FDA/NCTR Researchers Win Nanotechnology Conference "Science as Art Contest"

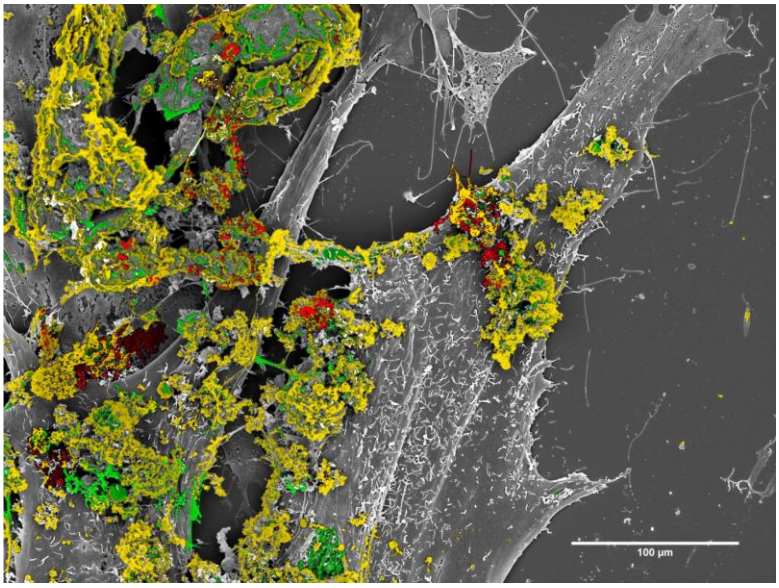
Research scientists from the FDA National Center for Toxicological Research (NCTR) earned first and second prize honors at the Sixth annual Nanotechnology Health Care Conference, "Science as Art" contest. The December 4, 2015 conference and contest was held at the Winthrop Rockefeller Center in Morrilton, Arkansas.

The conference is part of a partnership between the Winthrop Rockefeller Institute, University of Arkansas for Medical Sciences (UAMS), University of Arkansas at Fayetteville (UAF), University of Arkansas at Little Rock (UALR), and the U.S. Food and Drug Administration (FDA).

Research Biologist Dr. Angel Paredes; Commissioner's Fellow Dr. Jia Yao; and NCTR NanoCore Biologist William Monroe submitted the prize winning nano images on behalf of the FDA. Contest rules stated all submissions had to have some connection to nanotechnology, and could not be altered by image-altering programs in any way (except to enhance the color and contrast of the original image).

The winning images, with description, follow below.

1st Place:



FDA/NCTR-NanoCore Human STEM Cell Nanotechnology Photograph Places First in Science Contest
By Angel Paredes, Ph.D. and Jia Yao, Ph.D. (Commissioner's Fellow)

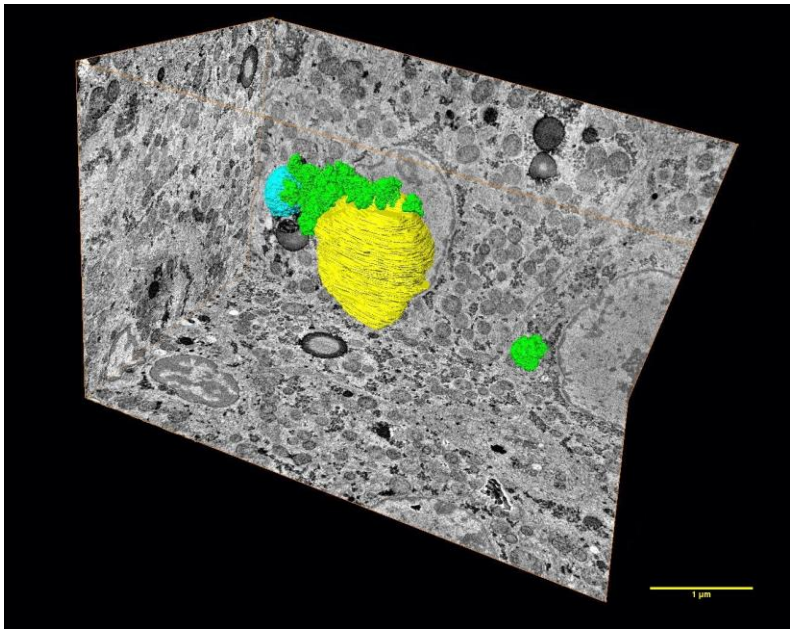
The image shows human bone-marrow-derived stem cells, grown in cell culture to form a uniform layer of cells that were then treated with Titanium Dioxide (TiO2) nanoparticles.

The stem cells were first washed and then prepared for scanning electron microscopy (SEM). The purpose of the experiment was to help develop methods to evaluate human exposure to TiO2. TiO2 is

found in sun block, some medicines, and food. For example, Titanium Dioxide is used to turn powdered sugar white.

The image was scanned at a 6144 x 4608 resolution. The TiO2 nanoparticles were then artificially colored to bring out the contrast of the nanoparticles against the grey cells (using first NIH ImageJ software).Then, CS6 Photoshop was used to mask those particles away from the original image. This allowed the regions containing the TiO2 to be colored separately from the background image of the cell. The colors only signify the average locations of Titanium nanoparticles. The image was recorded using a Zeiss Merlin FEG SEM operating at 5 kV accelerating voltage.

2nd Place:



Three-dimensional Nanotechnology Image of Liver Cells Exposed to Nano-iron Oxide (FeO3) From FDA/NCTR NanoCore Runner-up in Science Contest

FDA/National Center for Toxicological "NanoCore" http://www.fda.gov/AboutFDA/CentersOffices/OC/OfficeofScientificandMedicalPrograms/NCTR/WhatWeDo/NCTRResearchPriorities/ucm083162.htm scientists William Monroe and Angel Paredes, Ph.D., combined and recorded roughly one thousand images to produce this single three-dimensional image-stack of liver cells exposed to FeO3. This sub-volume was removed from the larger volume in order to focus in on just a few cells.

Because an electron microscope records in black and white, the images were segmented to extract and color the 3D information. The black and white images represent the X, Y and Z planes of the volume, with the segmented colored structures suspended against them. The yellow structure is the nucleus,

the blue structure a cell vacuole (a membrane-bound compartment containing fluid that is found in the cytoplasm of a cell), and the green structures are the aggregates (collection) of nano-iron oxide (rust).

The image stack was recorded on a Zeiss Merlin with a Gatan 3View Serial Block Face sectioning device at 1.3 keV, with a resolution of 50 nanometer (nm) per slice in Z, and 5.8 nm per pixel in X and Y. (Link here for an explanation of Nanometer sizing https://www.youtube.com/watch?v=IC3AcItKc3U).