Prof Dr Katja Hanack

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Research Objectives

new/era/mabs takes antibody discovery and production to the next level with their novel technology – selma.

Detail

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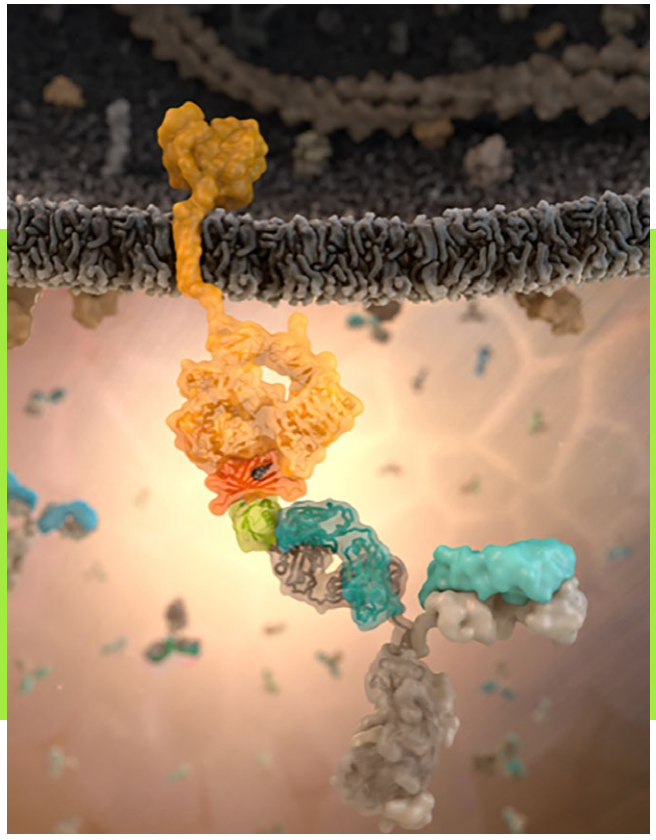
Bio
new/era/mabs was founded in 2014 by Katja Hanack and Pamela Holzlöhner. The technologies were developed at the University of Potsdam and transferred into the company for commercial use. European and US patents for selma were granted with new/era/mabs as owner. The motivated team is now ready for the next adventure.

Funding
We acknowledge the German Federal Ministry of Education and Research (BMBF) and Potsdam Transfer for their support.

Collaborators
We are grateful to Martin Listek, Manfred Gossen and Burkhard Micheel for their valuable contributions.



References

Listek, M., Hönow, A., Gossen, M., and Hanack, K. (2020). A novel selection strategy for antibody producing hybridoma cells based on a new transgenic fusion cell line. *Scientific Reports* 10:1664. https://doi.org/10.1038/s41598-020-58571-w

Personal Response

How might selma influence the development of treatments for diseases that are candidates for antibody therapy?

"It is worth noting that selma enables antibody discovery for nearly every diagnostic development and as a consequence also for therapeutic treatment.

selma is a novel, innovative screening process for antibody-producing cells, allowing early and very effective characterisation of antibodies. This combination allows the process of antibody discovery to be sped up by a factor of four compared to current state-of-the-art methods. As speed and efficacy are potent drivers for product development, selma provides a smart and powerful tool to select suitable antibodies for a broad range of diagnostic and therapeutic applications. The identification of outperforming antibody candidates is fundamental in this business. Therefore, selma is a great opportunity to use a new way of antibody selection!"

Meet selma: Novel antibody generation four times faster

new/era/mabs

Meet selma

Novel antibody generation four times faster

Monoclonal antibodies are widely used in diagnostics and even to treat a wide variety of diseases, including some cancers, but are difficult and time-consuming to produce. Professor Dr Katja Hanack and her colleagues at the University of Potsdam, Germany, have created selma: a totally novel system for antibody discovery and selection of hybridoma cells. The selma technology can identify suitable monoclonal antibodies more efficiently and four times faster than current standard methods. This new era of antibody generation is being propelled by new/era/mabs – an immunotechnology company founded by Professor Dr Hanack.

Antibodies are one of the body's most effective lines of defence against infection. These versatile proteins are produced by a type of white blood cell known as B-cells, and are used by the immune system to identify and neutralise invading pathogens like viruses and bacteria. Antibodies are able to recognise specific molecules (called antigens) on the surface of pathogens. By binding to the antigen, antibodies can label pathogens, and thus effectively neutralise the threat.

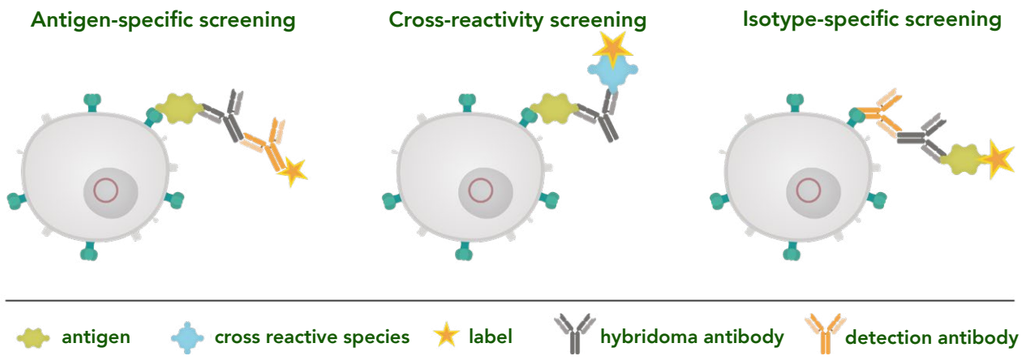
B-cells are capable of producing a huge variety of antibodies. For biotechnological use, antibodies can be grouped into two broad types: primary and secondary. Primary antibodies are specific to a particular antigen, whereas secondary antibodies are specific to primary antibodies in order to realise their proper detection (e.g. in diagnostic assays). Thanks to their specificity, a huge variety of antibodies are manufactured on a commercial scale for biomedical and diagnostic applications ranging from pregnancy tests to SARS-CoV2 detection assays as well as to provide therapeutic treatments.

Recently, Katja Hanack and her colleagues developed an innovative and imaginative solution to the challenges of antibody discovery. They named their novel technology selma.

THE CREATION OF SELMA

Conventionally, many antibodies are produced using the hybridoma technique. In this method, an animal – usually a mouse – is injected with the antigen that the researchers wish to produce antibodies against. This triggers an immune response in the form of specific antibody-producing B-cells. These B-cells can be extracted from the animal's spleen and fused with myelomas. Myeloma cells are cancerous B-cells, they are immortal and can reproduce quickly. The resulting fused cell is known as a hybridoma: like a B-cell, it produces antibodies; like a myeloma, it is immortal and reproduces fast.

The hybridomas are separated and each is allowed to divide rapidly to form a line of clones. These clones produce monoclonal (i.e. identical) antibodies. One of the most onerous and laborious steps in this process is separating the pool of hybridomas to ensure that the antibodies they produce are truly monoclonal. In addition, the multitude of generated antibodies must be tested individually by hand to check that they do in fact bind to the target antigen and to select the best binding candidate for the desired application. Overall, the process – from injecting the mouse with the antigen to the final product – takes between 8 and 12 months.



The three screening techniques of selma; these can be carried out consecutively or combined, streamlining the selection process and saving valuable time.

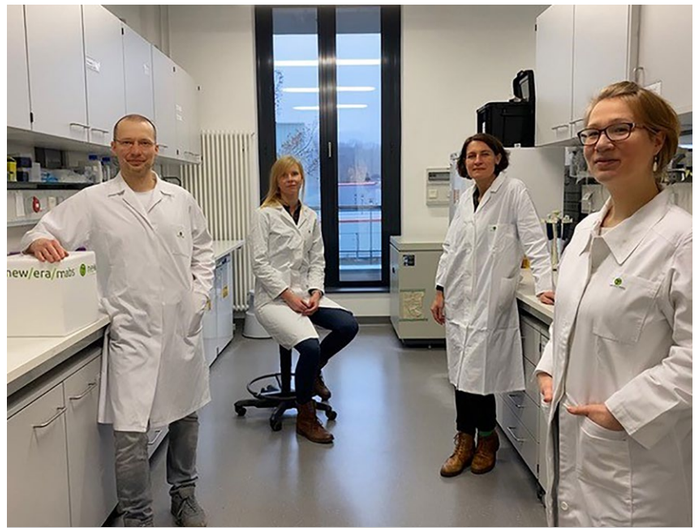
Katja Hanack and her research team realised that in order to achieve faster and simpler antibody discovery, a method was needed to allow the capture of the released antibody on the cell surface of the corresponding hybridoma cell. This system could enable researchers to quickly identify the desired hybridomas while discarding the others. This idea formed the highly innovative basis of selma.

THE SELMA SOLUTION

In the selma method, myeloma cells are genetically modified to include an artificial construct which results in a specific molecule (to be used as a marker) forming on the surface of the cell. These are fused with the B-cells to create a new line of transgenic cells, all possessing the new artificial surface marker. The overall effect of these changes is to allow the new hybridomas to "capture" the antibodies they produce. The captured antibody and the corresponding cell can be labelled with a fluorescent dye and thus be sorted from the pool of hybridoma cells. For the first time, this allows the identification of the secreted antibodies and the corresponding mother cell in one simple screening step. By an automated flow cytometry based cell sort, the desired antibody producing cells can be selected in high numbers, speeding up the whole process four times faster than conventional methods.

Crucially, the new surface marker expressed by hybridomas gives researchers three different options for identifying and sorting, thus isolating those that are producing the desired antibodies. The three screening techniques may be carried out consecutively or combined, streamlining the selection process and saving valuable time.

The first selection option is known as 'antigen-specific screening'. In this technique, the antigen attaches to the marker on the cell surface. In turn, the antibody binds to the immobilised antigen – thus connecting the antibody to the cell.



From left to right: Martin Listek, Anja Schlör, Katja Hanack and Nicole Schliebe-Ohler.

The second option, known as 'cross-reactive screening', is similar to the first, in that different antigens can be used to investigate the specificity of the produced antibody.

The third option is known as 'isotype-specific screening'. In this option, instead of the antigen binding to the cell surface marker, a secondary antibody is used. The secreted antibody then attaches to the secondary antibody and by using a labelled antigen the desired cells can be identified and sorted.

Using this gentle approach, selma represents an antibody selection system that is fast, flexible, direct and specific – and therefore revolutionises the selection of antibody producing hybridomas. Furthermore, selection can be done very early after fusion without the need to wait for clonal expansion of single cells and more cells can be analysed automatically compared to the manual tedious standard screening.

Researchers using selma will find that the selection of antibody producing cells is reduced from several months to just two weeks. Excitingly, the team of new/era/mabs has also successfully demonstrated that this process is suitable for human hybridomas meaning that it could benefit many different researchers working on a huge range of subjects.

The potential of selma is so great that the technology has not only been patent-protected in both the EU and the US, but has also led to an established immunotechnology company – new/era/mabs – making selma available to researchers and clients around the world.

FAST, EFFICIENT, SPECIFIC

With selma the company new/era/mabs has successfully established a novel and highly innovative technology that is four times faster than current state-of-the-art methods. With this new method, the arduous processes of separating the hybridoma cells and identifying those producing the desired antibodies are combined into just a single step – totally transforming the way antibodies are discovered.

selma represents a novel antibody selection system that is fast, flexible, direct and specific.

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