

SNIPPETS - Cancer Research Information

How collapsing bubbles could shoot cancer cells dead

Jets of fluid propelled by the collapse of microscopic bubbles could deliver drugs directly into cancer cells, if an idea from a team of engineers pays off. They have made bubbles project a fine jet that is powerful enough to puncture the cell wall and enter the cell.

Applying a pulse of heat or ultrasound to a fluid can produce bubbles that initially expand rapidly, before collapsing suddenly when the pulse ends.

Pei Zhong and his team at Duke University in Durham North Carolina, knew that collapsing bubbles send a pressure wave through the surrounding fluid, and oscillations at the surface of the bubbles can generate a needle-like jet. The problem is predicting where the jet will go. "Previously, there has been little control in jetting direction, and it has been hard to control the strength of the jet" Zhong says.

Now the team has shown that when pairs of bubbles collapse in close proximity, they interact in a predictable way.

Using successive pulses from two lasers, the team rapidly heated a sample of fluid containing the dye trypan blue. The first pulse produced a bubble of vapour 50 micrometers across, and the second produced another bubble close to the first.

As the bubbles cooled and contracted, their surface began to oscillate, creating vortices in the surrounding fluid. The interaction between neighbouring bubbles caused them to collapse creating a pair of jets shooting out in opposite directions. This provided the degree of control necessary for a targeted drug delivery system,

Zhong says. The size of the bubble is crucial as it dictates the size of the jet. "We want to produce a tiny jet that can penetrate a cell without killing it, he adds".

Zhong and his team tested their bubble needle on cells obtained from a rat tumour. High speed photography showed that the microbubble pair could be made to collapse in such a way that the jet of blue dye created a hole between .2 and 2 micrometers across- allowing the jet of liquid to enter without instantly destroying the cell. This shows the jets are suitable for targeting drugs at cells within the body, Zhong says. He says it should be possible to use microbubble pairs generated by ultrasound rather than laser as a clinical drug-delivery system.

Not everyone is convinced that the system will work in a clinical setting however. In the presence of biological tissue, the oscillating bubbles may be less stable than in the test solutions says Constantin Coussis, a biomedical engineer at the University of Oxford –

Article by Jamie Condiff. New Scientist Magazine 21st August 2010

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" It is not because things are difficult that we do not dare; It is because we do not dare that they are difficult"

Seneca