Anthrax Detector Developed

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Spores of the dreaded Bacillus anthracis have already been used as a bioweapon against the civilian population. Once inhaled, the anthrax pathogen almost always leads to death if the victims are not treated within 24 to 48 hours. Rapid and accurate diagnosis is thus vital.

A team from the Swiss Federal Institute of Technology (ETH) in Zürich, the Swiss Tropical Institute, and the University of Bern has now developed a new immunological approach that can be used to specifically recognize anthrax spores.

A number of tests for the diagnosis of anthrax already exist, including some highly accurate but also extremely complex, time-consuming, and expensive genetic methods. In contrast, immunological tests are very simple; however, it has not yet been possible to develop a truly reliable immunoassay. The similarity of the anthrax spore surface to the spores of other bacteria that commonly occur in humans has been a major problem: previous anthrax antibodies were not sufficiently specific.

Some time ago, a special carbohydrate consisting of four sugar components was discovered on the surface of anthrax spores. This carbohydrate contains a sugar component that occurs nowhere else and has been named anthrose. Peter H. Seeberger and his team targeted this carbohydrate as their point of attack.

In order to produce antibodies against a molecule, one first needs a large enough amount of the molecule in question, or antigen. However, it is exceptionally difficult to isolate a carbohydrate bound to the surface of a

cell in its pure form. Seeberger and his team thus chose an alternative route: they synthesized the carbohydrate in the laboratory, attached it to a special “carrier” protein and injected this compound into mice. The carrier protein stimulated an immunological reaction, which is normally rather weak for carbohydrate antigens. The researchers were then able to obtain monoclonal antibodies from these immunized mice. These antibodies were found to bind very specifically to anthrax spores; in contrast, they do not react to bacteria closely related to Bacillus anthracis.

“Our results demonstrate that small differences in the carbohydrates on cell surfaces can be used to obtain specific immune reagents,” says Seeberger. “Our new antibodies will be used as the basis for highly sensitive anthrax diagnosis and will contribute to the development of new therapeutic approaches.”

Citation: Peter Seeberger et al., Anti-Carbohydrate Antibodies for the Detection of Anthrax Spores, *Angewandte Chemie International Edition*, doi: 10.1002/anie.20062048

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