Magnetic nanoparticles can release anti-cancer microRNA on command

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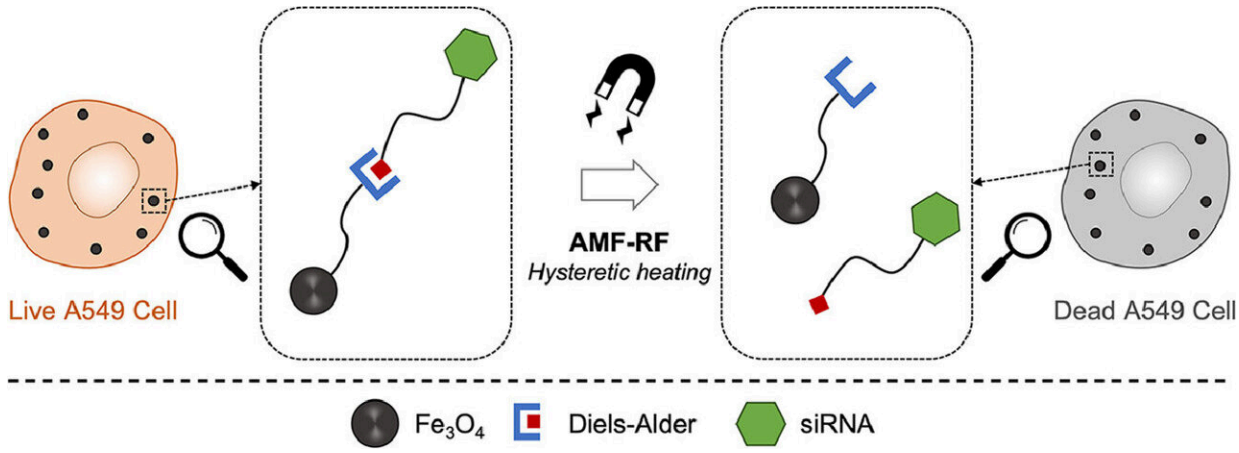

Graphical abstract. Credit: *Biomedical Engineering Advances* (2022). DOI: 10.1016/j.bea.2022.100031

Researchers are pursuing ever-more sophisticated treatments to tackle lung cancer. Traditional chemotherapy can have serious side-effects throughout the body, so many new treatments are highly targeted. These methods allow controlled release directly at the tumor using selective agents that are less likely to produce off-target effects.

An article published in *Biomedical Engineering Advances* presents such a strategy. Daniel Hayes and colleagues at Pennsylvania State University in the United States created magnetic nanoparticles that can be triggered to

release a therapeutic payload when stimulated using a magnetic field.

The technique should allow a doctor to administer the nanoparticles intravenously and then expose the tumor to an alternating magnetic field radiofrequency (AMF-RF) from outside the body. This will trigger the nanoparticles flowing through the area to heat up slightly and release their therapeutic payload precisely where it is needed.

The payload in question is a short strand of RNA known as a microRNA. In this case, the researchers connected the nanoparticles to a synthetic version of a microRNA called miR-148b, which has been shown to have tumor suppressing activity. Using a heat-sensitive chemical bond called a Diels-Alder cycloadduct, they joined the particles and microRNA, so that the bond would disintegrate and release the microRNA when heated using AMF-RF.

Upon testing their nanoparticles in lung cancer cells, the research team found that the particles successfully entered the cells and released their microRNA payload when exposed to AMF-RF. One day later, the researchers performed tests to see if the treated cancer cells had died.

They found that a significant number of cells had died in the group that received the nanoparticle/ AMF-RF treatment compared with groups that received no treatment, nanoparticles with no payload, or fully loaded nanoparticles but no AMF-RF. The results demonstrate that the technique has significant promise, and could pave the way for more advanced studies in animals.

More information: Julien H. Arrizabalaga et al, Development of magnetic nanoparticles for the intracellular delivery of miR-148b in non-small cell lung cancer, *Biomedical Engineering Advances* (2022). DOI: 10.1016/j.bea.2022.100031

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