Preventing Protein Build Up on In-Vivo Devices and Biosensors

John Marugg, Ph.D.

Every day, medical technology advances enable the development of smaller devices and sensors that are able to continuously and instantly monitor a growing list of vital statistics and chemical compositions from inside the human body. These *in-vivo* devices have uses in surgical, diagnostic, and drug delivery applications across many medical and scientific practices.

Biosensors are critical components of diagnostic devices. They are tiny, integrated circuit chips that transmit readings from within the body to an external component that displays data for physicians and patients. Biosensors have many applications including important roles in continuous glucose monitors, sensors that monitor cell health, and magnetic sensors associated with microlabels and microfluidic cartridges, just to name a few.

A big obstacle facing biosensors that are implanted into the body is longevity. Protein adheres to foreign materials and neighboring tissues develop a rigid, fibrous, and protective layer. The body attacks all medical implants as invaders. This is a sign of a healthy immune system, but it also shortens the time of use of a biosensor as it can disrupt accurate signal transmissions of critical information.

Continuous glucose monitors (CGM) are one type of device that relies on accurate biosensor readings. The devices are ideal for patients who need to see a more accurate, real-time glucose reading throughout the day. CGMs track trends in blood sugar since readings are taken on a consistent basis instead of a few times a day, as is the case with traditional finger prick glucose monitors. CGMs enable the tracking of how blood glucose levels react to insulin, exercise, food, and other factors. The data can be useful in correcting insulin dosages and calibrating automatic insulin pumps, as well as monitoring for glucose spikes and drops. If a CGM broadcasts inaccurate readings, patients could lose track of blood sugar levels and encounter issues associated with hyperglycemia or hypoglycemia.

DSM [1] realized there was a need for technology that could lengthen the lives of biosensors on CGMs. The company's VitroStealth [2] coating is durable and non-fouling, which significantly reduces unwanted protein absorption and cellular adhesion on synthetic surfaces. These characteristics are expected to improve the design of accurate implanted medical devices and biosensors, allowing them to remain in the patient for a longer period of time, thus improving cost efficiency. Further testing indicates that the VitroStealth coating encourages permeability and does not inhibit the transport of molecules, such as glucose or oxygen, thereby not compromising the accuracy of the detected signal.

Other potential applications for VitroStealth coating include *in-vitro* diagnostics such as point-of-care capillaries, blood capillaries, microfluidic devices, microtiter plates, and glucose test strips, as well as ex-vivo diagnostics such as dialysis filters, blood filters, pre-filled syringes, and insulin pens/pumps.

Medical devices are meant to help patients, but certain precautions must be taken to address the body’s autoimmune responses and to avoid trauma to blood vessels and other tissues. DSM’s advanced coating technologies can be customized for specific device requirements based on the design needs of medical device manufacturers. Improving device performance can lead to better clinical outcomes and faster recovery times, a winning scenario, especially for the most important end user, the patient.

John Marugg, Ph.D is the business manager for coatings at DSM Biomedical where he is responsible for the medical coatings business. In his 18 years with the company, he has negotiated various multi-year development, technology license, and manufacturing deals with large pharmaceutical and biotech companies, as well as settled disputes and potential litigation matters with suppliers and customers with high-risk exposures. Dr. Marugg can be reached at john.marugg@dsm.com *[3].*

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