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Research Highlights

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Nanosensors: A logical choice

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A nanoparticle self-assembly system uses Boolean logic to simultaneously probe for two different cancer markers

Nanoparticle self-assembly systems can be used as sensors for pathological markers, making it possible to monitor progression of diseases. However, usually only one molecule can be probed at a time. In the case of cancer, various proteases (protein digesting enzymes) are expressed in affected tissues, each indicating different aspects of the disease. Sangeeta Bhatia of the Massachusetts Institute of Technology and co-workers[1 (#B1)] have now developed a system to probe two such markers simultaneously.

One set of iron oxide nanoparticles were coated with a protein called avidin, and another set were covered with biotin, a small molecule that binds strongly to avidin. The nanoparticles do not coalesce, however, because long polymer molecules attached to one or both sets stops them from getting close enough to bind. The polymers are linked to the nanoparticles using peptide sequences that are recognized and cleaved by one of two proteases. In the case where all the nanoparticles are polymer-coated — each set through a different linker — both proteases must be present in order to cleave the polymers and allow aggregation to occur (logical AND). However, if just one set of nanoparticles is polymer coated — through a linker that can be cleaved by either protease — the presence of just one of them leads to aggregation (logical OR).

Previous techniques using nanoparticle self-assembly have been effective for *in vitro* applications, but the ability to monitor multiple molecules in this way is likely to also be of use in developing *in vivo* sensors.

References

1. von Maltzahn, G. *et al.* Nanoparticle self-assembly gated by logical proteolytic triggers. *J. Am. Chem. Soc.* doi: 10.1021/ja070461l (2007). | **Article** (http://dx.doi.org/10.1021/ja070461l) |