

HUMABS BioMed

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The antibodies of winners make the difference

Humabs BioMed is using antibodies from individuals that have survived serious infections to create better antibody therapeutics to treat disease.

The immune systems of some people are better than those of others at prompting a therapeutic immune response to antigens. There have been several reported cases of patients surviving with, for example, an HIV or other type of viral or bacterial infection for longer than would be expected. “Using the antibodies from these individuals to produce monoclonal antibodies is novel, intelligent and efficient,” said Alcide Barberis, president and CEO of Humabs. Earlier this year, researchers at Humabs described a unique human monoclonal antibody, MPE8, in a letter to *Nature*¹. This came shortly after the company reported in *Science*² the discovery of an antibody that neutralizes human and animal influenza viruses.

The discovery of MPE8 might be a breakthrough in the prevention and treatment of pulmonary infections caused by respiratory syncytial virus (RSV) and metapneumovirus (MPV). Both pose a severe health threat to infants and immunosuppressed patients and have a mortality rate of 40%. “The discovery of the MPE8 antibody is a remarkable example of the power of the Humabs discovery platform to select, from the human immune response, antibodies with unique and powerful properties,” said Davide Corti, head of antibody discovery at Humabs and first author of the studies.

Humabs is focusing on the creation of unique antibodies to treat infectious and inflammatory diseases for clinical development. The enterprise is a privately owned Swiss biotech incorporated in 2004 as a spin-out of Switzerland’s Institute for Research in Biomedicine (IRB). Humabs discovers and develops next-generation, fully human antibodies and has already partnered with two major pharmaceutical companies to move two of its programs—anti-human cytomegalovirus antibodies and anti-influenza A and anti-influenza B antibodies—to clinical development.

The company still maintains its close links with the IRB and has an extended network of high-level collaborations with other academic institutions worldwide. An exclusive agreement with the IRB allows Humabs to combine its discovery capabilities with years of experience and research excellence, thus maintaining a continuously active pipeline.

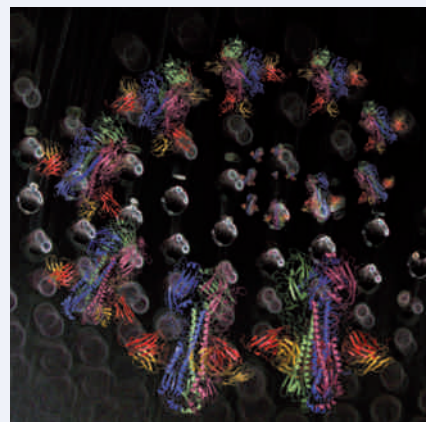
The company’s latest successes are due to the antibody discovery technique developed ten years ago by Antonio Lanzavecchia of the IRB, who is the scientific founder of Humabs. The proprietary platform is made for the rapid identification of naturally selected, highly effective human antibodies and is patent protected in key countries. The platform has been licensed to Humabs ever since the company was

founded. “We are cloning memory B and plasma cells from individuals who have a particularly good immune response to specific pathogens or who survived severe infections,” Corti said. Using this method, the most potent and efficacious antibodies are selected. What could work in theory proved to be highly efficacious both *in vitro* and *in vivo*. Antibodies selected using Humabs’s platform technology have shown superior properties compared with antibodies obtained by other methods¹. The approach provides a rapid and flexible method that enables a fast response to new infectious diseases. This has tremendous potential for fighting future public health threats. “It is adaptable to any human disease in which antibodies have a role, including cancer and neurodegenerative diseases,” said Corti.

Humabs has developed potent and broadly neutralizing antibodies against cytomegalovirus, pan-influenza, RSV and MPV, *Staphylococcus aureus*, hepatitis B, rabies and dengue viruses. Humabs’s MPE8 is the first neutralizing antibody that targets four different human and animal viruses, in particular RSV and MPV, which cause severe lower respiratory tract infections. MPE8 is a new, promising drug to treat and prevent the spread of respiratory infections in infants and immunosuppressed patients. The antibody identifies a conserved structure shared by different viruses, which could lead to the development of a new vaccine. Currently, there is no available vaccine against RSV or MPV. “What is especially interesting is that we discovered one antibody for two major respiratory pathogens,” said Barberis.

With MPE8, Humabs set a course to conquer a very lucrative market. The only humanized antibody against RSV, Synagis, is used exclusively for prophylaxis in premature newborns. The sales are around \$1 billion per year. “The pool of patients needing RSV and MPV treatment is considerably larger,” said Barberis. Over the next decade the market could expand to reach at-risk adults, the elderly and children suffering from acute infections. Humabs is in discussions with pharmaceutical companies that have shown interest in bringing the antibody into clinical development. In addition, Humabs is expanding its approach to other disease areas such as autoimmunity and cancer. Infectious diseases are a multibillion-dollar market—only oncology and autoimmune diseases generate more revenues. According to company sources, the global therapeutic antibody market was valued at \$45 billion in 2011 and is expected to grow to \$58 billion by 2016.

Immunocompromised patients have a 5–15% rate of RSV and 5–10% rate of MPV infection,



Structural biology representation of influenza neutralizing antibody bound to the influenza hemagglutinin from different perspectives.

so Humabs’s MPE8 addresses a serious health problem. MPV is likely to account for ten per cent of lower respiratory tract infection (LRTI) hospitalizations and is second only to RSV as a cause of hospitalization in children with acute LRTI. Progression to LRTI is observed in 38% of these hospital patients, with an average mortality of 32%. Currently, there is no effective treatment to prevent the MPV virus spreading or control the illness. RSV and MPV co-infection was observed in 70% of infants with RSV-associated severe bronchiolitis. “It is clear that we’re trying to address a high medical need causing the death of 30–40% of those infected,” said Corti.

“We are proud to generate enough cash flow not only to run the company but also to pursue a realistic growth strategy,” Barberis said, and the company has a track record of successful development deals. Humabs has also conducted a research collaboration with a pharmaceutical company on an undisclosed target. It has been granted patents and patent applications on technologies and products. “Being both lean and efficient, and having low operating costs and strong academic collaborations, we are a very interesting partner for pharmaceutical companies that need cutting-edge science to fill their pipeline,” Barberis said.

1. Corti, D. et al. *Nature* 501, 439–443 (2013).
2. Corti, D. et al. *Science* 333, 850–856 (2011).

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