives alone, dining on bacteria in the forest soil. When food becomes scarce, tens of thousands of neighboring amoebae meld into a blob--about a third the length of an eyelash--that slithers much farther than any amoeba could on its own. When the slug reaches a warm, sunlit locale, the aggregate transforms into a fruiting body: About 20% of amoebae sacrifice themselves to form a rigid stalk, hoisting their comrades upward as a ball of spores. These lucky amoebae hitch rides on the fur of passing mammals to reach greener pastures. The martyrs of the stalk wither and die.



To the stalk! Some 10,000 starving *Dictyostelium* cells coalesce and begin to wiggle.
(Credit: Thomas Gregor/Princeton University)

The strategy seems ripe for cheaters. After all, amoebae that shirk their stalk duty have a better chance of survival--and are more likely to pass their deceitful ways on to the next generation. Yet cheaters haven't overtaken the species, so something must be keeping them honest.

A team led by biologists Elizabeth Ostrowski of Rice University and Mariko Katoh of Baylor College of Medicine, both in Houston, Texas, wondered whether that something might be nepotism. In certain insect species, for example, workers "sacrifice" themselves for the good of their relatives so that some of their shared genes are passed on. The researchers gathered 14 strains of wild amoebae and measured how closely related they were to a common laboratory strain of *D. discoideum*. Then, they mixed each wild strain with the laboratory amoebae, which had been engineered to glow green under fluorescent light.

After the starving amoebae assembled into slugs and formed fruiting bodies, the researchers noticed something intriguing. When the lab strain was mixed with a close relative, the groups gathered into evenly blended fruiting bodies, with about half of the spores coming from each strain. When distant relatives were mixed, however, they segregated during aggregation, resulting in fruiting bodies that were dominated by either one strain or the other.

Excluding nonrelatives from the fruiting body is an effective way to limit cheating, says Ostrowski, because the genome of nonrelatives is unknown and thus more likely to harbor cheating mutations. Plus, relatives gain by helping each other out, as they pass on similar genes to the next generation. "If you end up making a sacrifice for the common good, it's likely that you're doing it for individuals you're related to," she says. The results appear online today in the journal *PLoS Biology*.

"This work is pretty compelling evidence that even these simple unicellular organisms are capable not just of distinguishing self from nonself but even between close and distant relatives," says evolutionary biologist Richard Grosberg of the University of California, Davis. The findings contribute to our understanding of how some of the earliest organisms may have balanced cooperation with self-interest, he says, essential traits for social behavior.

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