Environmental, health impacts of engineered nanomaterials theme of INBT’s annual symposium

By 2015, the National Science Foundation reports that the nanotechnology industry could be worth as much as $1 trillion. Nanomaterials have many beneficial applications for industry, medicine and basic scientific research. However, because nanomaterials are just a few atoms in size, they also may pose potential risks for human health and the environment.

To increase awareness of Hopkins’ research in this emerging area of investigation, the theme for the fourth annual symposium hosted by Johns Hopkins Institute for NanoBioTechnology (INBT) will be environmental and health impacts of engineered nanomaterials.

INBT’s symposium will be held Thursday, April 29, from 8 AM to 3 PM at the university’s Bloomberg School of Public Health in Baltimore, Md.

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INBT 4th ANNUAL SYMPOSIUM

Environmental and Health Impacts of Engineered Nanomaterials

Thursday, April 29th, 2010

Johns Hopkins Bloomberg School of Public Health

Sheldon Hall: Speakers
Feinstein Hall: Poster Session

8:00 - Registration
8:30 - Welcome and Introductions, Jon Links

8:45 - Potential Impacts of Engineered Nanomaterials: What we know; what we need to know, Ellen Silbergeld

9:00 - Manufacture and Characterization of Engineered Nanomaterials for Toxicity Studies, Howard Fairbrother

9:15 - Environmental Transport, Transformation, and Fate, Ed Bouwer

10:10 - Break

10:30 - Exposure Assessment of Nanomaterials, Pat Breysse

10:50 - Transport of Nanomaterials Across Mucus Membranes, Justin Hanes

11:10 - Example Toxicity Assessment: Neurotoxicity, Tomas Guilarte

11:30 - Policy Implications of Nanomaterial Risk Assessment, Ron White

12:00 - Break

1:30 - Poster Session/Poster Judging

3:00 - Award Ceremony and Adjourn

IN THIS ISSUE

Johns Hopkins Institute for NanoBioTechnology brings together Johns Hopkins faculty and their students using nanotechnology to generate new knowledge, tools, and techniques in medicine and health.
Cell’s ‘cap’ of bundled fibers could yield clues to disease

It turns out that wearing a cap is good for you, at least if you are a mammal cell.

Researchers from the Johns Hopkins Engineering in Oncology Center have shown that in healthy cells, a bundled “cap” of thread-like fibers holds the cell’s nucleus, its genetic storehouse, in its proper place. Understanding this cap’s influence on cell and nuclear shape, the researchers say, could provide clues to the diagnosis and treatment of diseases such as cancer, muscular dystrophy and the age-accelerating condition known as progeria.

“Under a microscope, the nucleus of a sick cell appears to bulge toward the top, while the nucleus of a healthy cell appears as a flattened disk that clings to the base,” said principal investigator Denis Wirtz, professor of chemical and biomolecular engineering and director of the Engineering in Oncology Center. “If we can figure out how and why this shape-changing occurs, we may learn how to detect, treat or perhaps even prevent some serious medical disorders.

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http://inbt.jhu.edu/cells-cap-of-bundled-fibers-could-yield-clues-to-disease/2009/12/02

Biodegradable nanoparticles ideal carrier for drug delivery

Johns Hopkins University researchers have created biodegradable nanosized particles that can easily slip through the body’s sticky and viscous mucus secretions to deliver a sustained-release medication cargo. The researchers say that these nanoparticles, which degrade over time into harmless components, could one day carry life-saving drugs to patients suffering from dozens of health conditions, including diseases of the eye, lung, gut or female reproductive tract.

The mucus-penetrating biodegradable nanoparticles were developed by an interdisciplinary team led by Justin Hanes, a professor of chemical and biomolecular engineering in Johns Hopkins’ Whiting School of Engineering*. The team’s work was reported recently in the Proceedings of the National Academy of Sciences. Hanes’ collaborators included cystic fibrosis expert Pamela Zeitlin, a professor of pediatrics at the Johns Hopkins School of Medicine and director of Pediatric Pulmonary Medicine at Johns Hopkins Children’s Center.

These nanoparticles, Zeitlin said, could be an ideal means of delivering drugs to people with cystic fibrosis, a disease that kills children and adults by altering the mucus barriers in the lung and gut. “Cystic fibrosis mucus is notoriously thick and sticky and represents a huge barrier to aerosolized drug delivery,” she said. “In our study, the nanoparticles were engineered to travel through cystic fibrosis mucus at a much greater velocity than ever before, thereby improving drug delivery. This work is critically important to moving forward with the next generation of small molecule- and gene-based therapies.”

Beyond their potential applications for cystic fibrosis patients, the nanoparticles also could be used to help treat disorders such as lung and cervical cancer and inflammation of the sinuses, eyes, lungs and gastrointestinal tract, said Benjamin C. Tang, lead author of the journal article and a postdoctoral fellow in the Department of Chemical and Biomolecular Engineering. “Chemotherapy is typically given to the whole body and has many undesired side effects,” he said. “If drugs are encapsulated in these nanoparticles and inhaled directly into the lungs of lung cancer patients, drugs may reach lung tumors more effectively and improved outcomes may be achieved, especially for patients diagnosed with early stage non-small cell lung cancer.”

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http://inbt.jhu.edu/nanoparticles-bypass-mucus-barrier-may-deliver-drugs/2010/01/04

*Hanes’ current primary affiliation is with the School of Medicine.
On new lab chip, heart cells display a behavior-guiding ‘nanosense’

Johns Hopkins biomedical engineers, working with colleagues in Korea, have produced a laboratory chip with nanoscopic grooves and ridges capable of growing cardiac tissue that more closely resembles natural heart muscle. Surprisingly, heart cells cultured in this way used a “nanosense” to collect instructions for growth and function solely from the physical patterns on the nanotextured chip and did not require any special chemical cues to steer the tissue development in distinct ways. The scientists say this tool could be used to design new therapies or diagnostic tests for cardiac disease.

The device and experiments using it appeared in the December 15, 2009 Early Edition issue of Proceedings of the National Academy of Sciences. The work, a collaboration with Seoul National University, represents an important advance for researchers who grow cells in the lab to learn more about cardiac disorders and possible remedies.

“Heart muscle cells grown on the smooth surface of a Petri dish would possess some, but never all, of the same physiological characteristics of an actual heart in a living organism,” said Andre Levchenko, an associate professor of biomedical engineering in Johns Hopkins’ Whiting School of Engineering. “That’s because heart muscle cells—cardiomyocytes—take cues from the highly structured extracellular matrix, or ECM, which is a scaffold made of fibers that supports all tissue growth in mammals. These cues from the ECM influence tissue structure and function, but when you grow cells on a smooth surface in the lab, the physical signals can be missing. To address this, we developed a chip whose surface and softness mimic the ECM. The result was lab-grown heart tissue that more closely resembles the real thing.”

INBT, EOC directors named AAAS 2009 Fellows

The Johns Hopkins Whiting School of Engineering faculty members who direct the Institute for NanoBioTechnology and Engineering in Oncology Center both have been awarded the distinction of AAAS Fellow. Election as a Fellow is an honor bestowed upon AAAS members by their peers.

Peter C. Searson, the Joseph R. and Lynn C. Reynolds Professor of Materials Science and Engineering, was named for distinguished contributions to the field of surface chemistry and nanoscience. His research interests include surface and molecular engineering, and semiconductor quantum dots.

Denis Wirtz, the Theophilus H. Smoot Professor of Chemical and Biomolecular Engineering, was elected for his contributions to cell micro-mechanics and cell adhesion. He also was distinguished for his development and application for particle tracking methods to probe the micromechanical properties of living cells in normal conditions and disease state. Wirtz studies the biophysical properties of healthy and diseased cells, including interactions between adjacent cells and the role of cellular architecture on nuclear shape and gene expression.

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Denis Wirtz named Smoot professor

Denis Wirtz, Johns Hopkins University professor of chemical and biomolecular engineering and director of the Engineering in Oncology Center, has been named the Theophilus Halley Smoot Professor in the Whiting School of Engineering. University president Ronald J. Daniels and the Board of Trustees determined the recipient.

Wirtz is the founding associate director of the Johns Hopkins Institute for NanoBioTechnology. He was recently named a 2009 fellow of the American Academy for the Advancement of Science in the Engineering Section for his contributions to cell micromechanics, cell adhesion, and for the development and application of particle tracking methods that probe the micromechanical properties of living cells. Wirtz will be installed as Smoot professor on April 19, 2010.

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Animator, scientist partner to illustrate cover of Advanced Materials

The cover of the January 19, 2010 issue of the journal Advanced Materials features a photo illustration executed by Martin Rietveld, Web Director and Animator at Johns Hopkins Institute for NanoBioTechnology. Rietveld’s work illustrates an article about chemomechanical actuators grippers that open and close like a hand in response to chemical reactions. The paper is based on the research of lead author, doctoral student Jatinder Randhawa in the laboratory of David Gracias, associate professor of chemical and biomolecular engineering and faculty affiliate of the Institute for NanoBiotecnology. Randhawa conceptualized the illustration of his research for the journal cover.

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