

# DETECTION OF CIRCULATING TUMOR CELLS BY ELECTRICALLY-CHARGED MAGNETIC NANOPROBES

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**W**e report a new approach in sensitive detection of circulating tumor cells by electrically-charged magnetic nanoprob- es. 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.

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