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DETECTION OF CIRCULATING TUMOR CELLS BY ELECTRICALLY-CHARGED MAGNETIC NANOPROBES

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We report a new approach in sensitive detection of circulating tumor cells by electrically-charged magnetic nanoprobcs. We have recently found the negative surface charges are the biophysical manifestation of the Warburg effect that is a hallmark metabolic pattern associated with cancer cell glycolysis. A close correlation has been established between the cancer cell lactate acid secretion and a net of negative electrical charges that appears on cancer cell surfaces. The lactate-secretion-generated cancer cell surface negative charges can be explained by the cross-membrane movement of mobile ions. The charge neutrality of most human cells is maintained by the ion pumps through the plasma membrane. Superparamagnetic nanoparticles are rendered positively charged, via surface functionalization, to strongly bind onto the cancer cells for effective and specific targeting and binding. The charge-based targeting paves a new way for cancer cell capturing and sensitive detection in clinical settings.



Biography

Donglu Shi is currently the Chair of the Materials Science and Engineering Program at the University of Cincinnati. He received his PhD in Engineering from the University of Massachusetts, Amherst. He was the Staff Scientist in the Materials Science Division of Argonne National Laboratory between 1988 and 1995. He has so far published 270 refereed SCI journal publications including *Physical Review Letters*, *Nature*, *ACS Nano*, and *Advanced Materials*. His main interests include Nanostructure Design, Nano Biomedicine, Nanophotonics, and Magnetism. The most recent works pioneer several novel approaches in developing multifunctional nano carrier systems for early cancer diagnosis and therapy.

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