Abstractions

FIRST AUTHOR

Many stars are surrounded by a swirling mass of interstellar dust, known as a protoplanetary disk. Over millennia, the dust coagulates to form pebbles, then boulders and, eventually, planets. Thousands of such disks exist, but most are too far away for us to study the details and timing of planet formation. On page 194, William Herbst at Wesleyan University in Middletown, Connecticut, and his colleagues use the unique geometry of the system surrounding a star called KH 15D to observe the growth of grain-sized particles from interstellar dust — the first step in the evolution of protoplanetary material. Herbst talks to *Nature* about the project.

How did this star's discovery change your research?

Wesleyan students discovered the KH 15D star in 1995, using a small telescope, as part of a training project I started almost 30 years ago. Originally, we were looking for stars with odd behaviours. KH 15D was known as the winking star because it goes from normal brightness to almost undetectable during the course of a single day. The winking occurs because the KH 15D system contains not one but two stars that orbit one another in a 48-day cycle. The geometry of these stars' orbits caused the disk to be illuminated in a way that allowed us to see the particles in the disk.

Will this system continue to be productive?

Definitely. So far, we have only scratched the surface by analysing light that is reflected by the particles in the disk. We still have high-resolution spectroscopy data to explore that include light transmitted from the stars through the disk. Our work is complicated by the fact that the disk's orientation is changing at the moment, and will block the stars in future observations.

Will this compromise your work?

We won't be able to replicate this work. We don't have any way to see around the blockage, and we don't know how long we'll have to wait for conditions to change — it could be 30 years, or just until tomorrow. In the meantime, we hope to use different techniques to get further clues from the stars' reflections as the system shifts.

What was the biggest challenge?

It is very difficult for researchers, especially those at small institutions, to get time on the top telescopes around the world. With collaborators in Germany and Uzbekistan, we were able to continuously monitor the stars and gather preliminary data. This, in turn, allowed us to successfully compete for limited telescope time at the W. M. Keck Observatory in Hawaii and at the Chile-based Very Large and Magellan telescopes. ■

MAKING THE PAPER

Elaine Fuchs

RNA fragments in skin provide a fine degree of control.

As a young researcher, Elaine Fuchs was drawn to skin because of all that this most accessible of organs could reveal about cellular development. It is, she says, "a wonderful experimental system" — one that led her and her colleagues to discover a molecule responsible for fine-tuning the switch that causes a stem cell to produce a specialized cell.

Our skin's surface, or epidermis, comprises several layers of cells, all of which begin life as stem cells in the innermost 'basal' layer. From there, they stop dividing and move towards the outer layer, developing into specialized protective cells through a process known as differentiation as they go. For years, Fuchs, now a Howard Hughes Medical Institute cell biologist based at the Rockefeller University in New York, and others used cultured cells and animal studies to tease out the details of how cells migrate through the epidermis. By 2004, much had been learned about the mechanisms that demarcate the switch from proliferation to differentiation.

Then microRNAs appeared on the scene. These short, single-stranded RNA molecules turn down the production of certain proteins by binding to the mRNAs that normally serve as 'recipes' for those proteins' synthesis. "We started to wonder whether microRNAs might also be involved in the switch," says Fuchs.

Working with mice, Fuchs' postdoc Rui Yi found a wealth of microRNAs in skin at various stages of the animals' development. One in particular, named miR-203, stood out. Early in embryonic development, when the epidermis comprises just one layer, Yi found no miR-203 expression. But by the time these stem cells began to generate differentiating epidermal layers, miR-203 levels were high. This suggests that the microRNA might be involved in the switch to stratification and differentiation.

So Fuchs and her collaborators began investigating miR-203's function — work that involved many late nights in the lab. "I received plenty of emails from Rui at 2 and 3 a.m.," Fuchs acknowledges. But the results were worth the hard work. The team discovered that miR-203 interacts with the mRNA for a protein that is known to help epithelial stem cells maintain their proliferative abilities or 'stemness' (see page 225). The prevalence of this protein, called p63, was reduced whenever miR-203 was expressed.

Knockout of p63 in mice leads to stem-cell depletion and severe developmental abnormalities. Fuchs and her team found that precocious expression of miR-203 in mouse basal-layer cells causes lethal flaws that resemble those of p63-knockout mice. Conversely, miR-203 knockdown resulted in p63 levels being boosted, and sustained cell proliferation in epidermal layers beyond the basal layer.

Fuchs suggests that, in skin, miR-203 may function as a fine-tuning system for the switch from stem-cell proliferation to differentiation. "When a cell commits to differentiate, the first step is to induce changes in gene expression and generate different mRNAs," she says. "But simultaneously reducing protein expression makes for a cleaner, swifter change in the transition."

MicroRNAs may have roles in many developmental processes and some cancers. MiR-203 might be a therapeutic target for a type of cancer known as squamous cell carcinoma, Fuchs suggests. She adds that "if microRNAs turn out to be broadly important in controlling the balance between stem cells and differentiation, their therapeutic potential could be even greater". ■

FROM THE BLOGOSPHERE

Posters are an important tool for communicating research findings to a large audience, but their value can be hit-and-miss, according to Martin Fenner's Nature Network blog Gobbledygook (http://tinyurl.com/2d8tob). The research presented in many posters will never be peer-reviewed or published. And although at some meetings the poster presentation leads to stimulating discussions, at others, Fenner says, it is mainly "a trick to increase conference attendance".

The authors of a paper in *Deutsches Ärzteblatt* interviewed poster authors and attendees at a conference and found that although poster-session attendance was very low, the event was valued by younger scientists and by the meeting's moderators. Almost one-third of the posters had already been presented elsewhere.

Fenner concludes that poster presentations should be taken more seriously. Meeting organizers should select abstracts through a competitive peer-review process, rejecting those that have already been presented or published, and should allow space and time for viewing posters during a meeting. ■

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