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PRESS RELEASE

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Synthetic antibodies easier to produce

UNIGE scientists have developed a groundbreaking technology that creates synthetic molecules mimicking antibodies, potentially revolutionizing disease treatments.

For decades, lab-made antibodies have been used to support patients in fighting specific diseases. These treatments have become a cornerstone of cancer therapy and were among the first medical solutions developed to combat COVID-19. However, producing antibodies in the lab is costly and time-consuming. A research group from the University of Geneva (UNIGE) has developed a new technology called Self-Assembled Proteomimetics (SAPs). This innovative approach offers a faster, more affordable way to create synthetic molecules that work like antibodies, potentially revolutionizing treatments for diseases such as cancer and COVID-19. The full article is published in the latest edition of *Proceedings of the National Academy of Sciences (PNAS)*.

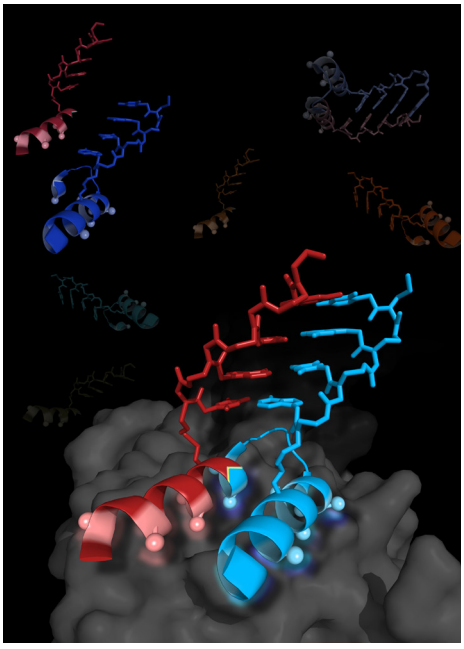
Monoclonal antibodies are crucial in biomedical research and effective cancer treatments due to their targeted approach. These lab-made molecules act like natural antibodies in our immune system, each designed to bind to a specific protein. This precision allows them to target certain cells, like cancer cells or viruses, effectively. However, despite their efficacy, monoclonal antibodies are complex to prepare, limiting their broader application across various cancers.

A group of the School of chemistry and biochemistry of the University of Geneva, led by Prof. Nicolas Winssinger, introduces a new paradigm for designing protein-targeting drugs which could replace monoclonal antibodies: Self-Assembled Proteomimetics (SAPs).

Easier and cheaper to produce

SAPs are tiny, tailor-made molecules designed to target and neutralize harmful proteins in the body, much like antibodies. The difference? “SAPs are easier and cheaper to produce. They are designed as a two-part system. Like puzzle pieces, these components snap together to form a stable structure capable of binding tightly to disease-causing proteins. This innovative design mimics the precise and powerful function of antibodies but eliminates many of the challenges associated with their production,” explains Nicolas Winssinger.

More precisely, SAPs are made of two parts, each about 30 amino acids long, tightly bound together using Peptide Nucleic Acid (PNA) strands, a synthetic polymer similar in structure to DNA and RNA. These miniproteins, being rather small, can be easily produced in a lab. The efficiency of this new approach is demonstrated on



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The SAP molecule tightly bounded to a disease-causing protein. The two different parts of the SAP molecule are represented in blue and red, they are are securely linked together using Peptide Nucleic Acid (PNA) strands, a synthetic polymer similar in structure to DNA and RNA.

High resolution pictures

important therapeutic targets, namely HER2, a well-known cancer biomarker, and the receptor-binding domain (RBD) of the SARS-CoV-2 spike protein.

Additionally, the researchers demonstrated that the PNA can be dynamically controlled to adjust how tightly SAPs bind to their targets. This capability could be highly beneficial in therapeutic applications, offering precise control over the therapeutic activity.

By making these synthetic molecules accessible and efficient, SAPs hold the potential to transform how we treat complex diseases, making life-saving therapies more widely available.

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