

STREPTOCOCCUS MUTANS SURVIVES WITHOUT IMPORTANT BIOCHEMICAL PATHWAY

Scientists have long believed that a certain biochemical pathway involved in the folding and delivery of proteins to cell membranes is essential for survival. However, researchers at the University of Florida, Gainesville, have discovered that *Streptococcus mutans*, the caries-causing organism that thrives in human mouths, can survive without it.

The findings, reported in the Nov. 29 issue of Proceedings of the National Academy of Sciences, have rocked the cellular biology scientific community, which has long considered the pathway to be crucial.

“We were met with skepticism ... because the dogma was that this biochemical pathway is key for all living cells,” said study investigator Jeannine Brady, PhD, an associate professor of oral biology at the University of Florida College of Dentistry. “As far as we know, this is the first example of any bacteria that can cope without this pathway; all of the existing literature indicated it is vital.”

The signal recognition particle (SRP) pathway is a primary mechanism by which proteins are delivered from cellular assembly lines, where they are made, to the protective outer surface of the cells, where they are inserted. Without a steady infusion of proteins, the membrane weakens and the cell—in this case, a bacterium—becomes unable to protect itself from harsh environmental conditions.

In its natural environment of the human mouth, *S. mutans* typically goes on the attack. When sugary foods are eaten,

the *S. mutans* population explodes, excreting lactic acid as it digests sugar. The acid prevents helpful bacteria from thriving and demineralizes tooth enamel, causing caries.

In an effort to understand how best to combat the caries causing properties of *S. mutans*, Dr. Brady and the other researchers set out to learn how the organism was able to survive its own acid. They tinkered with systematically turning off several genes, individually and in combination, to see how the bacteria responded.

“We found *S. mutans* can survive, with normal growth, without the SRP pathway,” said Adnan Hasona, PhD, a research assistant professor of oral biology and the study’s lead author.

The bacteria, altered to lack SRP components, were able to adapt and survive gradual increases in acid resulting from their own metabolism, suggesting that a backup pathway was in place.

However, the altered bacteria could not contend with sudden environmental change. When artificially shocked with acid to a pH below that at which tooth demineralization begins, the altered bacteria became sick and unable to grow. Shocking the bacteria with other environmental stressors, such as high salt levels or the presence of hydrogen peroxide, also caused them to weaken, Dr. Hasona said.

The research team surmised that two other molecules—YidC1 and YidC2—might be acting as alternate routes for protein delivery in the absence of the SRP pathway. They tested their hypothesis and found that *S. mutans* could continue to function in nonstress conditions without the SRP and

YidC1 genes, but not without the YidC2 and SRP simultaneously.

“The fact that the bacteria could survive without the SRP pathway was the most striking finding for scientists in the membrane protein insertion field,” said Ross E. Dalbey, PhD, a professor of chemistry at The Ohio State University, Columbus. “The big question now is discovering how these proteins are targeted in the absence of the SRP pathway, and I think that will be an important area of future research.”

TOOTH LOSS, HEART DISEASE LINKED, EVEN AMONG NONSMOKERS

A strong, progressive association between tooth loss and heart disease exists, researchers reported in a recent issue of American Journal of Preventive Medicine.

Heart disease was present in 4.7 percent of those without tooth loss, 5.7 percent of those with one to five missing teeth, 7.5 percent of those with six to 31 missing teeth and 8.5 percent of those with total tooth loss, reported lead investigator Catherine Okoro, an epidemiologist in the Division of Adult and Community Health, Centers for Disease Control and Prevention, Atlanta.

This finding emerged after the researchers adjusted for sex, race and ethnicity, education, marital status, diabetes, smoking status, alcohol consumption, high blood pressure, high blood cholesterol and body mass index, Ms. Okoro said.

The researchers analyzed data from 41,891 respondents to the 1999-2002 Behavioral Risk Factor Surveillance System survey, which involved adults aged 40 to 79 years in 22 states and

the District of Columbia. The survey was conducted by telephone.

The investigators noted that the study results are consistent with the results of previous studies that have linked periodontal disease and tooth loss to an increased risk of atherosclerosis and heart attack. However, they said that other studies had not shown an association between oral conditions and heart disease.

Ms. Okoro emphasized that the correlation between tooth loss and heart disease held even when smoking status was considered. "Smoking has strong relationships to both tooth loss and heart disease," she said. "Nonetheless, when we stratified by age group and smoking status, a significant association remained between tooth loss and heart disease among respondents aged 40 to 59 years who had never smoked."

Ms. Okoro said the relationship between tooth loss and heart disease is of considerable public health interest because of the prevalence of both conditions in the general population.

James Beck, Distinguished Professor of Dental Ecology, University of North Carolina at Chapel Hill, offered a note of caution about overinterpreting the study results.

"If you believe that the data are reasonable estimates of the cardiovascular and oral status of those interviewed, then you must understand, as the authors point out, that one cannot determine from this study whether people with poor oral status are at greater risk for cardiovascular disease," he said. "We only know that the two conditions are related to one another."

INTERACTION BETWEEN SMOKING, GENES IN RHEUMATOID ARTHRITIS

A history of smoking increases the risk of developing rheumatoid arthritis (RA), but only for people who test positive for anticitrulline antibodies, researchers reported in the January issue of *Arthritis & Rheumatism*.

Smoking is the major known environmental risk factor for RA, although little is known about the mechanisms involved. HLA-DR shared epitope (SE) genes are a widely recognized genetic risk factor for RA, though little is known about how these genes affect autoimmune reactions that lead to chronic inflammation and progressive joint and organ damage.

Researchers in Sweden focused on the disease's distinctive autoimmune hallmark: citrulline, an amino acid not normally present in protein. While extremely rare in healthy people and relatively rare in people with other inflammatory conditions, citrulline-modified proteins are common in about two-thirds of patients with RA and may be an underlying factor in the development of the disease. To investigate whether smoking and SE genes trigger immune reactions to citrullinated proteins, the team conducted a case-control study.

Nine hundred thirty patients with early RA, ranging in age from 18 to 70 years, were drawn from the Epidemiological Investigation of Rheumatoid Arthritis Study Group. Three hundred eighty-three healthy control subjects, drawn from the blood bank of northern Sweden, were matched for age, sex and residential area.

All participants completed questionnaires about their past and present smoking habits, as well as genotyping profiles. In addition, bronchial fluid was obtained from a representative sample of patients with RA, including both current heavy smokers and lifelong nonsmokers, and was tested with immunostaining for the presence of citrullinated protein in cells.

The researchers found that a history of smoking increases the risk of developing RA, but only for people who test positive for anticitrulline antibodies, regardless of the presence of SE genes. Similarly, inheriting HLA-DR SE genes in a single copy, as well as in double copies, increases the risk of developing RA, but only for people who test positive for anticitrulline antibodies, including those who have never smoked. However, for people who test positive for anticitrulline antibodies, the interaction of smoking and carrying two copies of the SE gene increases the risk of developing RA by 21 times.

"The remarkable gene-environment interaction observed in the case-control study, together with the immunostaining for citrullinated proteins, might now provide a clue to the molecular mechanisms of importance for disease development in a subset of RA patients," said team spokesperson Lars Klareskog, MD, PhD, Karolinska Institutet, Stockholm, Sweden. "We may thereby be given some new opportunities to both predict and understand the onset of RA and to interfere with RA-inducing events before clinical symptoms are apparent."

This study was funded by The Swedish National Research

Council, Swedish Council for Working Life and Social Research, Swedish Rheumatism Association, insurance company AFA, Flight Attendants Medical Research Institute, King Gustaf V's 80-Year Foundation, Söderberg Foundation and the Swedish Heart-Lung Foundation.

CORRECTION

In the October issue of JADA, Table 1 in the article "Oral Health Findings for HIV-Infected Adult Medical Patients From the HIV Cost and Services Utilization Study," by James R. Freed and colleagues, contained an error. The percentage of male subjects was 77 and of female subjects was 23.

Compiled by Janice Snider, senior editor.

MEETINGS

— The American Prosthodontic Society will hold its 78th annual meeting Feb. 23-24 in Chicago. For more information, contact Dr. Robert Schneider by phone at 1-877-499-3500, by fax at 1-201-440-7963 or by e-mail at "robert-schneider@uiowa.edu".

— The American Academy of Fixed Prosthodontics will hold its annual scientific session Feb. 24-25 in Chicago. For more information, contact Dr. Rick Jordan by phone at 1-866-891-5656, by fax at 1-828-891-5657 or by e-mail at "drdjpros19@yahoo.com".

— The American Academy of Dental Practice Administration will hold its annual meeting March 1-5 in Dana Point, Calif. For more information, contact Ms. Kathy S. Uebel by phone at 1-847-934-4404, by fax at 1-847-934-4410 or by e-mail at "executivedirector@aadpa.org".

— The Pacific Dental Conference will be held March 9-11 in Vancouver. For more information, contact Ms.

Marilynne Webster by phone at 1-604-714-5303, by fax at 1-604-736-3645 or by e-mail at "marilyn@adsbc.org".

— The Thomas P. Hinman Dental Meeting will hold its 94th annual meeting March 23-25 in Atlanta. For more information, contact Executive Director Ms. Sylvia Ratchford by phone at 1-404-231-1663 or by fax at 1-404-231-9638 or visit "www.hinman.org".

— The American Academy of Orofacial Pain will hold its annual meeting April 27-30 in Las Vegas. For more information, contact the AAOP Meetings Department by phone at 1-856-423-3629, option 2; by fax at 1-856-423-3420; or by e-mail at "kbaumer@talley.com".

— The 2006 Irish Dental Association Conference will be held April 27-28 in Ballsbridge, Ireland. For more information, contact Dr. Donal Atkins by phone at 011-353-1-2830499, by fax at 011-353-1-2830515 or by e-mail at "info@irishdentalassoc.ie".

— The British Dental Conference & Exhibition 2006 will be held May 18-20 in Birmingham, England. For more information, contact Ms. Elise Cole by phone at 011-44-20-7563-4590, by fax at 011-44-20-7563-4591 or by e-mail at "e.cole@bda.org".

APPOINTMENTS/ELECTIONS/ AWARDS

— **Dr. Frederic Barnett**, Norbeth, Pa., has been appointed chairman and program director of the Albert Einstein Medical Center's I.B. Bender Division of Endodontics.

— **Dr. Byron W. Benson**, Dallas, was elected president of the American Board of Oral and Maxillofacial Radiology for 2007, and **Dr. Sharon L. Brooks**, Ann Arbor, Mich., was elected vice president.

— **Dr. Clifton O. Dummett**, Los Angeles, received the 2005 Presidential Commendation Award from the University of Southern California Dental Alumni Association for his lifelong contribution to dentistry.

— **Dr. Marjorie K. Jeffcoat**, Philadelphia, was one of 64 new members named to the Institute of Medicine of the National Academies.

— **Dr. David S. Williams**, Columbia, Tenn., is the 2006 president-elect of the Southern Association of Orthodontists, and **Dr. John B. Whitley**, Baton Rouge, La., is the secretary-treasurer.

CALENDAR OF EVENTS

ADA ANNUAL SESSIONS

2006 Oct. 16-19, Las Vegas
2007 Sept. 27-Oct. 2, San Francisco
2008 Oct. 16-19, San Antonio

2006 CONSTITUENT DENTAL SOCIETY ANNUAL MEETINGS

Meeting dates are subject to change. Dentists interested in attending any of the listed meetings should contact the sponsoring organization for more information.

Alabama Dental Association, 836 Washington St., Montgomery 36104, 1-334-265-1684, **June 13-18, Orange Beach.**

Alaska Dental Society, 9170 Jewel Lake Road, Anchorage 99502-5381, 1-907-563-3003, **May 5-7, Juneau.**

Arizona Dental Association, 3193 N. Drinkwater Blvd., Scottsdale 85251-6491, 1-480-344-5777, **Western Regional Dental Convention, March 16-18, Phoenix.**

Arkansas State Dental Association, 2501 Crestwood Dr., Suite 205, North Little Rock 72116, 1-501-771-7650, **April 7-8, Hot Springs.**

California Dental Association, 1201 "K" Street Mall, Sacramento 95853, 1-916-443-3382, Ext. 4470, **Spring Scientific Session, April 27-30, Anaheim; Fall Scientific Session, Sept. 15-17, San Francisco.**

Colorado Dental Association, 3690 S. Yosemite, Suite 100, Denver 80237-1808, 1-303-996-2845, **June 15-18, Steamboat Springs.**

Connecticut State Dental Association, 62 Russ St., Hartford 06406, 1-860-278-5550, **Charter Oak Dental Meeting, May 11-13, Mohegan Sun Resort and Casino.**

Delaware State Dental Society, The Christiana Executive Campus, 200 Continental Drive, Suite 111, Newark 19713, 1-302-368-7634, **May 12, Wilmington.**

District of Columbia Dental Society, 502 C St., N.E., Washington 20002-5810, 1-202-547-7613, **Nation's Capitol Dental Meeting, April 20-22, Washington.**

Florida Dental Association, 1111 E. Tennessee St., Suite 102, Tallahassee 32308, 1-850-681-3629, **Florida National**

Dental Congress, June 15-17, Orlando.

Georgia Dental Association, 7000 Peachtree Dunwoody Road, Suite 200, Building 17, N.E., Atlanta 30328-1655, 1-404-636-7553, **July 27-30, Amelia Island, Fla.**

Idaho State Dental Association, 1220 W. Hays St., Boise 83702, 1-208-343-7543, **June 14-17, Sun Valley.**

Illinois State Dental Society, P.O. Box 376, Springfield 62705, 1-217-525-1406, **Sept. 15-17, Bloomington.**

Indiana Dental Association, P.O. Box 2467, Indianapolis 46206-2467, 1-317-634-2610, **May 11-13, Indianapolis.**

Iowa Dental Association, 505 5th Ave., Suite 333, Des Moines 50309, 1-515-282-7250, **May 6-8, Des Moines.**

Kansas Dental Association, 5200 S.W. Huntoon St., Topeka 66604-2398, 1-785-272-7360, **April 27-29, Wichita.**

Kentucky Dental Association, 1940 Princeton Drive, Louisville 40205, 1-502-459-5373, **The Kentucky Meeting, May 18-21, Louisville.**

Louisiana Dental Association, 7833 Office Park Blvd., Baton Rouge 70809-7604, 1-225-926-1986, **March 23-25, Baton Rouge.**

Maine Dental Association, P.O. Box 215, Manchester 04351-0215, 1-207-622-7900, **June 16-17, Rockport.**

Maryland State Dental Association, 6410 Dobbin Road, Suite F, Columbia 21045, 1-410-964-2880, **Chesapeake Dental Conference, Sept. 15-17, Ocean City.**

Michigan Dental Association, 230 Washington Square, Suite 208, Lansing 48933, 1-517-372-9070, **May 17-20, Lansing.**

Minnesota Dental Association, 2236 Marshall Ave., Saint Paul 55104, 1-651-646-7454, **Star of the North Meeting, April 29-May 1, Saint Paul.**

Mississippi Dental Association, 2630 Ridgewood Road, Jackson 39216-4920, 1-601-982-0442, **June 2-7, Destin, Fla.**

Montana Dental Association, P.O. Box 1154, Helena 59624-1154, 1-406-443-2061, **May 3-5, Helena.**

Nebraska Dental Association, 3120 "O" St., Lincoln 68510-1533, 1-402-476-1704, **March 31-April 2, Omaha.**

Nevada Dental Association, 8863 W. Flamingo Road, Suite 102, Las Vegas 89147, 1-702-255-4211, **Midwinter Meeting, Feb. 2-4, Park City, Utah; Annual Summer Meeting, July 6-8, Napa, Calif.**

New Hampshire Dental Society, 23 S. State St., Concord 03301, 1-603-225-5961, **May 18-20, Meredith.**

New Jersey Dental Association, One Dental Plaza, P.O. Box 6020, North Brunswick 08902-6020, 1-732-821-9400, **June 7-9, Atlantic City.**

New Mexico Dental Association, 9201 Montgomery Blvd., N.E., Suite 601, Albuquerque 87111, 1-505-294-1368, **June 7-10, Albuquerque.**

New York State Dental Association, 121 State St., 4th Floor, Albany 12207, 1-518-465-0044, **Board of Governors**

**Meeting, June 8-11,
Cooperstown.**

North Carolina Dental Society, P.O. Box 4099, Cary 27519, 1-919-677-1396, **May 18-21, Myrtle Beach, S.C.**

North Dakota Dental Association, P.O. Box 1332, Bismark 58502, 1-701-223-8870, **2006 Annual Session, Sept. 15-17, Minot.**

Ohio Dental Association, 1370 Dublin Road, Columbus 43215-1009, 1-614-486-2700, **Aug. 24-27, Columbus.**

Oklahoma Dental Association, 317 N.E. 13th St., Oklahoma City 73104-2835, 1-405-848-8873, **April 28-30, Tulsa.**

Oregon Dental Association, 17898 S.W. McEwan Road, Portland 97224-7798, 1-503-620-3230, **Oregon Dental Conference, April 6-8, Portland.**

Pennsylvania Dental Association, P.O. Box 3341, Harrisburg 17105, 1-717-234-5941, **April 27-30, Hershey.**

Rhode Island Dental Association, 200 Centerville Road, Warwick 02886-0204, 1-401-732-6833, **May 17, Providence.**

South Carolina Dental Association, 120 Stonemark Lane, Columbia 29210, 1-803-750-2277, **May 4-7, Myrtle Beach.**

South Dakota Dental Association, P.O. Box 1194, Suite 103, 804 N. Euclid, Pierre 57501-1194, 1-605-224-9133, **May 18-21, Sioux Falls.**

Tennessee Dental Association, P.O. Box 120188, Nashville 37212, 1-615-383-8962, **May 18-21, Chattanooga.**

Texas Dental Association, 1946 S. IH35, Suite 400, Austin 78704, 1-512-443-3675, **The Texas Meeting, May 11-14, San Antonio.**

Vermont State Dental Society, 100 Dorset St., Suite 18, South Burlington 05403-6241, 1-802-864-0115, **Sept. 28-29, Burlington.**

Virginia Dental Association, 7525 Staples Mill Road, Richmond 23228, 1-804-261-1610, **Sept. 13-16, Roanoke.**

Washington State Dental Association, 1001 Fourth Ave., Suite 3800, Seattle 98154, 1-206-448-1914, **Pacific Northwest Dental Conference, July 13-14, Seattle.**

West Virginia Dental Association, 2003 Quarrier St., Charleston 25311-2212, 1-304-344-5246 **100th Annual Session, July 20-23, White Sulphur Springs.**

Wisconsin Dental Association, 111 E. Wisconsin Ave., Suite 1300, Milwaukee 53202-4815, 1-414-276-4520, **Jewel of the Great Lakes, May 4-5, Wisconsin Dells.**

Wyoming Dental Association, 1637 S. Spruce St., Casper 82601, 1-307-237-1186, **June 8-11, Jackson.**

Compiled by Jennifer Garvin, senior editor, ADA News.