RÉGION ACADÉMIQUE
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BACCALAURÉAT GÉNÉRAL ET TECHNOLOGIQUE

ÉPREUVE SPÉCIFIQUE MENTION « SECTION EUROPEENNE »

Académie de Nantes
Binôme : Anglais/SVT

Thème 3 – Corps humain et santé
3 - A - Le maintien de l'intégrité de l'organisme

A Pill That Mimics The Immune System

Question 1. Compare both the *in vivo* and the *in vitro* synthesized antibodies.

Question 2. Explain how this pill can help but cannot replace the immune system.

Doc. 1:

When a foreign pathogen or substance, say an unwanted virus, finds its way into our blood stream we produce antibodies that neutralize the threat. These "Y" -shaped proteins are made by a class of white blood cells called plasma cells and bind to molecules on the invaders called antigens, triggering another set of white blood cells to literally ingest the interloper. For years now doctors have used antibodies (Doc. 2) and other protein-based therapies to treat a range of illnesses, cancers, infections and autoimmune diseases among them. But antibodies have their drawbacks: for one they are bulky and hence usually have to be administered intravenously as they are often too big to be absorbed in the gastrointestinal tract. With this in mind, chemist David Spiegel and his colleagues at Yale University are out to develop compounds with the benefits of antibodies - hopefully minus the needle.

Spiegel and his team have successfully developed the first synthetic molecules that behave like antibodies. Like the real thing, these so-called "synthetic antibody mimics"- or "SyAMs"-bind to both diseased cells and disease-fighting immune cells (Doc. 3). Specifically, the compounds were found to bind to a specific antigen on prostate cancer cells. The SyAMs also bind to and activate certain immune cells that then devour the malignancy.

"Unlike antibodies, however, our molecules are synthetic organic compounds that are approximately one-twentieth the size of antibodies," said David A. Spiegel. "They are unlikely to cause unwanted immune reactions due to their structure, are thermally stable, and have the potential to be administered orally, just like traditional, small-molecule drugs."

Beyond attacking prostate cancer, Spiegel's group has also developed SyAM-based approaches targeting HIV, various other cancers and bacterial triggers of autoimmune disease. And although SyAM research remains in the petri dish, a mouse model is in the works and human studies are not far off.

Bret Stetka, 2015 www.scientificamerican.com

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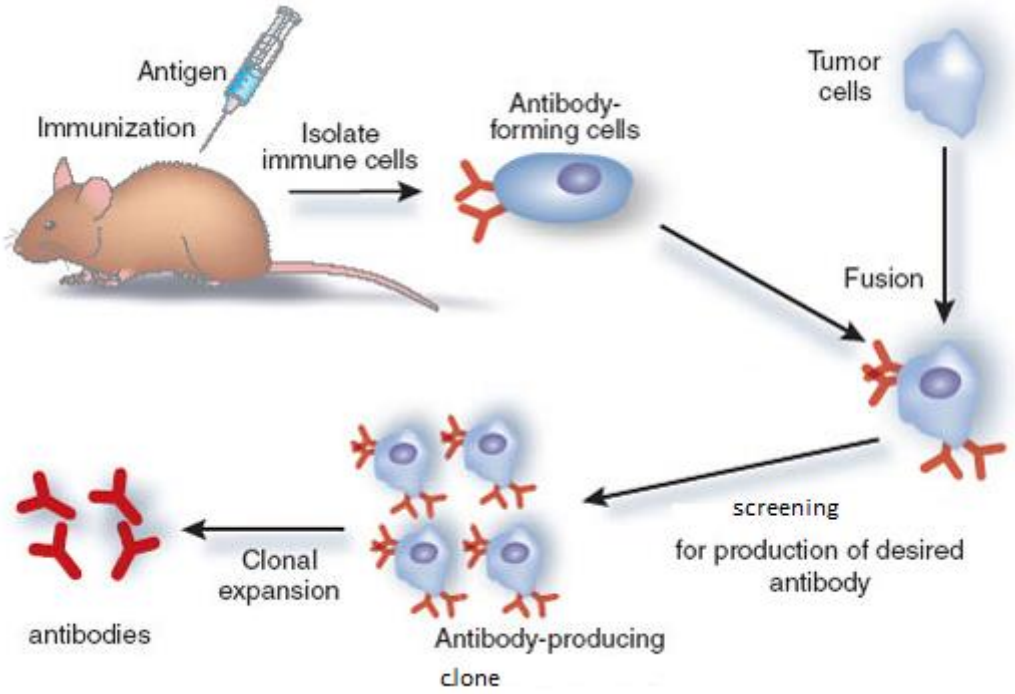
Doc. 2. Production of antibodies (method first described by Milstein and Kholer, 1975)
https://www.sciencedaily.com/releases/2014/12/141217113656.htm



Doc. 3. The Synthetic antibody mimics (SyAMs, 2015)
http://www.nature.com/nchembio/journal/v4/n6/fig_tab/nchembio0608-326_F1.html