U.S. ARMY
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
Public Affairs Office
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News Release

For Information: Amanda Dubbs, 410-436-1159 20 December 2013

ECBC, Harvard collaborate on organ-on-a-chip research

ABERDEEN PROVING GROUND, Md. – A couple of years ago two researchers from the U.S. Army Edgewood Chemical Biological Center (ECBC) heard Harvard professor Donald Ingber, M.D., Ph.D., speak at a conference about his lung-on-a-chip research, and they *knew* they had to speak to him. The organ or lung in this case, is composed of swatches of human tissue that are placed on "chips" of silicon wafer that are about the size of a computer thumb drive. Ingber's model was a 3D swatch of lung tissue that actually acted like a human lung by "breathing." Ingber had created a way for the sides of his model to contract and expand like an actual lung. This was revolutionary because until then the organs-on-a-chip did not do much to simulate the organs they represented.

After the conference was over, the two researchers - Harry Salem, Ph.D., and Russell Dorsey, Ph.D. - approached Ingber to discuss their own organ-on-a-chip research being carried out at ECBC and to discuss the possibility of collaborating.

It has been two years since that meeting and over the last two months, organ-on-a-chip scientists - both from Harvard and several businesses founded and ran by Harvard professors - have visited the Center and Salem and Dorsey have traveled to Harvard University's Cambridge, Mass., campus. After seeing all of the capabilities that Harvard and ECBC have, the teams are excited about the thought of collaboration.

As an Army research laboratory, ECBC researchers have been studying the organs-on-a-chip for several years exposing organs-on-a-chip to various chemicals, pharmaceuticals and chemical warfare agents. ECBC is the nation's principal research and development resource for non-medical chemical and biological defense, and the Center's main focus is supporting the warfighter.

Salem, the Center's chief scientist for Life Sciences, and his team's research assesses the effectiveness and toxicity of chemicals and drugs in a way that is relevant to humans' and their ability to process them. The plan is for Harvard to provide its functioning lung model so that Salem's team can test biological and chemical warfare agents, as well as countermeasures, and compare to results of the static models studied. This will allow them to learn more about how the body responds to agent exposure. The team will hopefully be able to use the testing results to explore various treatment options and provide feedback to organ-on-a-chip scientists for future development and use.

"Collaborating with top experts in the field, such as Harvard University, the Wyss Institute and others, the Army is living up to its reputation as a team player and innovator," ECBC Research and Technology Director Joseph Corriveau, Ph.D., said. "While the Center's research directly

impacts the defense of our warfighters, the organ-on-a-chip research will have a resounding global impact."

Founded by Ingber, the Wyss Institute for Biologically Inspired Engineering is part of Harvard University. In 2005, Harvard convened a committee to envision the future of bioengineering and they created the Wyss Institute. The Institute applies their research to solve real-world problems. Another major collaborator is the private company CellBridge. Founded by Harvard professor George Whiteseides, CellBridge performs similar studies to the Wyss Institute and develops technology solutions for the stem cell and 3D tissue culture markets. Researchers at the Wyss Institute and CellBridge frequently work together in their research.

The hope is that collaboration between ECBC and these organizations could lead to many chemical and biological testing improvements. One such improvement will be the reduction of chemical and drug testing on animals. Traditional animal testing results are not applicable to providing solutions for humans 90 percent of the time. The organ-on-a-chip research could provide more solutions and narrow their research efforts early on in the testing process by quickly yielding accurate results. This is especially important to the warfighter who could be exposed to various chemical or biological hazards in the field.

"The warfighter comes first," said Mitchell R. Zakin, Ph.D., Cellbridge's executive vice president and Harvard professor. "Our partnership with ECBC allows us to focus on emerging technologies on solving the most critical and operationally relevant problems."
It is the hope of all the teams to leverage the research being conducted at each site to further advance the science of organ-on-a-chip research and to lead to other partnerships.

"There are many opportunities for mutually beneficial collaboration, and it is a very exciting time in this type of research," Salem said. "These key partnerships just make sense. We have so many common goals that we hope to achieve."

Salem's researchers are also collaborating with U.S. Army Medical Research Institute of Chemical Defense, Wake Forest, Harvard and the University of Michigan on various aspects of the research.

Photo credit: U.S. Army Edgewood Chemical Biological Center

(1) During a visit to the Wyss Institute for Biologically Inspired Engineering at Harvard University, ECBC's Harry Salem, Ph.D. is shown some of the Institute's research.

(2) ECBC and Harvard scientists discuss human-on-a-chip research during a Harvard visit to the Center.

For more information about ECBC, visit http://www.ecbc.army.mil/.

ECBC is the Army's principal research and development center for chemical and biological defense technology, engineering and field operations. ECBC has achieved major technological advances for the warfighter and for our national defense, with a long and distinguished history of providing the Armed Forces with quality systems and outstanding customer service. ECBC is a U.S. Army Research, Development and Engineering Command laboratory located at the Edgewood Area of Aberdeen Proving Ground, Maryland. For more information about the Edgewood Chemical Biological Center, please visit our website at http://www.ecbc.army.mil or call (410) 436-1159.

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