

## Welcome to BCM

### Education

Baylor College of Medicine is the academic center around which the Texas Medical Center, the world's largest health complex, evolved.

Within the four schools of BCM our faculty creates, implements and shares new knowledge, new systems and new technologies that improve the lives of our patients, our community, our nation and our world.

**Baylor College of Medicine** – Consistently ranked as one of the leading research-intensive medical schools in *U.S. News & World Report* and ranked fourth in the nation by StudentDoc.com, BCM is the least expensive private medical school in the U.S.

**BCM Graduate School of Biomedical Sciences** – BCM's extensive research portfolio combined with faculty who are world leaders in their fields support 12 programs which are ranked among the top 10 percent of graduate programs in biological sciences.

**BCM School of Allied Health Sciences** – Drawing highly regarded applicants from throughout the region and the nation, the programs of BCM School of Allied Health Sciences consistently rank among the best in the country.

**BCM National School of Tropical Medicine** – This is the only school in the nation dedicated exclusively to patient care, research and education related to neglected tropical diseases, the most common infections of the world's poorest people.



### The BCM faculty includes

7 members of the National Academy of Sciences (NAS)

13 members of the Institute of Medicine of the NAS and

3 Howard Hughes Medical Investigators.



### Healthcare

At BCM, leading research and technology translate to exceptional patient care.

Our doctors and staff provide a multi-disciplinary team approach to health care with a focus on quality and safety. More than 2,000 BCM doctors care for patients in over 40 locations across the Houston area, including the Baylor Clinic and the Lee and Joe Jamail Specialty Care Center as well as our affiliated hospitals and community clinics:

#### Affiliated Hospitals

- Harris Health System
  - Ben Taub Hospital
  - Quentin Mease Hospital
- Memorial Hermann - The Institute for Rehabilitation and Research
- Michael E. DeBakey Veterans Affairs Medical Center
- St. Luke's Episcopal Hospital
- Texas Children's Hospital
- The Menninger Clinic
- The Methodist Hospital
- The University of Texas MD Anderson Cancer Center

#### Community Clinics

- Harris Health System
  - Casa de Amigos Health Center
  - Gulfgate Health Center
  - Martin Luther King, Jr. Health Center
  - Northwest Health Center
  - People's Health Center
  - Strawberry Health Center
  - School-Based Clinics
  - Thomas Street Health Clinic
- Harris County Public Health and Environmental Services
- Mental Health and Mental Retardation Authority
- El Centro de Corazon
- Santa Maria Hostel

With a profound history of breakthroughs in healthcare, BCM continues this tradition of excellence by bringing the latest technologies, treatments and clinical research to the forefront of patient-centered care.

### Research

In 2012, BCM faculty successfully competed for more than \$329 million in research funding. The scale of our research enterprise and the richness of biomedical research resources within Houston support creativity, innovation, and discovery. Our faculty and trainees, whether native Texans or not, embrace the Texas "can do" spirit as well as a strong sense of family. The result is an environment in which researchers mentor each other and celebrate each other's successes.

Total grant applications submitted to all funding sources grew by **18.5%** from FY 2011 to FY 2012.

In funding from the National Institutes of Health

BCM ranks **17th** in the nation and **1st** in Texas

**9** departments rank in the **top 20** in research funding from NIH, including **#7** ranked Genetics and Cell Biology.







**Advanced Technology Cores are an essential part of the research enterprise of Baylor College of Medicine.**

Core facilities provide state-of-the-art instrumentation and technologies to support research of all faculty on a fee-for-service basis. Each Core is staffed by a scientific director and dedicated technical personnel who provide the highest quality work, consultation on experimental design, data analysis and training. ATCs offer competitive pricing through subsidization of their operations and equipment by funds from extra-mural grants and the Institution.

To maximize efficiency, quality and utilization, Advanced Technology Cores have been organized as an independent unit in the Office of the Vice President for Research with a faculty level Executive Director and a full-time Administrator. ATCs have adopted and adhere to uniform policies for operation and governance.

**Executive Director**

Dean P. Edwards, Ph.D.

*Professor*

*Departments of Molecular & Cellular Biology and Pathology & Immunology*

**Administrator**

Thomas Sanchez, M.B.A.

*Office of Research*

713-798-6992

ATC@bcm.edu

**BCM**  
Baylor  
College of  
Medicine

To learn more about Core labs, download a free QR code app on your SmartPhone and then scan this code.

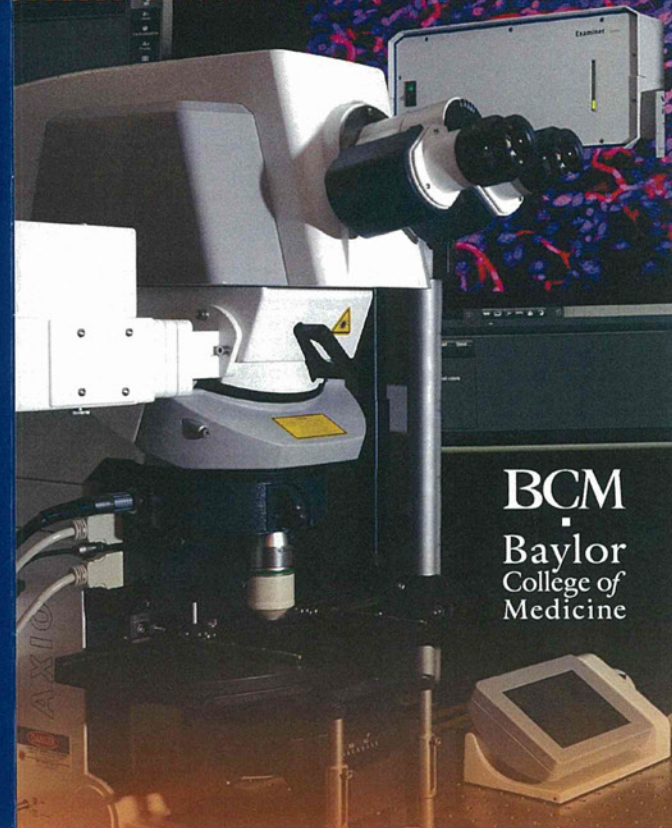


[www.bcm.edu/research/corelabs.cfm](http://www.bcm.edu/research/corelabs.cfm)

ATC@bcm.edu

713.798.6992

**ADVANCED TECHNOLOGY CORES**





## Cytometry and Cell Sorting

This is a state-of-the-art facility offering assisted and unassisted flow cytometric services. Instrumentation includes FACSAria cell sorters with up to 13 colors plus forward and side scatter, LSRII Analyzers with high throughput put 96 well sample loading plates, VI-Cell counter, AutoMACS magnetic bead cell sorter and workstations with data analysis software. The Core provides training on all instruments, assists with data analysis and design of experiments, and is available 24 hours-a-day, 7 days-a-week for all trained users.

### Directors

Joel M. Sederstrom, M.B.S.  
Christine Beeton, Ph.D.

713-798-3868 • [bcm.edu/flowcytometry/](mailto:bcm.edu/flowcytometry/)

## DNA Sequencing

This Core provides automated sequencing on Applied Biosystems Model 3130XL Genetic Analyzer. The Core provides sequence data from single-stranded DNA, double-stranded DNA, BAC, PCR product. More than 1,000 bp can be read from each sequence run. Quality of sequencing is directly proportional to the quality of the DNA template.

### Director

Lawrence Chan, M.D., D.Sc.

713-798-8577 • [bcm.edu/labs/dnacorelab/](mailto:bcm.edu/labs/dnacorelab/)

## Genome-wide shRNA Screening (GRSA/C-BASS)

The Core facilitates high-throughput screens using a variety of technology platforms including shRNA and cDNA libraries (human and mouse). Screens may be carried out in pools or arrayed format. And several automated workstations and analyzers including robotics for liquid handling, automated fluorescent microscopes, and a high-throughput flow cytometer are available for phenotypic analysis. Additional support in data acquisition, processing, and storage is also provided. The resources and reagents can also be utilized for studies of specific pathways or individual genes.

### Directors

Dan Liu, Ph.D.  
Trey Westbrook, Ph.D.

713-798-8987  
c-bass@bcm.edu • [bcm.edu/cbass](mailto:bcm.edu/cbass)

## Genetically Engineered Mouse (GEM)

The GEM Core provides investigators with advice and services requiring the manipulation of mouse gametes to facilitate research involving genetically engineered mice. The following services include DNA microinjection (traditional transgene DNA constructs, lentivirus constructs or BAC DNA into the one cell mouse embryo), ES cell microinjection into blastocysts, strain rederivation into a pathogen free stratus, colony expansion, in vitro fertilization, embryo cryopreservation and sperm cryopreservation for safe preservation of valuable mouse strains. These services can be scheduled and tracked using Mouse Embryo Manipulation Services software (MEMS). The Core also provides consultation on approaches and can work with the investigator to facilitate their research needs.

### Director

Franco DeMayo, Ph.D.

713-798-6241 • [bcm.edu/genecore/home.htm](mailto:bcm.edu/genecore/home.htm)

## Integrated Microscopy

The Integrated Microscopy Core provides state-of-the-art light and transmission electron microscopy imaging support. This fully digital-imaging-based resource provides routine microscopy (Nikon, Nikon Elements, CoolSnap B&W and color CCDs), fixed and live cell-capable Nikon A1rs multispectral laser scanning confocal with full live cell enclosure (photobleaching and timelapse), Applied Precision deconvolution microscopy with high intensity solid state illumination and temperature/gas control, digital transmission electron microscope (Hitachi) and specimen processing service, and a robust high throughput microscopy and automated image analysis platform for assay development and drug/RNAi screening (API, Vala, Beckman), including fluid handling robotics (Beckman).

### Director

Michael Mancini, Ph.D.

### Co-Directors

Adam Szafran M.D., Ph.D.  
Fabio Stossi, Ph.D.

713-798-8952 • [bcm.edu/microscopy/](mailto:bcm.edu/microscopy/)

## Human Tissue Acquisition and Pathology (HTAP)

The Human Tissue Acquisition and Pathology (HTAP) Core provides tissue and serum related services to researchers that includes histology and immunohistochemistry (IHC) and organization of the different tissue banks at BCM. Histology and IHC of human and experimental animal tissues are available to all BCM faculty on a fee-for-service basis. Services include tissue processing, embedding, sectioning and staining for routine histology (H&E, PAS, ORO, Trichrome, VVG, Giemsa), IHC and TUNEL assay for apoptosis. Also available are laser capture microdissection, archival tissue microarrays (TMA), image analysis by Inform and Vectra and consultation with pathologists.

### Director

Michael Ittmann, M.D., Ph.D.

713-798-3705

[bcm.edu/cancercenter/index.cfm?pmid=8923](mailto:bcm.edu/cancercenter/index.cfm?pmid=8923)

## Mass Spectrometry Proteomics

The Mass Spectrometry Proteomics Core (MS-PCL) provides services for high sensitivity high throughput triple Time-Of-Flight mass spectrometer and full-fledged proteomics technologies for discovery and validation of biomarkers of various diseases. The services include (i) rapid mass determination of proteins and peptides, (ii) identification of proteins/peptides in complex biological samples, (III) subproteome isolation and characterization, and (iv) detailed analysis of post-translational modification of proteins/peptides.

### Director

Hon-Clui Eastwood Leung, Ph.D.

713-798-6360

[bcm.edu/cancercenter/index.cfm?pmid=21743](mailto:bcm.edu/cancercenter/index.cfm?pmid=21743)

## Mouse Embryonic Stem Cells

Procedures for the manipulation of ES cells and the subsequent construction of mice from manipulated ES cells are intensive and technically demanding and it is a goal of the core to make such experiments possible for investigators. Our core focuses on the manipulation of embryonic stem cells for further studies in vivo or in vitro.

### Director

Monica Justice, Ph.D.

713-798-1981 • [bcm.edu/atmc/](mailto:bcm.edu/atmc/)

## Monoclonal Antibody/ Recombinant Protein Expression

This Core provides custom services for generation of monoclonal antibody (MAb) producing hybridomas and recombinant baculovirus vectors for over-expression of proteins in insect cells. The Core will also mass produce and purify MABs from large-scale hybridoma cultures in bioreactors or large spinner vessels. Baculovirus recombinant proteins are expressed in either conventional spinner cultures or oxygenated bioreactors.

### Directors

Dean P. Edwards, Ph.D.

Kurt Christensen

713-798-2325

[bcm.edu/cancercenter/index.cfm?pmid=8912](mailto:bcm.edu/cancercenter/index.cfm?pmid=8912)

## Mouse Metabolic Research Unit (Children's Nutrition Research Center)

The MMRU at the CNRC has extensive facilities for automating feeding studies and for measuring numerous metabolic parameters related to understanding energy expenditure and its various determinants (substrate oxidation, activity, body composition, etc.) in mice. The number of mouse metabolic units available enables concurrent measurements on a relatively large number of mice. Dedicated engineer and faculty members are also available to help investigators design their experiments and interpret their data.

### Director

Marta Fiorotto, Ph.D.

713-798-7146 • [marfaj@bcm.edu](mailto:marfaj@bcm.edu)

## Population Sciences Biorepository (PSB)

The PSB Core provides risk factor and clinical data collection and a centralized facility for biospecimen processing and storage from epidemiological and clinical studies. Services are available for individual investigators as well as for clinical centers that require prospective banking of patient specimens. Clinical coordinators can assist with consenting, phlebotomy, and data collection. The PSB also provides laboratory services including: full fractionation and aliquoting for blood samples, DNA extraction from whole blood, buffy coat, or saliva; and RNA extraction from whole blood.

### Director

Michael Scheurer, Ph.D.

713-798-7480

[bcm.edu/cancercenter/index.cfm?pmid=18496](mailto:bcm.edu/cancercenter/index.cfm?pmid=18496)

## Mouse Phenotyping

The Mouse Phenotyping Core facility contains a multitude of testing capabilities for the assessment of mouse models from embryo to adult. All equipment and services include: MRI, CT, ultrasound, body composition/densitometry, indirect calorimetry, telemetry, and indirect blood pressure. Workstations for image reconstruction and data analysis are also available within the Core.

### Director

Corey Reynolds, Ph.D.

713-798-5040 • [bcm.edu/cnrc/mmru/](mailto:bcm.edu/cnrc/mmru/)

## Genomic and RNA Profiling (GARP)

The Genomic and RNA Profiling Core provides investigators access to state-of-the-art microarray and 2nd generation DNA and RNA sequencing technologies and services for both transcriptional and genomic profiling. Its purpose is to assist researchers in utilizing these cutting edge technologies, employing good experimental design, and providing data management and data analysis resources.

### Director

Lisa White, Ph.D.

713-798-7699 • [bcm.edu/mefweb/](mailto:bcm.edu/mefweb/)

## MHC Tetramer

The tetramer production Core provides customized MHC/peptide tetramers for identification of antigen-specific T lymphocytes by flow cytometry. Tetramers and/or derivatives are provided for research purposes only; their use for commercial purposes is prohibited.

### Director

Xiaochi Lily Wang, M.S.

713-798-3918

[bcm.edu/cancercenter/index.cfm?pmid=16979](mailto:bcm.edu/cancercenter/index.cfm?pmid=16979)

## Pathway Discovery Proteomics

This is a unique proteomic service that provides antibody affinity purification of endogenous protein complexes and MS-based identification and analysis of the associated proteins. Suitable antibodies for immunoprecipitation of the desired protein complex and conditions for antibody affinity purification are also optimized as a service.

### Directors

Jun Qin, Ph.D. • Sung Yun Jung, Ph.D.

713-798-1517

[bcm.edu/cancercenter/index.cfm?pmid=9265](mailto:bcm.edu/cancercenter/index.cfm?pmid=9265)

## Optical Imaging and Vital Microscopy (OIVM)

The Optical Imaging and Vital Microscopy Core offers equipment, training and support for vital and intravital imaging studies in cells, tissues, embryos and live mice. Available technologies include confocal microscopy, line scanning confocal microscopy, multispectral microscopy and two-photon microscopy using microscopes designed for live cell and live animal imaging.

### Directors

Mary Dickinson, Ph.D.

Tegy Vadakkan, Ph.D.

713-798-6486 • [bcm.edu/physio/oivm/](mailto:bcm.edu/physio/oivm/)

## Protein and Antibody Array Proteomics

This Core provides customized services for protein profiling by affinity based proteomic platforms. These include Luminex bead technology for multiplex quantitative analyses of intracellular and extracellular protein signaling pathways, fractionation of serum and other subproteomes, forward antibody and protein-protein interaction arrays as discovery tools for protein biomarkers, and reverse phase protein arrays (RPPA).

### Director

Shixia Huang, Ph.D.

713-798-8722

[bcm.edu/cancercenter/index.cfm?pmid=8928](mailto:bcm.edu/cancercenter/index.cfm?pmid=8928)

## RNA In Situ Hybridization

The RNA In Situ Hybridization core provides services and equipment to determine gene expression patterns in rodent and human tissues. We can process and section tissue (frozen or paraffin), prepare labeled RNA probes, perform high-throughput in situ hybridization, image and quantify the gene expression levels.

### Director

Cecilia Ljungberg, Ph.D.

832-824-8873

[mrrs.bcm.tmc.edu/cores/rna.html](mailto:mrrs.bcm.tmc.edu/cores/rna.html)



# BCM Q2

BAYLOR COLLEGE OF MEDICINE  
QUARTERLY REVIEW 2012

[www.bcm.edu](http://www.bcm.edu)



## An Abundance of Life

The Human Microbiome Project



# Welcome to BCM Quarterly.

After completing two years as president and CEO of Baylor College of Medicine, I continue to be awed by the talent and dedication of the colleagues with whom I am privileged to work.

From major roles in big international research endeavors like the microbiome initiative highlighted on page 4, to innovative ways to help Houstonians live healthier lives like the farmers markets highlighted on page 8, BCM faculty, trainees and staff are trailblazing innovative ways to enhance quality of life for all of us.

A financially stable environment is a prerequisite to fund the resources needed to continue this innovation. Like academic medical centers around the country, BCM has had its share of fiscal challenges over the last few years.

Through implementing mission-based budgeting and continued focus on improving operations and processes, we are creating a foundation of stability that will support continued strategic growth. The BCM Board of Trustees approved a strategic plan, developed with extensive faculty input, that will ensure our financial stability for years to come. The plan will also support growth that will allow BCM to define a new model for academic medical centers prepared to face the current and future challenges in healthcare.

**Best regards.**  
**Paul Klotman, MD**  
**President and CEO, Baylor College of Medicine**

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**Chiu (top) joins BCM NAS members Drs. Arthur Beaudet (top left), Henry and Emma Meyer Chair in Molecular Genetic and chair of molecular and human genetics; Thomas Caskey (top right), professor of molecular and human genetics; Mary Estes (center left), Cullen Foundation Endowed Chair; Bert O'Malley (center right), Thomas C. Thompson Chair in Cell Biology and chair of molecular and cellular biology; Salih Wakil (bottom left), professor of biochemistry and molecular biology; and Huda Zoghbi (bottom right), Ralph D. Feigin, M.D. Endowed Chair and director of the Jan and Dan Duncan Neurological Research Institute at Texas Children's Hospital.**



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BCM physicians provide state-of-the-art care to patients from Houston and around the world at numerous facilities within the Texas Medical Center, including:





# BCM UPDATE

## WAH CHIU JOINS NATIONAL ACADEMY OF SCIENCES

Wah Chiu, the Alvin Romansky Professor of Biochemistry and Molecular Biology and director of the National Center for Macromolecular Imaging at Baylor College of Medicine, has been elected to the National Academy of Sciences.

Chiu's work is focused on the development of high throughput methodology for electron cryo-microscopy and computational methods to solve 3-dimensional structures of macromolecular machines towards atomic resolution. The biological applications of this methodology include viruses, ion channels, membranes, oligomeric proteins, protein folding machines, and cytoskeletal protein complexes. Chiu is well known for his collaborative efforts, drawing in the top scientists in his field to develop national programs to enhance the field of computational biology and molecular imaging.

Chiu, who is also professor of molecular and cellular biology, molecular physiology and biophysics, and molecular virology and microbiology, is the seventh BCM faculty member to be named to the Academy.

## WINNING STUDENT DEVELOPED PROGRAM

When Emma Corbett, a medical and public health student at Baylor College of Medicine and The University of Texas School of Public Health, was trying to pull together her own immunization records, which she was required to have before starting school, she found, "They were fragmented, all over the place. I think everyone struggles trying to find them."

Corbett said the need to simplify became obvious while she was shadowing a pediatrician. "When you have multiple kids and they're all on different schedules, it gets kind of confusing." She teamed up with friends from BCM and Rice University to create VaxNation, which allows patients and parents to open family accounts, link them to Facebook pages and find information on vaccinations supplied by the Centers for Disease Control and Prevention. The program automatically calculates age-appropriate immunizations based on CDC guidelines. The team earned first prize in the Go Viral to Improve Health collegiate challenge from The Institute of Medicine and the National Academy of Engineering. Find out more about VaxNation at <http://www.vaxnation.org/>.



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## MS PATIENT COMPETES IN PARALYMPICS

When Erika Baitenmann sits tall on Casablanca with the horse nice and square and his hooves lined up perfectly for competition, she is herself again. She is the same sleek young athlete who was raised riding horses and who now lives at her ranch on the outskirts of Mexico City.

Baitenmann suffers from multiple sclerosis (MS), a chronic, often disabling disease that affects the nervous systems of 2.5 million people worldwide.

Her health has improved so much after being diagnosed by George Hutton, M.D., an associate professor of neurology at Baylor College of Medicine and an expert in MS, that that she was able to compete in the International Paralympics in England in August. She was among the top contenders in Paralympic Dressage, a competitive equestrian sport that develops riding and training of a horse for obedience, flexibility and balance.

Baitenmann's path to diagnosis was not smooth. It started in Mexico City with misdiagnoses, terrible reactions to different medications and unsympathetic healthcare workers. "It was such a hard time finding what was wrong. I was so worried, and my mother was so depressed," Baitenmann's daughter, Reni reflected on the time before they found Dr. Hutton and started making progress with treatments.

"My mother is herself when she is on a horse," Reni said. "This is the mother I know. I feel like I have my mother back."

## SCHWEITZER FELLOWS DEVELOPING PROGRAMS FOR UNDERSERVED HOUSTONIANS

Five Baylor College of Medicine medical students will spend the next year improving community health and developing lifelong leadership skills as part of the 2012-13 class of Houston-Galveston Schweitzer Fellows.

The Albert Schweitzer Fellowship program was established to give graduate students the tools to effectively address the social factors that impact health and develop leadership skills.

Vishwaratn Asthana and Miel Sundararajan will work at Ben Taub General Hospital to address the lack of primary care options for uninsured people by developing a preventive health counseling program for individuals seeking primary care in the emergency center. Andrew Franco and Akhil Shenoy will develop a meal program and job-training curriculum at The Haven Center at St. Stephen's Episcopal Church to empower homeless young adults in Houston to lead healthier and more self-sustained lives. Working at Ben Taub General Hospital, Shehni Nadeem will develop a program



With Dr. Hutton among the many fans in attendance, Erika Baitenmann and Casablanca competed for Mexico at the London 2012 Paralympics.

for newborns and their mothers promoting sun safety and skin cancer prevention.

## BCM HELPS JUNIOR OLYMPIANS REALIZE THEIR DREAM

While some may have thought all the major athletic competitions this summer happened in London, England, for 15,000 young athletes representing the 50 states and U.S. territories Houston was the place to be. This summer, Houston hosted the AAU Junior Olympic Games, the largest, national, multi-sporting event conducted annually for youth.

BCM faculty and staff provided medical services and filled other essential volunteer roles to help make this event a tremendous success.



“Congratulations to Dr. Peter Hotez, dean of the Baylor College of Medicine National School of Tropical Medicine and Texas Children’s Hospital Endowed Chair of Tropical Pediatrics, and Dr. Christie Ballantyne, professor of medicine and section chief of cardiology and cardiovascular research in the Department of Medicine at BCM, for their election to membership in the Association of American Physicians. Nomination to AAP honors the work of physicians toward the advancement of medical knowledge through experimentation and their application to clinical medicine.”

Dr. Paul Klotman, president and CEO

**Dr. Teresa A. Davis**, professor of pediatrics – nutrition at BCM, is **president** of the **American Society for Nutrition**.

**Dr. Alan J. Garber**, professor of medicine – endocrinology at BCM, was elected **president** of the **American Association of Clinical Endocrinologists**, the world’s largest international endocrinologist association.

**Dr. Jimena Giudice**, postdoctoral associate in pathology at BCM, has been named a **Pew Latin American Fellow in the Biomedical Sciences** by the **Pew Charitable Trusts**.

**Dr. Farook Jahoor**, professor of pediatrics – nutrition at the USDA/ARS Children’s Nutrition Research Center at BCM and Texas Children’s Hospital, has been named a **Grand Challenges Explorations** winner, an initiative funded by the **Bill & Melinda Gates Foundation**.

**Dr. Ayelet Erez**, an assistant professor of molecular and human genetics at BCM and a medical geneticist at Texas Children’s Hospital, has received the **2012 William K. Bowes, Jr. Award in Medical Genetics**, which is given by the **Partners HealthCare Center for Personalized Medicine of Harvard Medical School**.

**Dr. Sameer Ather**, resident in medicine at BCM, was awarded the international **Young Investigators Award** at the **Heart Rhythm Society’s Annual Scientific Sessions**.

**Dr. Rabih Darouiche**, professor of physical medicine and rehabilitation at BCM, received the **Gold Medal for Distinguished Scholarly Achievement** from the **Alumni Association of the American University of Beirut**.

**Dr. Fabrizio Gabbiani**, associate professor of neuroscience at BCM, earned a **Humboldt Research Award**.

**Dr. Jun Wang**, post-doctoral associate in molecular physiology at BCM, was awarded the **Michael Bilitch Fellowship in Cardiology Pacing and Electrophysiology** from the **Heart Rhythm Society**.

**Dr. Theodore Wensel**, interim chair and professor of biochemistry and molecular biology at BCM, received the **Proctor Medal** from the **Association for Research in Vision and Ophthalmology**.

Fourth-year medical student, **Joshua Liao** won first place in the **18th National Medical Student Clinical Vignette Competition** of the **American College of Physicians**.

**Dr. Bert O’Malley**, chair of molecular and cellular biology at BCM, and co-principal investigator **Dr. C. Kent Osborne**, director of both the NCI-designated Dan L. Duncan Cancer Center and the Lester and Sue Smith Breast Center at BCM, received a **Komen Promise Grant**.

**Dr. Alice R. McPherson**, professor of ophthalmology at BCM, received the **2012 Harvard Medical School Department of Ophthalmology Distinguished Alumni Professional Achievement Award**.

**Dr. Hardeep Singh**, assistant professor of medicine – health services research at BCM and chief of the health policy and quality program at the Houston VA Health Services Research and Development Center of Excellence, received the **2012 Alice S. Hersh New Investigator Award** from **AcademyHealth**. Singh is the first recipient from Texas to receive this prestigious award.

**Ryanne Ashley Brown**, BCM medical student, was selected for the **American Society of Hematology’s 2012 Minority Medical Student Award Program**.

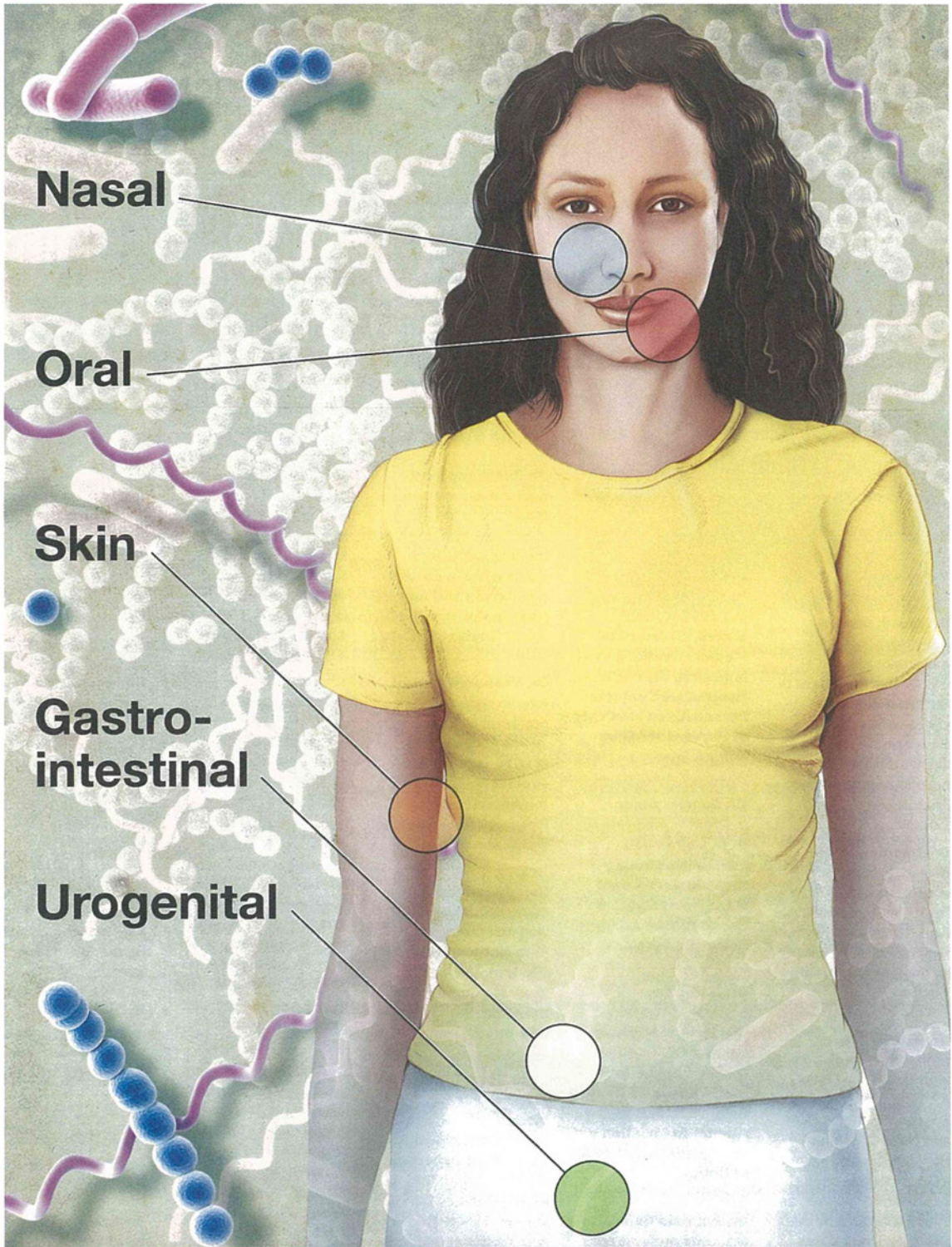
**Dr. Aditi Shastri**, BCM resident, received a **2012 American Society of Hematology Trainee Research Award**.

**Dr. Elizabeth Uyen Tran**, a resident in family and community medicine at BCM, was honored for her involvement in the **Interprofessional Drug Education Alliance (IDEA)**, a program developed by the Houston Bar Association in conjunction with the Harris County Medical Society.

**Dr. Leroy Chiao**, chair of the User Panel of the National Space Biomedical Research Institute and member of BCM’s Center for Space Medicine, is a 2012 recipient of the **Russian Medal of Merit for Space Exploration**.

BCM graduate student **Hsing-I Ho** was awarded an **International Student Research Fellowship** from the **Howard Hughes Medical Institute**.





Researchers in the Human Microbiome Project are sampling and analyzing the genome of microbes from five sites on the human body: nasal passages, oral cavities, skin, gastrointestinal tract, and urogenital tract. This illustration of the sites that were sampled was provided by the NIH Roadmap for Medical Research <http://nihroadmap.nih.gov>.



# An Abundance of Life

Several papers published on June 13, 2012, in *Nature* and three *Public Library of Science* journals provided the first detailed picture of the human microbiome. As reporter Gina Kolata noted in the *New York Times* coverage of these papers, "The results are expected to change the research landscape."

The *Times* and other media outlets compared the project behind this work, The Human Microbiome Project, to the Human Genome Project. In addition to their scope and potential to radically change our understanding of human health and disease, these two projects have another common denominator—in each, researchers from Baylor College of Medicine played prominent roles.

In the Human Genome Project, the BCM Human Genome Sequencing Center was responsible for sequencing 10% of the total genome. BCM researchers also developed many of the technologies and procedures that made sequencing possible.

BCM was one of the first three institutions to earn grants as part of the National Institutes of Health (NIH) sponsored Human Microbiome Project. Now with the first mapping of the normal bacteria that live

in and on the healthy human body, BCM researchers have once again contributed in a wide-variety of ways to big science with the potential to change the way we view human health and disease, and perhaps even exactly what it means to be human.

## THE HUMAN MICROBIOME PROJECT

The human microbiome is defined as the collection of microbes - bacteria, viruses, and single-cell eukaryotes - that inhabits the human body. Microbes in a healthy human adult are estimated to outnumber human cells by a ratio of ten to one, and the total number of genes in the microbiome exceeds the number of genes in the human genome by a factor of at least 200.

The Human Microbiome Project (HMP) was launched by NIH in 2007 to characterize the microbes found in different regions of the body, including the nose, mouth, skin, digestive tract and vagina.



“We need partners who work with diverse populations and have the intellectual resources to collaborate with us on analyzing the data.”

Dr. Joseph Petrosino

In the June reports on five years of work on the HMP, scientists reported on studies of the microbes of 242 healthy adult volunteers. Bacteria were identified by extracting DNA from each sample and then analyzing a bacteria-specific gene called the 16S ribosomal RNA gene. The researchers also did more complete sequencing for about 800 reference strains.

The scientists reported that more than 10,000 microbial species occupy the human body. They estimated that the microbiome provides more genes that contribute to human survival than the human genome itself provides (8 million vs. 22,000).

#### CROSSBORDER MICROBE HUNT

Dr. Nadim Ajami's search for a way to give back to his native country of Columbia led to expanded opportunities for researchers at the Universidad del Norte in Barranquilla, Colombia in a collaboration that is helping to fulfill one of the primary missions of the Alkek Center for Metagenomics and Microbiome Research at BCM.

“We expect that the microbiome will vary greatly between individuals with different diets and environments,” said Dr. Joseph Petrosino, director of the Alkek Center for Metagenomics and Microbiome Research at BCM, “One of our primary aims is to engage clinicians around the world to work together to attain a complete picture of how various microbiota impact human health and disease.”

So, when Ajami met with a group of investigators in Columbia to determine how his BCM connections (Ajami earned his Ph.D.

#### BCM MICROBIOME TIMELINE

Carrying out a project of this complexity took considerable efforts and coordination among the 80 institutions. This timeline presents some of the many ways in which BCM researchers have contributed to this monumental initiative.

- **May 2007**  
NIH approves the Roadmap Human Microbiome Project.
- **October 2007**  
The BCM Human Genome Sequencing Center receives \$2.3 million “Jumpstart” grant from the National Human Genome Research Institute to generate 50 complete bacterial genomes from microbes that inhabit humans and sample the human metagenome.
- **November 2007**  
BCM hosts the first NIH/NHGRI Human Microbiome Project Network Meeting.
- **January 2008**  
The Manual of Procedures Working Group, chaired by Dr. Sarah Highlander, associate professor of molecular virology and microbiology at BCM, is established to develop standardized methods for nucleic acid extraction protocols for human clinical samples.
- **May 2008**  
Drs. James Versalovic, professor of pathology at BCM and now chief, of the Texas Children's Hospital Microbiome Center and Wendy Keitel, professor of molecular virology and microbiology, and director of the Vaccine Research Center at BCM and colleagues present the first version of the Human Microbiome Project Core Sampling Protocol.
- **October 2008**  
The International Human Microbiome Consortium is formed with BCM as a charter member.
- **November 2008**  
Sampling of Human Microbiome Project subjects begins at BCM under the direction of Keitel.
- **June 2009**  
An expansion grant enables the BCM Human Genome Sequencing Center, the Washington University Genome Sequencing Center and the J. Craig Venter Institute, to sequence genomes of 400 more microbes. Versalovic received a grant to study pediatric irritable bowel syndrome.
- **May 2010**  
The release of data for the first 178 microbial reference genomes sequenced by the Human Microbiome Jumpstart Consortium is published in the journal *Science*. The BCM Human Genome Sequencing Center, The Broad Institute, the Genome Center at Washington University and the J. Craig Venter Institute, all took part.



● **August 2010**

In collaboration with investigators at the University of Illinois and JCVI, Highlander and Dr. Richard Gibbs, director of the BCM Human Genome Sequencing Center and the Wofford Cain Chair in Molecular and Human Genetics Professor at BCM, publish a comparative analysis of *Gardnerella vaginalis* genomes associated with vaginosis in the journal *PLoS ONE*.

● **September 2010**

The NIH expanded funding for the BCM Human Microbiome Project clinical program initiated in 2009 at Texas Children's Hospital under the direction of Versalovic.

● **March 2011**

An interdisciplinary team of BCM researchers receive a grant from Burroughs Wellcome Fund to study the possible link between the human microbiome, the mitochondrial genome and premature birth.

● **June 2011**

The Alkek Center for Metagenomics and Microbiome Research at BCM was announced under the direction of Dr. Joseph Petrosino, assistant professor of molecular virology and microbiology.

● **August 2011**

Versalovic and Dr. Robert Schulman, professor of pediatrics at BCM, publish one of the first papers coming out of microbiome funding in the *Journal Gastroenterology*.

● **September 2011**

Petrosino and colleagues from multiple other institutions publish the genome sequence of Segmented Filamentous Bacteria, a unique member of the Clostridiales order of bacteria that impacts T cell functions in our immune system.

● **June 2012**

The first major papers to arise from the Human Microbiome Project are published in the journal *Nature* and *PLoS* journals.

Other BCM researchers who have made significant contributions to the Human Microbiome Project include Drs. Kjersti Aagaard, associate professor of obstetrics and gynecology; Janet Butel, holder of the Joseph L. Melnick Professorship of Virology and chair of molecular virology and microbiology; Amy McGuire, associate professor and director of the Center for Medical Ethics and Health Policy; Shital Patel, assistant professor of molecular virology and microbiology; Simon Whitney, William W. O'Donnell, M.D. and Regina O'Donnell Chair in Family Medicine; Kim Worley, associate professor in the Human Genome Sequencing Center, and graduate students Bonnie Youmans in Highlander's laboratory and Matthew Ross in Petrosino's laboratory.

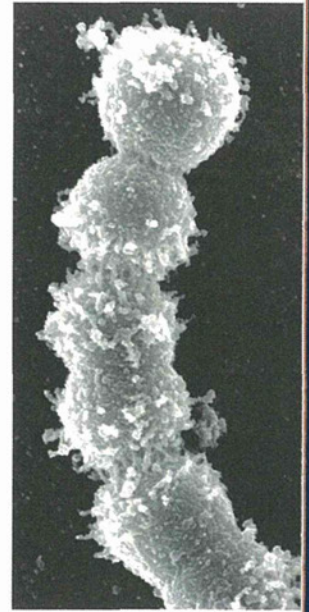
and is now a postdoctoral fellow at BCM) could be helpful to his native country's efforts to grow its science enterprise, the potential for symbiotic relationship was clear.

"We are looking for partners in the U.S. and around the world," said Petrosino. "BCM has already invested in the costly infrastructure necessary for large scale sequencing. We need partners who work with diverse populations and have the intellectual resources to collaborate with us on analyzing the data."

When Ajami proposed the Universidad del Norte as a potential partner, the mutual benefits were clear, with BCM offering resources and technical expertise and Universidad del Norte providing access to a new patient population as well as researchers interested in expanding their expertise in the analysis necessary to understand the human microbiome. The partnership started off with a conference in Columbia. Widely covered in the Columbian media, the conference revealed many opportunities for BCM and Columbian researchers to work together.

Petrosino and other faculty of the Alkek Center are also working with partners in China, India and elsewhere to establish collaborations that will increase the diversity of microbiomes available for study as well as the number of individuals qualified to analyze the vast quantities of data generated from sequencing.

Representatives from institutions who may be interested in similar collaborations are encouraged to contact Petrosino at [joseph.petrosino@bcm.edu](mailto:joseph.petrosino@bcm.edu). ■



**This scanning electron micrograph of a bacterium species in the genus *Streptococcus* was cultivated from a bronchoalveolar lavage sample from a healthy volunteer. The photo was supplied by Drs. Thomas Schmidt and Arvind Venkataraman of the Department of Microbiology and Molecular Genetics at Michigan State University.**





## From Farm to (Clinic) Table

Farmers markets in Harris Health System health centers are helping Baylor College of Medicine doctors help Houstonians make healthier choices.

Day in and day out, Dr. Ann Smith Barnes was counseling patients about healthy eating. She would emphasize the importance of fresh produce and then say good bye, watching her patients return to lives in which following her advice often seemed impossible. Some of her patients lived in food deserts—areas with little or no access for fresh produce. Others could not afford the fresh items that were in their local markets. For others, lack of familiarity with fresh produce meant they did not know how to cook it even if they wanted to try.

Barnes, medical director of Weight Management Services and Disease Prevention at the Harris Health and assistant professor of medicine at BCM, approached Harris Health leadership with an idea she hoped would make it easier for patients to follow nutrition advice. She proposed bringing fresh produce directly to the patients in the form of farmers markets in the clinics. She was met with enthusiastic support.

Then she was faced with actually trying to make it happen. After trying and failing



many times to find a partner with access to fresh produce who could manage the markets, Barnes was finally connected with Renea Gray.

Gray is the owner of Veggie Pals, a Houston-based program focused on helping students learn about healthy eating. Veggie Pals runs programs in 192 schools, has planted over 42 community gardens in Houston schools and holds programs for students and parents to learn about healthy eating.

Working closely with leadership of Harris Health, Barnes and Gray worked through the many logistical details and figured out a way to bring farmers markets into clinics.

Since beginning Healthy Harvest in November 2011, the program has operated farmers markets once a week in 11 Harris Health centers, selling an average of 20 tons of produce a month.

Harris Health won the 2012 Gage Award for Improving Population Health from the National Association of Public Hospitals and Health Systems for this program. In an announcement about the award, David S. Lopez, president and CEO of Harris Health, said “The tremendous work of Dr. Barnes and our community health centers are to be commended. The goals of Healthy Harvest and many of the programs at Harris Health fall right in line with the goals of our healthcare system to provide primary care, wellness, prevention and disease management to improve the public’s health.”

While still too new to show quantifiable results, anecdotal evidence indicates the markets are having the desired impact. “My colleagues in the clinic frequently comment that the overhead announcements of the markets remind them to discuss healthy eating with their patients and to encourage a stop at the market,” said Barnes. Market staff relay stories to Gray about individuals who come back week after week to stock up, try new foods, and learn more about health eating. ■

## HEALTHY HARVEST PROGRAM

While access to healthy, fresh produce is an important part of the Healthy Harvest Program, it is not all of it. To help patients incorporate more healthy foods in their diets, the Healthy Harvest Program also provides education on why fresh produce is important as well as practice tips such as recipes.

This recipe for Avocado, Tomato and Mango Salsa was developed by the health promotions staff at Harris Health and is shared with visitors to the farmers markets.

### INGREDIENTS

- 1 mango - peeled, seeded and diced
- 1 avocado - peeled, pitted, and diced
- 4 medium tomatoes, diced
- 1 jalapeno pepper, seeded and minced
- 1/2 cup chopped fresh cilantro
- 3 cloves garlic, minced
- 1 teaspoon salt
- 2 tablespoons fresh lime juice
- 1/4 cup chopped red onion
- 3 tablespoons olive oil

### DIRECTIONS

In a medium bowl, combine the mango, avocado, tomatoes, jalapeno, cilantro, and garlic. Stir in the salt, lime juice, red onion, and olive oil. To blend the flavors, refrigerate for about 30 minutes before serving. Serve with fresh vegetables, chips or on fish.





# RESEARCH BRIEFS

## COACTIVATOR STOKES CONTINUING FIRE OF ENDOMETRIOSIS



Endometriosis, which can cause severe pain and even infertility in the estimated 8.5 million U.S. women it affects, is driven by one of the cell's master regulators—steroid receptor coactivator 1 or SRC-1, said researchers at Baylor College of Medicine in a report in the journal *Nature Medicine*.

“This finding could lead to new therapies for this age-old condition,” said Dr. Bert O’Malley, chair of molecular and cellular biology at BCM and the report’s corresponding author.

The causes of endometriosis are unclear, because the molecular pathways involved have not been elucidated previously. Understanding the role of the isoform of SRC-1 in maintaining the endometriosis is an important step toward developing new ways to treat it, said O’Malley, who holds the Thomas C. Thompson Chair in Cell Biology.

## MEMORY’S BUFFER NOT LIMITED



When a basketball player scans the court, his brain automatically records the players to his right and left, the one in front and ones running in from the side as he also gauges the distance to the basket. As he whips and turns, his memory retains that data in the short term, enabling him to chart a good path to the basket and goal.

The amount of data you can retain is not—as has been long thought—a finite magical number—usually about four, said Dr. Wei Ji Ma, assistant professor of neuroscience at Baylor College of Medicine and author of a report on the phenomenon in the *Proceedings of the National Academy of Sciences*. Instead, it’s a graded continuous resource distributed over all the objects you need to remember. And the quality of that memory fluctuates. This visual short-term memory is like a “buffer” in a computer, allowing you to retain important pieces of information that will inform your future actions, said Ma.

Ma acknowledges that his theory is not necessarily the final word in the debate. “It does open the debate, and there may be proponents of other theories that can come up with new models,” he said.

## HOW THE ‘FORGOTTEN’ BRAIN

### CELL DEVELOPS



Often called the ‘forgotten’ brain cell, glial cells account for as much as 80 percent of the brain. Their origin and development is a mystery that scientists at Baylor College of Medicine are beginning to unravel.

In a recent report in the journal *Neuron*, Dr. Benjamin Deneen, assistant professor of neuroscience at BCM, and his colleagues describe a novel transcriptional cascade that controls the generation of new glial cells, answering the question of how these cells are generated from neural stem cells.

The researchers identified two proteins—NFIA and Sox9—which drive the process by which production of glial cells is initiated. These proteins cooperatively regulate a genetic program that controls cell migration and energy metabolism, two key processes associated with cellular differentiation. “Deciphering how glial cells are generated is key to understanding brain function during health and disease,” said Deneen.

## STEM CELL RESTING STATE

### REGULATION REVEALED



The growth or production of hematopoietic stem cells (stem cells that give rise to all blood cell types) is known as proliferation, and when cells are in a resting state, not actively proliferating, it is known as quiescence.

While it was believed that quiescence took place because of a lack nutrients or



stimulation, meaning the cell had no other option but to rest, researchers at Baylor College of Medicine now say this process is actively regulated. The findings were published in *PLoS ONE*.

“Our findings show that hematopoietic stem cells make the choice to stay in quiescence. This process is regulated by the protein GOS2,” said Dr. Daniel Lacorazza, assistant professor of pathology and immunology at BCM and a researcher with Texas Children’s Hospital.

#### SUCCESS RATES OF PREGNANCY WITH FERTILITY

#### TREATMENTS VARY WITH AGE AND EGG TYPE



Women undergoing fertility treatments have a lower chance of achieving a successful birth as they age, and when they use their own eggs versus a donor, according to a large study published in *The New England Journal of Medicine*.

Conducted by the Society for Assisted Reproductive Technology (SART) Research Committee, the study followed 246,740 women through multiple cycles of fertility treatments.

Dr. William Gibbons, professor of obstetrics and gynecology at Baylor College of Medicine and a reproductive endocrinology/infertility specialist at the Texas Children’s Hospital Pavilion for Women and past president of SART, is a co-author on the report.

Gibbons said the analysis will give clinicians much better information to counsel patients undergoing fertility treatment.

#### TRANSCRIPTION FACTOR LYL-1 CRITICAL IN PRODUCING

#### EARLY T-CELL PROGENITORS



A transcription factor called Lyl-1 is necessary for production of the earliest cells that can become T-cells, critical cells born in the thymus that coordinate the immune response to cancer or infections, said a consortium of researchers led by those from Baylor College of Medicine in a report in the journal *Nature Immunology*.

These earliest progenitors (called early T lineage progenitor cells) are the first cells that can be identified as being on the road to becoming T-cells, said Dr. Margaret Goodell, director of the Stem Cells and Regenerative Medicine Center and holder of the Vivian L. Smith Chair in Regenerative Medicine at BCM. Without Lyl-1, only a few of these early T lineage progenitor cells get made.

“This finding gives us insight into the biology of these progenitor cells,” said Goodell.

#### NEW PATHWAYS TO CANCER FOUND IN COLORECTAL TUMORS

The solutions to the problems of cancer may possibly be found by following the pathways it disrupts.

The majority of colorectal tumors sequenced in the first major project of The Cancer Genome Atlas showed that gene mutations disrupted proper activity of a cellular pathway known to play a crucial role in embryogenesis and in cancer, said researchers including those from the Baylor College of Medicine Human Genome Sequencing Center in a report in the journal *Nature*. The BCM Human Genome Sequencing Center carried out two-thirds of the sequencing activities for the study.

“The large number of patients in the study enabled us to identify several new genes not previously suspected of playing a role in colorectal cancer,” said Dr. David Wheeler, associate professor in the Baylor Human Genome Sequencing Center and a communicating author of the report. “The surprising finding was the confluence of mutations that led to the activation of the MYC pathways,” he said.

“MYC is a key driver of proliferation in many stem and progenitor cell types and its continued overexpression would keep the colon cells proliferating and not differentiating,” said Dr. Lawrence Donehower, professor of molecular virology and microbiology at BCM, who helped analyze the results. Both Donehower and Wheeler are members of the NCI-designated Dan L. Duncan Cancer Center at BCM.



## BOUNDARY STOPS MOLECULE WHERE NEEDED



A molecule responsible for the proper formation of a key portion of the nervous system finds its way to the proper place not because it is actively recruited, but instead because it can't go anywhere else.

Dr. Matthew Rasband, associate professor of neuroscience at Baylor College of Medicine, Dr. Mauricio Galiano, postdoctoral associate in neuroscience at BCM, and colleagues have identified a distal axonal cytoskeleton as the boundary that makes sure AnkyrinG clusters where it needs to so it can perform properly. The findings appear in the journal *Cell*.

"It has been known that AnkyrinG is needed for the axon initial segment to form. Without the axon initial segment, there would be no output of information within the nervous system," said Rasband.

"We had anticipated there was a kind of molecule that recruited AnkyrinG but instead we found a barrier that excludes it," Rasband said. "These results have important implications because they imply a similar exclusion mechanism might be in play or functioning all of the places where AnkyrinG is found."

Rasband said within many disorders like autism or epilepsy proteins that AnkyrinG is responsible for forming are disrupted. So understanding how this molecule functions properly could one day play a role in finding treatment targets for diseases.

"This is a novel inborn error of metabolism," said Beaudet, who is also a physician at Texas Children's Hospital, and the senior author of a report on the role of this gene in autism in the *Proceedings of the National Academy of Sciences*. "How it is associated with the causes of autism is as yet unclear. However, it could point to a means of treatment or even prevention in some patients."

Beaudet and his international group of collaborators believe the gene deletion leads to an imbalance in carnitine in the body. "The gene deletion is neither necessary nor sufficient in itself to cause autism," Beaudet said. He estimated that at the rates found in his study, the deficiency might be a factor in about 170 males born with autism per year in the United States. This would equate to about one-half of one percent of autism cases. While the gene mutation might be only a weak risk factor for autism, Beaudet thinks that understanding it further will enlighten the search for answers in this difficult disease. Beaudet holds the Henry and Emma Meyer Chair in Molecular Genetics.

## GENE MUTATION FINDING MAY PROVIDE ANSWERS

### FOR SOME AUTISM



When Dr. Arthur Beaudet and his colleagues first identified deletion of part of a gene that plays a role in the synthesis of carnitine—an amino acid derivative that helps the body use fat for energy—and realized that it might play a role in milder forms of autism, the chair of molecular and human genetics at Baylor College of Medicine thought the finding might have implications for treatment and prevention.



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# BCM

Baylor College of Medicine

One Baylor Plaza  
Houston, Texas 77030



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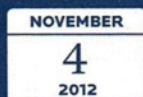
**HEADING TO SAN FRANCISCO FOR THE  
AAMC NATIONAL MEETING?**

Join Dr. Paul Klotman, President and CEO of Baylor College of Medicine,  
at the BCM Alumni and Friends Reception

We are pleased to be able to include a wine tasting with the Palmaz Vineyards  
as part of our AAMC reception this year.

**SAVE THE DATE**

**AAMC NATIONAL MEETING**



6:30 PM to 8:00 PM  
Marriott Marquis  
Sierra J

The reception is open to all alumni and friends of BCM. You do not need to be  
registered for the AAMC Annual Meeting to attend.