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Morning Edition

Scientists Explore Why Single Cells Band Together

by Joe Palca

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Researchers are discovering how multicellular organisms evolved.The first evidence of multicellularity happened about 2 billion years ago.

RENEE MONTAGNE, host:

Let's turn now to the very first cells that swam all alone in the primordial soup. Those cells figured out a way to get together, and that led to the explosion of complex plants and animals we see on Earth today. It's a process scientists would like to know more about.

And as NPR's Joe Palca tells us, a new study sheds light on that.

JOE PALCA: This is a story that starts a long time ago.

Dr. JOHN KOSCHWENAZ (Researcher, Harvard University): It's believed life started around four billion years ago, and the first evidence of multicellularity is a little over two billion years ago.

PALCA: John Koschwenaz is a researcher at Harvard. He's investigating how those first cells joined together.

Dr. KOSCHWENAZ: We can't take a time machine back two billion years ago to find out exactly what happened, but instead we can do a couple things in the lab.

PALCA: One of those things is to see if there any benefit for cells that are normally loners to gather their pals and form a clump. Koschwenaz tried this with yeast. A single

yeast cell has a problem. It can get energy from sugar, but it spills lot, so it doesn't make the most efficient use of the sugar around it. But if the yeast clump together into a group, instead of spilling the sugar on the floor, as it were, they're all spilling it on their neighbors.

Dr. KOSCHWENAZ: So in essence all the cells within the clump of cells are feeding each other.

PALCA: So Koschwenaz tried growing loners and clumpers in conditions where sugar was scarce.

Dr. KOSCHWENAZ: And we compared the single cells against a group of cells.

PALCA: Sure enough, as Koschwenaz reports in the journal Plos Biology, the clumpers beat the loners hands-down. So if in the course of evolutionary time a group of yeast cells did happen to clump together, they would probably stick around and thrive.

Rick Grosberg is a biologist at the University of California Davis. He says the new study shows you don't need some unique and strange event two billion years ago to encourage cells to form into groups.

Dr. RICK GROSBERG (University of California, Davis): The conditions that really promote group formation in organisms as simple as yeast are very simple conditions. There's nothing complicated or surprising or special about them. They must have been very general conditions.

PALCA: Now there is multicellularity, and then there is multicellularity. Nicole King is at the University of California, Berkeley.

Professor NICOLE KING (University of California, Berkeley): There are simple forms of multicellularity, in which cells typically are living on their own but they can come together under certain environmental conditions.

PALCA: But King thinks more interesting is the kind where different cells take on different tasks within a single organism. In the case of humans, that would mean heart cells or brain cells or something specialized like that.

Prof. KING: That's the kind of multicellularity that most of us think about, and know and love.

PALCA: And how that happened is really complicated. In her work, King studies tiny single-celled organisms called choanoflagellates. These are organisms that have already begun to develop special bits, like a kind of tail for swimming around on a collar of tentacles to grab bacteria for dinner.

Prof. KING: All of them are single-celled, but the exciting thing is that some of them can form little multi-celled colonies as well.

PALCA: Inside the colonies, individual cells can start to take on these specialized functions, like swimming or digesting. King doesn't know precisely how that happens, but she does know one thing. If you compare the genomes of these tiny single-celled creatures with the genomes of some of the first true animals, they look remarkably similar.

Prof. KING: So we in fact think that a cell that looked like a choanoflagellate was probably the ancestor of animals.

PALCA: In other words, we all have some pretty humble origins.

Joe Palca, NPR News, Washington.