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Life in Discovery

For Immediate Release:

Rosalind Franklin University Cell Biology Team Discovers Groundbreaking Clues in Nuclear-Body Formation

Work published in *Science* and reviewed in *Nature* foremost Journals



NORTH CHICAGO, IL – Our bodies have trillions of cells. Each one highly specialized with biological functions that affect our existence. If we understood how cells build their complex internal structures, the knowledge could lead to cures for many diseases, but this complicated cellular activity has always been a mystery.

However, recent local work has shed light on this subject.

Mirek Dundr, Ph.D., and his colleagues have begun to unlock this complex puzzle. Dundr, assistant professor of cell biology at the Chicago Medical School of Rosalind Franklin University of Medicine and Science, explains this in the 2008 landmark paper, “De Novo Formation of a Subnuclear Body” (Kaiser, Intine and Dundr), published this month in *Science* and reviewed in *Nature*—two internationally acclaimed science journals.

A cell’s nucleus holds most of an individual’s genetic information. Many specialized compartments are formed around the genome (genetic material) and are affected by diseased genes. Dundr wanted to understand how organization of the genome in the nucleus contributes to the cell’s function.

The way a cell’s internal structures are organized to interact with each other affects how the genome is expressed.

So, how are nuclear structures formed?

Researchers have studied two main hypotheses: A defined, sequential system that relies on factors already present in the cell or by random assembly pathways through self-organization.

Dundr's research, performed solely at Rosalind Franklin University, provided the first experimental proof that a nuclear body is formed by the self-organization model, i.e. no linear or defined pathway exists.

For example, there is no defined, sequential way that people arrive at a post office. Lines are formed—or built—by people coming together by chance interactions. It's random, but lines do get created. It works. And at some point, predictions about the formation of lines can be made. Ask any experienced post office employee.

In the *Nature* special “News and Views” article, “Nuclear Order out of Chaos” (Nov. 20, 2008), Dr. Tom Misteli, of the National Cancer Institute, of the National Institutes of Health (NIH), writes about the discovery:

“. . . [This] represents a major step forward. Not only does it provide a conceptual framework for probing nuclear-body formation further, but it also gives us potential means of succeeding in one of the remaining quests of modern cell biology—finding out how cellular structures form *in vivo* [in the body].”

Based on this model, Dundr's team also analyzed cells derived from healthy individuals and patients with Spinal Muscular Atrophy (SMA) disease; they were able to identify the differences. Practical implications are vast. One day, physicians might be able to diagnose, control, and prevent many diseases.

“We know, for example, that in certain genetic disorders, such as SMA, some of these nuclear structures are significantly altered. It's important to understand why. Does it contribute to the disease? Does it reflect the disease? Can we do something about it?” said Dundr.

With this model, Dundr can also observe how differences in the cell's nuclear structure actually reveal the disease's severity.

This research may also benefit pharmacologists' goals. “Our proven model might be used to test millions of already available chemicals to help combat specific genetic diseases,” said Dundr.

“If we can monitor change between a gene's healthy status and disease status, we can develop tools that identify this change and potential problems. We might then have a diagnostic tool for cancer, and in cancer, diagnosis is everything,” said Dundr. “But we don't only want a cure—we want prevention.”

Dundr was a research fellow at the world-renowned National Cancer Institute at Bethesda, Maryland for six years before he was recruited to Rosalind Franklin University in 2006.

“Rosalind Franklin University has a great reputation, which is what drew me here. We have many highly advanced scientists; their advice and guidance have been invaluable to my work. I truly appreciate their generosity,” said Dundr.

Dundr grew up in suburban Prague in the Czech Republic, close to a small forest sprinkled with ponds. It was heaven for an inquisitive boy. At the age of nine, he began to spend numerous hours identifying trees, watching birds, and becoming an amateur biologist.

A kind gentleman from the neighborhood, Dr. Hostounsky, an insect pathologist in Prague, had the greatest impact on Dunder. Hostounsky was an expert in microscopy and taught him invaluable techniques. The teenager's excitement was obvious. Later, this thoughtful doctor bought the young man of 17 a microscope—his fate was set.

“He triggered a passion in me, which I’ve had ever since,” Dunder said.

Dunder earned his Ph.D. in cell and molecular biology from the Czech Academy of Science in Prague. Shortly afterwards he moved to the United States for its scientific advances and research opportunities.

It’s a tremendous achievement when a scientist’s work is published in *Science* and reviewed in *Nature*, yet Dunder remains humble. He said, “It’s an enormous privilege. And I’m very grateful to my colleagues and mentors. It gives my work meaning when I know I can make a difference in people’s lives.”

About Rosalind Franklin University of Medicine and Science

Rosalind Franklin University of Medicine and Science is a national leader in interprofessional medical and healthcare education, comprising the Chicago Medical School, College of Health Professions, Dr. William M. Scholl College of Podiatric Medicine and School of Graduate and Postdoctoral Studies.

Rosalind Franklin University recently received approval for its new doctoral program in Interprofessional Healthcare Studies – the first in Illinois – and has launched a new master in science program in Psychology Clinical Counseling in fall 2008.

There are more than 16,000 RFUMS degreed graduates in the United States and worldwide.