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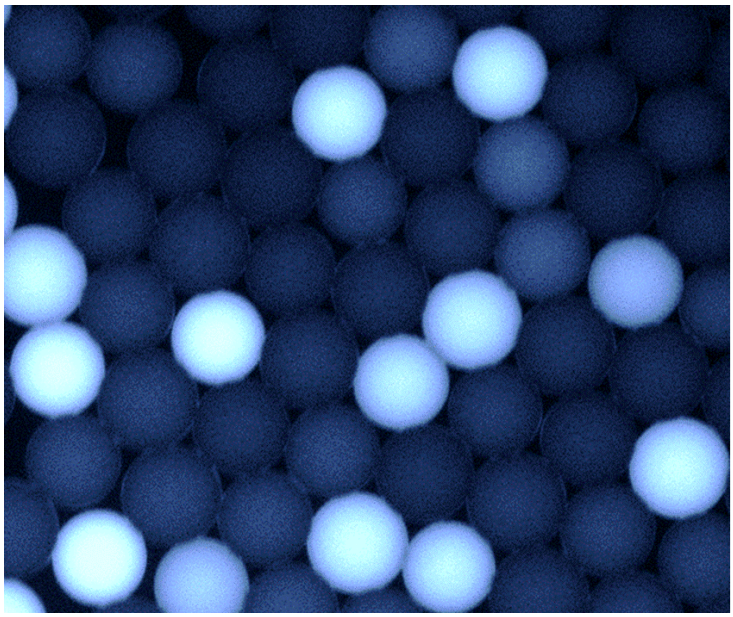
NUS microfluidic device detects all bioparticles

15 April 2013 | News | By BioSpectrum Bureau



Singapore: A bioengineering research team from the National University of Singapore (NUS) team, led by Associate professor Zhang Yong, has developed a novel microfluidic device for efficient, rapid separation and detection of non-spherical bioparticles. Microfluidic devices deal with the behavior, precise control and manipulation of fluids that are geometrically constrained to sub-millimeter scale. This new device, which separates and detects non-spherical bioparticles such as pathogenic bacteria and malaria infected red blood cells, can potentially be used for rapid medical diagnostics and treatment.

Bioparticles such as bacteria and red blood cells (RBC) are non-spherical and many are also deformable. For example, blood cells may change shape when affected by different pathogens in our body. Hence, the team's shape-sensitive technique is a significant discovery. Currently, separation techniques are mostly designed for spherical particles.

Though the team is focusing mainly on the rapid separation and detection of bacteria from pathological samples at the moment, their device has potential as a rapid diagnostic tool as well. Their new technique can potentially replace an age-old method of detection, based on bacterial culture.

Explained associte professor Zhang, "The old method was developed about 100 years ago, but it is still being used today as the mainstream technique because no new technique is available for effective separation of bacteria from pathological samples like blood. Many of the pathogenic bacteria are non-spherical but most of microfluidic devices today are for separating spherical cells. Our method uses a special I-shape pillar array which is capable of separating non-spherical or irregularly-shaped bioparticles."

The method developed by the NUS team can complete the diagnosis process in less than an hour compared to 24-to-48 hours required for bacterial detection by using conventional methods. Their device is also efficient in separating red blood cells (RBCs) from blood samples as RBCs are non-spherical. This enables rapid detection of diagnostic biomarkers that reside in blood sample.