Discovery could lead to manipulating part of body’s immune system

By Jim Barlow

UI scientists have found a way to improve the properties of T-cell receptors – and potentially other proteins. In doing so, they’ve opened the door to manipulating a virtually untapped part of the immune system to fight autoimmune and viral diseases.

A team – led by biochemist David M. Kranz and chemical engineer Kane Wittrup – has discovered that mutations within two regions of the receptor protein allow it to be displayed on the surface of yeast. Their biotechnological breakthrough appeared in the May 11 issue of the Proceedings of the National Academy of Sciences.

The researchers used a yeast-display system, which was created in 1997 in Wittrup’s lab, in combination with directed evolution – a genetic engineering process in which a protein is subject to random amino-acid changes, and then only those proteins with desired properties are selected. Their selection process also used flow-cytometry equipment at the UI Biotechnology Center.

T-cells and their T-cell receptors represent one-half of the immune system’s capability to recognize infection,” Kranz said. “There has not been a method available to engineer these like you can do with antibodies. This paper shows that we’ve found a way to begin engineering the recognition molecules from the T-cell immune system. Realistically, we’re a long way from seeing new therapeutic approaches, but the development of this capability is a major initial step.”

Such a strategy may prove beneficial in manipulating the immune system’s ability to bind to infected cells. Such binding has been difficult in AIDS and cancer, because infections often remain invisible to antibody-based treatments. Likewise, the researchers said, genetically engineered receptors could be used to block inappropriate immune responses in autoimmune diseases such as multiple sclerosis and rheumatoid arthritis.

Scientists around the world have been refining monoclonal antibodies – proteins similar to those that occur naturally in the immune system that search for and bind to specific antigens – since the 1970s. However, similar refinements to T-cell receptors have not been possible for reasons that were unclear.

The structure of antibodies and T-cell receptors are similar, but the responses of each are carried out very differently. “The immune system looks around for things that don’t belong,” said Wittrup, the James W. Westwater professor of chemical engineering at the UI. “The two major classes of molecules that accomplish this are the recognition proteins – antibodies and T-cell receptors. We are working at the contact point of where the immune system decides something doesn’t or does belong. “

The research – funded by the National Institutes of Health and Whitaker Biomedical Engineering Foundation – offers the hope of doing genetic engineering directly on recognition molecules from the T-cell system. “In addition, this strategy for T-cell receptors may be of general use in the study and directed evolution of other proteins that to date have been impossible to improve,” Kranz said.

Oxide technology enhances performance of semiconductor lasers

By James E. Kloeppe

A semiconductor oxidation process developed at the UI a decade ago has important new applications in the fabrication of advanced electronic devices, including a type of semiconductor diode laser called a vertical-cavity, surface-emitting laser (VCSEL).

“The VCSEL is fast becoming one of the hottest items in the electronics industry,” said Nick Holonyak Jr., the John Bardeen Professor of Electrical and Computer Engineering and Physics at the UI who led the team that developed the oxide technology. “Among its many uses, the VCSEL can serve as an optical interconnect for high-speed data communication.”

Unlike conventional edge-emitting lasers (the kind used in compact disc players and laser pointers, for example), a VCSEL’s optical beam is perpendicular to the chip surface. This not only simplifies device fabrication and testing – which lowers production costs – it also creates smaller structures that consume less power.

Research performed in various labs has shown that the UI oxidation process makes the smallest, most efficient and highest performance VCSELs to date,” Holonyak said.

The power of the process, Holonyak said, is its ability to selectively oxidize layers of aluminum gallium arsenide buried deep within the device structure, creating an insulating “collar” around a VCSEL’s conducting cavity.

“Prior to our discovery, there was no known method for forming useful oxides in aluminum gallium arsenide or similar III-V materials,” Holonyak said. “This was a real breakthrough in the preparation of these materials, which have been so important in the development of optoelectronic devices.”

Holonyak, who is credited with the invention of the first practical light-emitting diode (LED) and the first semiconductor laser to operate in the visible spectrum, was the first graduate student of two-time Nobel laureate John Bardeen, a UI professor who died in January 1991.
Admissions and Records, Office of. D.A.A.S. specialists with training and experience in computer programming and operating systems also are needed. Also required is familiarity with student data systems and experience in advising and academic advising. Available immediately. Contact: Dr. Robert B. Gennis, 6638. Closing date: July 7 or when position is filled.

Research programmer. Bachelor's in computer science, mathematics, or related field, and two years' relevant experience in programming for scientific and technical applications. Experience conducting open and continuous testing for civil service examinations is desirable. Knowledge of programming languages and operating systems required. Must be fluent in Perl, SQL, and other database query languages. Must be willing to work on an as-needed basis. Available immediately. Contact: Judy McCoy-Lindauer, 333-6600 or jmdchokeills@uiuc.edu. Closing date: July 9.

Supercomputing Applications, National Center for Supercomputing Applications (NCSA). Research programmer (specializing in Microsoft FrontPage). Bachelor's degree in computer science or related field, and two years' relevant experience required. Must have working knowledge of HTML and numerous programming languages such as JavaScript, Java, Perl, and Smalltalk. Also must be familiar with Web page development and print production processes, and server-side technologies such as ColdFusion (or equivalent). Knowledge of UNIX file systems and networks is highly desirable. Social work, psychology, or education background is also desirable. Available: July 15. Contact Career Services, 333-6456, career@ncsa.uiuc.edu. Closing date: July 15.

Information Technology and Communication Services. Network analyst. Bachelor's degree in computer science, computer engineering, or related field, and experience in network configuration, security and disaster recovery. Knowledge of network administration is essential. Must be available immediately. Contact: Judy McCoy-Lindauer, 333-6600 or jmdchokeills@uiuc.edu. Closing date: July 7.

International Cooperation, Committee on. Director, Center for Library Initiatives. Proven success is required in directorship of library programs or departments. Experience as a senior management level in an academic research library or corporate library organization, coordinating multiple assignments or projects. Preferred qualifications are competence in leveraging electronic resources and knowledge of digital development and use. More information about the position is available online. Contact: Karen Sage, 533-8475 or karl@uiuc.edu. Closing date: Aug. 14.

Cultural diversity. Bachelor's or master's in area related to position, three years' experience of working with persons of diverse cultural backgrounds, and significant skill in research methods and techniques. Preferred qualifications include research background and experience in urban, rural and multi-ethnic communities, and/or in other areas of the Midwest. Experience in Latino/Latin American communities is highly desirable. Available: Aug. 21. Contact Andrea Lynn, 244-2895 or e-mail to d-dahl2@uiuc.edu. Closing date: July 22 when position is filled.

Boning Division. Associate director of housing for maintenance and repairs. Bachelor's degree in construction management or related field; experience in managing or related field in real estate and five years' experience as a plant manager or engineer preferably in a college or university setting. Also must have the ability to work in building construction including mechanical and electrical engineering and related fields. Available: Sept. 1 when position is filled. Contact Jack Collis, 333-6210. Closing date: Oct. 1.

Information Management, Office of. Network analyst. Bachelor's degree in computer science or related field. Experience with IBM compatible PCs and with LAN, Ethernet, and network protocols. Also required is familiarity with network configuration, competition with operating systems, and maintenance of multiple networks (e.g., IBM Network Server and MS Windows 95). Available immediately. Contact: Andy Ridley, 728-2032 or e-mail to carol@uiuc.edu. Closing date: July 12.

Pathobiology (rank open). DVM (or equivalent) and/or PhD, or completion of the PhD program in diagnostic veterinary microbiology with a molecular biology emphasis is preferred. Also required is familiarity with the mission, programs and functions of the Department and the College of Veterinary Medicine. Experience working with stakeholder groups and media; strong personal computer skills; technical writing, organizational and communication skills; and ability to work in building construction including mechanical and electrical engineering and related fields. Available: Sept. 1 when position is filled. Contact Jack Collis, 333-6210. Closing date: Oct. 1.

Veterinary Diagnostic Medicine/Department of Veterinary Pathobiology (rank open). DVM (or equivalent) and/or PhD, or completion of the PhD program in diagnostic veterinary microbiology with a molecular biology emphasis is preferred. Also required is familiarity with the mission, programs and functions of the Department and the College of Veterinary Medicine. Experience working with stakeholder groups and media; strong personal computer skills; technical writing, organizational and communication skills; and ability to work in building construction including mechanical and electrical engineering and related fields. Available: Sept. 1 when position is filled. Contact Jack Collis, 333-6210. Closing date: Oct. 1.


Since 1978, Margaret “Maggie” Agnew has been handing out towels in the locker room in the lower level of the Intramural Physical Education Building. She works 7 a.m. to 3 p.m. Monday through Friday, and notes that the hours around noon are the busiest times. She collects IDs from users in exchange for towels or recreational equipment, and she returns the IDs when the items are brought back. In her down time with customers, she discovered that she could draw, and she has created scores of stylized, primitive rural scenes.

You have busy times of the day, but what about down times when it’s real slow. What do you do then?

That’s when I sit here and doodle, or draw, or work crossword puzzles. Do you take any classes at IMPE or take advantage of the pool or exercise machines?

No, not really. I should come back out here and exercise but it’s too much like coming back to work, so I just go walking at home. And when it’s real slow at work and we’re caught up on our work, I’ll go walk in the basement here or try out a few of the machines, but I don’t really use it like I should.

Are you married?

I’ve been widowed about 10 years now. My kids are grown. I have two boys and three grandchildren. They’re great. They’re all boys: 12, 7 and 3. They’re a lot of fun. They keep me going.

Do you see them a lot?

Oh yeah, every day just about. They live across town from me but we really use it like I should.

Do you see them a lot?

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7 Wednesday
“Coronary Microsurgery: Past, Present and Future.”
René S. Akhmia
Cardiology Research Center, Moscow. 4 p.m. Veterinary Medicine Basic Sciences Building. Veterinary Biosciences.

1 Thursday
“The Foreigner.”
Peter Reynolds, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

1 Friday
“Smoke and Mirrors.”
Sara Lampert Hoover, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

1 Saturday
“The Odd Couple.”
Peter Reynolds, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

7 Thursday
“The Foreigner.”
Peter Reynolds, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

7 Friday
“Smoke and Mirrors.”
Sara Lampert Hoover, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

10 Thursday
10 Friday
14 Wednesday
“Who’s a Classic?”
Through July 31.
Rare Book and Special Collections Library.

14 Thursday
17 Thursday
“The Foreigner.”
Randi Jennifer Collins Hard, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

17 Friday
17 Saturday
17 Sunday
18 Thursday
18 Friday
18 Saturday
“The Odd Couple.”
Randi Jennifer Collins Hard, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

18 Sunday
“The Foreigner.”
Peter Reynolds, director. 7 p.m. Studio Theater, Krannert Center. Admission charge.

21 Thursday
“The Odd Couple.”
Randi Jennifer Collins Hard, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

21 Friday
“The Odd Couple.”
Randi Jennifer Collins Hard, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

21 Saturday
21 Sunday
25 Saturday
25 Sunday
“The Odd Couple.”
Randi Jennifer Collins Hard, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.

25 Monday
“The Odd Couple.”
Randi Jennifer Collins Hard, director. 8 p.m. Studio Theater, Krannert Center. Admission charge.