

La coreografia della divisione cellulare

GLI STUDI DI ROSELLA VISINTIN SUL LIEVITO SI CONCENTRANO SULLA DIVISIONE DELLE CELLULE

Rosella Visintin Ph.D. | Awarded 2002

A Giovanni Armenise-Harvard Foundation Laboratory

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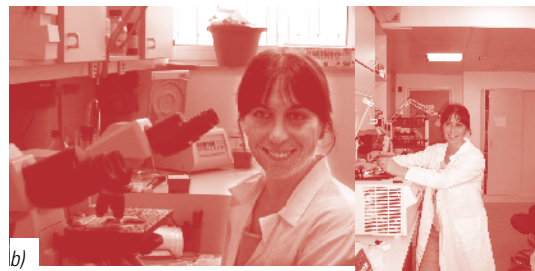
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\ di Courtney Humphries

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a)



b)



c)

a) Rosella Visintin b) Clara Visintin tech in the lab. c) Guendalina Mimun PhD student.

Fin dal suo primo corso di genetica, Rosella Visintin ha saputo ciò che voleva diventare: una biologa. E, fin dall'inizio della sua carriera, ha scelto di studiare un organismo che potrebbe sembrare poco entusiasmante: il lievito gemmante. Sebbene semplici, le cellule di lievito forniscono un importante strumento per uno scienziato interessato a capire il processo basilare che rende possibile la vita, da un punto di vista sia genetico, sia biochimico, che della biologia cellulare. Le cellule di lievito sono facili da produrre e da manipolare, poiché mancano della complessità di organismi maggiori. Utilizzando un sistema così semplice, si è detta, "si può davvero fare ciò che si vuole; basta porsi una domanda di interesse e provare ad analizzarla."

La domanda alla quale Visintin ha scelto di rispondere è come le cellule si dividono. Nessun organismo può crescere, svilupparsi o mantenersi se le sue cellule non replicano il loro DNA, non separano i loro contenuti cellulari e non si dividono. "La divisione cellulare, secondo la mia opinione, è ciò che guida il mondo," dice. Come le cellule riescano a eseguire i processi sistematici di crescita e divisione nel ciclo cellulare è un mistero. Riuscendo a comprendere in che modo il processo possa andare storto, si può fare luce su come le cellule tumorali possano dirottare il ciclo cellulare per replicarsi continuamente e causare il cancro.

Dopo i suoi studi di dottorato, Visintin ha lavorato nel laboratorio di Angelika Amon al Whitehead Institute e, in seguito, al Center for Cancer Research del Massachusetts Institute of Technology. Quando ne entrò a far parte, il laboratorio stava proprio per essere avviato. Visintin ebbe quindi la possibilità di avere un ruolo nella sua formazione. "Ho avuto la possibilità di vedere come inizia e come si sviluppa un laboratorio," dice, un'esperienza che l'ha aiutata quando è arrivato il momento di organizzare il suo laboratorio. >

The choreography of cell division

ROSELLA VISINTIN'S STUDIES IN YEAST FOCUS ON HOW ONE CELL BECOMES TWO

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\ by Courtney Humphries

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From her first genetics class, Rosella Visintin knew that she wanted to be a biologist. And from the beginning of her career, she has chosen to study what might seem like an unexciting organism, budding yeast. Though uncomplicated creatures, yeast cells provided a powerful tool for a scientist interested in understanding the basic processes that make life possible, including genetics, biochemistry, and the biology of cells. Yeast cells are easy to generate and to manipulate, without the complexity of a larger organism. With this simple system, she realized, "you could really do anything you wanted; you just had to think of a question that interested you and you could try to pursue it."

The question Visintin chose to pursue is how cells divide. No organism can grow, develop, or maintain itself if its cells are not constantly replicating their DNA, separating their contents, and splitting in two. "Cell division, in my opinion, is what drives the world," she says. How cells manage to execute the orderly processes of growth and division in the cell cycle is a puzzle. Understanding how the process goes awry can shed light on how tumor cells are able to hijack the cell cycle in order to continuously replicate themselves and cause cancer.

After her doctoral studies, Visintin worked in the lab of Angelika Amon at the Whitehead Institute and later at the Center for Cancer Research at Massachusetts Institute of Technology. When she joined it, the lab was just getting started, so Visintin was able to take a formative role. "I had the chance to see how a lab starts and how it develops," she says, an experience that helped her when it came time to organize her own lab.

At the time, much was known about the early stages of cell division or mitosis—how cells separate chromosomes that are destined for different daughter cells. Visintin decided to tackle the later stages, how the cell exits from mitosis. Her work focused on a protein called Cdc14, which has proved to be a key regulator of several stages of mitosis. But how does a protein like this "know" when to perform its different functions? It turns out that the protein's functions are separated by distance: Cdc14 is sequestered away in a part of the cell called the nucleolus until mitosis begins, when it is released into other areas of the cell where it is active. The protein's activity is controlled by two interacting networks of proteins, one ensuring that the cell does not start dividing before its chromosomes are properly separated, and the other ensuring that the chromosomes are safely partitioned between the mother and daughter cells. Visintin hopes to better understand how these networks interact with Cdc14, which may lead to ideas for halting the unchecked cell division of cancer cells.

After receiving a Career Development Award in 2002, Visintin took a position at the European Institute of Oncology as one of the few researchers to focus on yeast. Visintin says that the support she received not only made setting up a lab less stressful, but provides an opportunity for ongoing connection to other yeast researchers at Harvard.

Because working with human cells is much trickier and time-consuming, yeast researchers like Visintin are often at the forefront of biological hypotheses, pointing the way for further research on higher organisms. "The basic mechanisms of the cell cycle are conserved from yeast to humans," she said. "But with budding yeast, everything is much simpler."

d) The localization of the protein phosphatase Cdc14 is cell cycle regulated.

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