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Molecular Biology Times Two

Rebecca and Susan Kahane are identical twins with nearly identical interests: Field hockey, helping children, karate, molecular biology.

Molecular biology may sound like an extraordinary pursuit for teenagers, but these sisters are anything but ordinary. The 17-year-olds, both seniors at Walter Johnson High School in Bethesda, Maryland, are high achievers whose interest in science arose in a ninth grade honors biology class and already has them doing after-school research in National Institutes of Health (NIH) labs.

Becky and Susie, as they like to be called, are participating in an HHMI-supported Student and Teacher Program at NIH. It enables high school students to receive academic credit for conducting biomedical research, with NIH scientists as mentors and advisors.

Susie, Becky and 18 other Maryland high school students are presenting their research findings at a symposium May 9, 2002, at HHMI headquarters in Chevy Chase, Maryland.

Becky works at the National Institute of Child Health and Development's molecular growth regulation laboratory. She is studying the role of two transcription factors—interferon regulatory factor 4 (IRF-4) and interferon consensus sequence binding protein (ICSBP)—in the normal development of blood cells and their potential roles in blood disorders such as leukemia.

"ICSBP is a transcription factor whose activities are believed to be disturbed in chronic myelogenous leukemia (CML)," Becky explains. "Mutant mice in which the ICSBP gene is disrupted develop a CML-like disease characterized by an increased number of granulocytes and an impaired production of macrophages. We believe that a closely related protein—IRF—may also play an important role in macrophage and granulocyte development."

To test this hypothesis, she introduced IRF-4 into ICSBP knockout mice and found that IRF-4 also controls myeloid cell differentiation. She plans further

experiments to identify the molecular mechanism by which these two transcription factors control target genes. "That should help us learn more about how myeloid cell growth and differentiation are regulated," she explains.

"Becky was very quick to learn highly sophisticated techniques, and she obtained useful results," says Keiko Ozato, an NIH researcher who heads the lab where Becky works.

Working in the laboratory of molecular pharmacology at the National Cancer Institute, Susie has been helping develop a knockout mouse whose mitochondrial topoisomerase gene has been inactivated. Topoisomerases are a class of enzymes essential for normal cellular activity. "One goal of this project is to gain a better understanding of mitochondria, which have been linked to aging and several genetic diseases," she explains.

Susie's scientist advisor, Sally Amero, calls the teen "a most impressive and promising young scientist. Her clear understanding of her research topic is far advanced for the normal high school student."

The twins share more than an interest in science. They are mirror images with only a few physical differences. Becky is left-handed and Susie, right-handed. Susie has several tiny spots on her forehead; Becky does not. "We tell people to remember 'S' for spots and for Susie," Becky remarks.

Their personality differences are more striking. Susie, older by one minute, is the quiet, introspective one. Becky is more outgoing and often speaks for both of them. Susie is comfortable with that. "We don't feel very competitive with each other," she says.

Becky agrees. "We have so many of the same interests. If we want to be different, we have to force it." She remembers the time both qualified for an advanced placement science class, but only Susie took it. Becky deliberately opted instead for advanced placement Latin. "Actually, it was fun for a change knowing something that she didn't know," Becky says.

Both are academic award winners. Becky was a finalist for the National Presidential Scholar Medal, which is based on SAT scores, while Susie won a National Merit Scholarship. They expect to end up at different colleges, although both have been accepted at the University of Maryland. Susie also was accepted at Columbia University, and Becky is wait-listed at the University of Pennsylvania, her first choice.

Neither twin has yet decided whether to pursue a research career. "If I stay in research, I'm interested in studying cancer," says Becky. "But I'm also interested in public health, in working with people, and possibly teaching. I will probably go into some health area, but I'm not sure it will be scientific research."

Susie agrees and adds: "Whether or not we do end up doing biomedical research, this program has helped me learn how to handle a job. Although it was sometimes tough, overall it was a great experience."