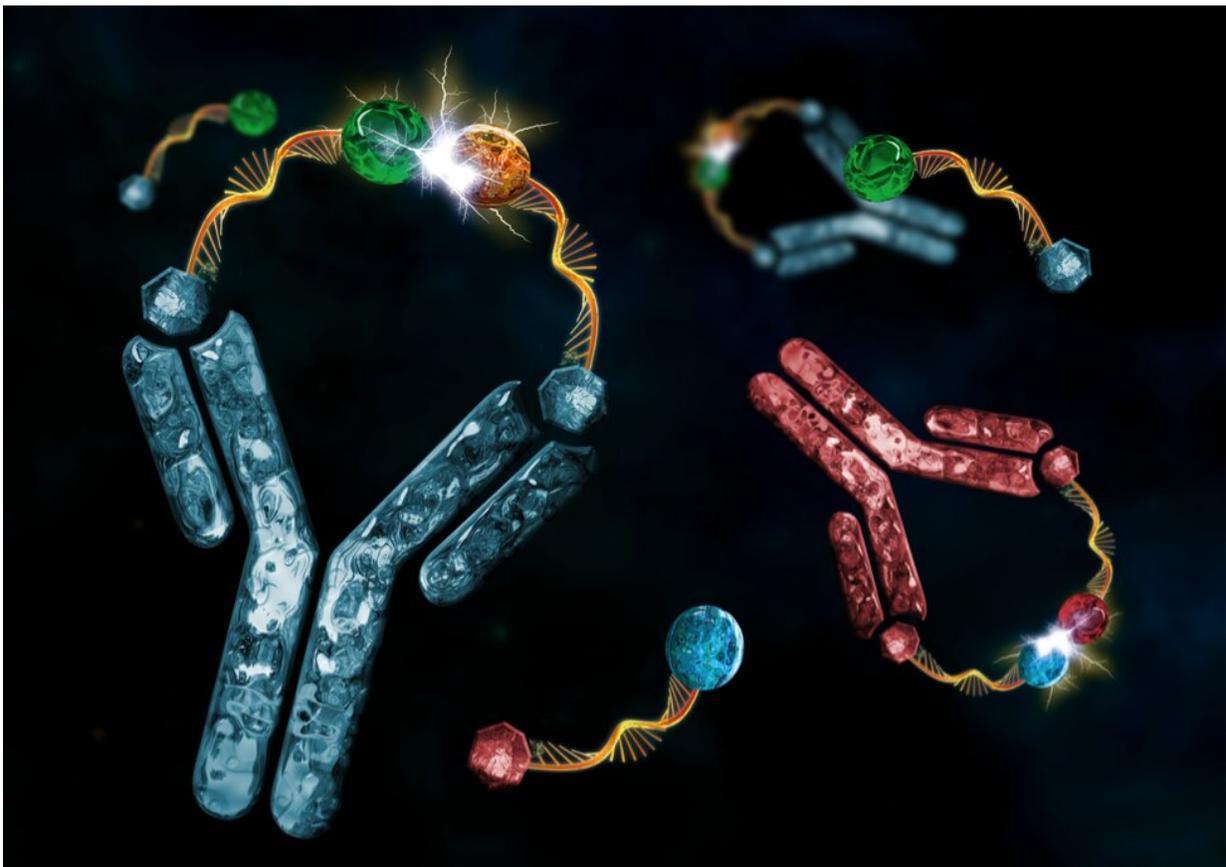


How to use antibodies to control chemical reactions

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Artistic representation of two antibodies triggering two chemical reactions.
Credit: Oscar Melendre Hoyos

In a collaborative effort a group of international scientists has recently

demonstrated a way to control different synthetic chemical reactions with specific antibodies. Their work has been now published in *Nature Communications*.

Antibodies are remarkable biomarkers: they are the cues that provide us with indications about many diseases and how our immune system counters them. Now a group of scientists from the University of Rome, Tor Vergata (Italy) has found a way to repurpose them so that they can trigger a specific chemical reaction.

"We demonstrated a strategy to use specific [antibodies](#) to control chemical reactions forming a wide range of molecules, from imaging to therapeutic agents," says Francesco Ricci, full professor at the University of Rome Tor Vergata and senior author of the article. "Our approach allows to synthesize a functional molecule from inactive precursors only when a specific antibody is present in the reaction mixture."

To achieve this goal, the researchers took advantage of the versatility of synthetic DNA oligonucleotides and of the predictability of DNA-DNA interactions. "Synthetic oligonucleotides are amazing molecules, they can be modified with a range of reactive groups and also with recognition elements that can target specific antibodies," says Lorena Baranda, Ph.D. student in the group of Prof. Ricci and first author of the article. "In our work we rationally designed and synthesized a pair of modified DNA sequences that can recognize a specific antibody and bind to it. When this happens the reactive groups appended on the other ends of the DNA strands will be in [close proximity](#) and their reaction will be triggered ultimately leading to the formation of a chemical product," she explains.

The strategy demonstrated in this work can be used, for example, to control the formation of functional molecules, such as therapeutic agents, with biomarker antibodies. As a proof of principle of this

possible application the researchers demonstrated the formation of an anticoagulant drug able to inhibit the activity of thrombin, a key enzyme of blood coagulation and an important target for the treatment of thrombosis. "We demonstrated that a specific IgG antibody can trigger the formation of the anticoagulant agent, which was further proven to efficiently inhibit the activity of thrombin," says Prof. Ricci. "The strategy is highly specific to the antibody of interest and also programmable. We envision it would represent a new avenue to targeted therapy and diagnostics," he concludes.

More information: Lorena Baranda Pellejero et al, Using antibodies to control DNA-templated chemical reactions, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-20024-3](https://doi.org/10.1038/s41467-020-20024-3)

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