NIST reference materials are 'gold standard' for bio-nanotech research

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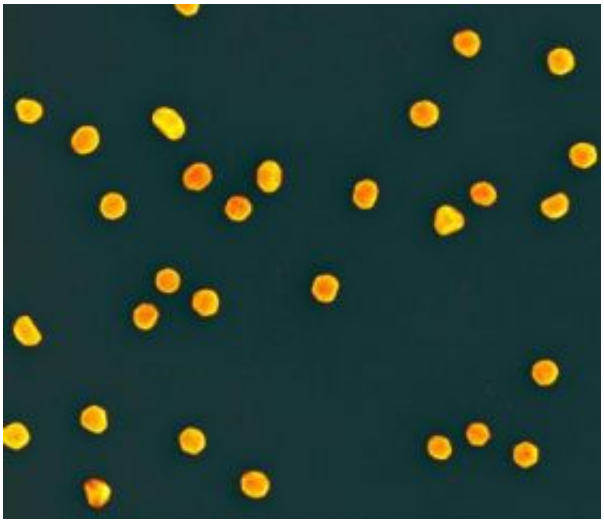

False color scanning electron micrograph (250,000 times magnification) showing the gold nanoparticles created by NIST and the National Cancer Institute's Nanotechnology Characterization Laboratory for use as reference standards in biomedical research laboratories. Credit: Andras Vladar, NIST

The National Institute of Standards and Technology has issued its first reference standards for nanoscale particles targeted for the biomedical research community—literally “gold standards” for labs studying the biological effects of nanoparticles. The three new materials, gold spheres nominally 10, 30 and 60 nanometers in diameter, were developed in cooperation with the National Cancer Institute’s Nanotechnology Characterization Laboratory (NCL).

Nanosized particles are the subject of a great deal of biological research, in part because of concerns that in addition to having unique physical properties due to their size, they also may have unique biological properties. On the negative side, nanoparticles may have special toxicity issues.

On the positive side, they also are being studied as vehicles for targeted drug delivery that have the potential to revolutionize cancer treatments. Research in the field has suffered from a lack of reliable nanoscale measurement standards, both to ensure consistency of data from one lab to the next and to verify the performance of measurement instruments and analytic techniques.

The new NIST reference materials are citrate-stabilized nanosized gold particles in a colloidal suspension in water. They have been extensively analyzed by NIST scientists to assess particle size and size distribution by multiple techniques for dry-deposited, aerosol and liquid-borne forms of the material. Dimensions were measured using six independent methods—including atomic force microscopy (AFM), transmission electron microscopy (TEM), scanning electron microscopy (SEM), differential mobility analysis (DMA), dynamic light scattering (DLS), and small-angle X-ray scattering (SAXS). At the nanoscale in particular, different measurement techniques can and will produce different types of values for the same particles.

In addition to average size and size distributions, the new materials have been chemically analyzed for the concentrations of gold, chloride ion, sodium and citrate, as well as pH, electrical conductivity, and zeta potential (a measure of the stability of the colloidal solution). They have been sterilized with gamma radiation and tested for sterility and endotoxins. Details of the measurement procedures and data are included in a report of investigation accompanying each sample.

Source: National Institute of Standards and Technology