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Toyobo Develops FAD-GDH Enzyme, Produced by Aspergillus, for SMBG

Toyobo Co., Ltd. has successfully developed the next-generation enzyme FAD glucose dehydrogenase (FAD-GDH) and obtained multiple domestic and foreign patents. FAD-GDH, an enzyme produced by *aspergillus oryzae* (a mold widely used in food products and other applications), will be used in sensors for SMBG (Self Monitoring of Blood Glucose). Diabetics generally purchase these sensors over the counter to measure their glucose levels on their own on a daily basis. FAD-GDH is drawing more attention as a raw material for higher-performance SMBG sensors, and Toyobo plans to expand its enzyme sales based on this development.

1. Development Background

With the global increase in the number of diabetes patients, the SMBG market continues to grow at a rate of around 10% per year. As the market expands, the competition among glucose sensor manufacturers is becoming more intense. This competition is pushing manufacturers to make consistent efforts to meet patients' needs, which include minimizing the pain when blood samples are collected and shortening the measurement time.

As one of the key materials used in SMBG sensors, enzymes play an import role by reacting to the glucose contained in the blood. Toyobo has been supplying a few kinds of enzymes for SMBG, depending on the sensor applications which vary by customer. The Toyobo product PQQ glucose dehydrogenase (PQQ-GDH) has been one of the most widely used materials in the market. However, when it comes to usage in hospitals, PQQ-GDH is not the perfect enzyme to be employed in glucose sensors. In hospitals, patients who are receiving intravenous drip solutions that contain maltose might have their glucose levels checked at the same time. In such cases, the sensors which employ PQQ-GDH as a material enzyme could give inaccurate glucose readings because the enzyme reacts not only with the glucose in the blood but also with the maltose in the drip solution.

In an attempt to overcome this shortcoming, Toyobo has been advancing research and development on FAD-GDH as a next-generation enzyme which has almost no reaction to Maltose and therefore is superior to earlier products in terms of substrate specificity, maltose in this particular case.

2. Product Characteristics

Because of no reactivity to maltose, FAD-GDH offers a broader range of applications in blood glucose monitoring, both at home and in hospitals. In addition, the gene recombination

technology that Toyobo employs in developing FAD-GDH contributes to make the enzyme more heat-resistant, which is critical when used in glucose sensors. Also, the technology vests the enzyme with higher productivity, another advantage in terms of production cost.

3. Future Developments and Sales Plans

Having obtained multiple domestic and foreign patents on this recently developed FAD-GDH enzyme, Toyobo has set an initial sales target of ¥1.0 billion per year. Being in the business for more than forty years gives Toyobo a remarkable competitive edge. Now enjoying the number two global share in the market (Toyobo estimate), Toyobo continues advancing further product development and business expansion in the glucose-monitoring niche, which is poised for additional demand growth.

Explanation of Terms

Glucose dehydrogenase: Enzyme which prompts a reaction that extracts electrons from glucose.

FAD: Flavine-adenine dinucleotide – a coenzyme required for the glucose dehydrogenase enzyme reaction.

PQQ: Pyrrolo-quinoline quinine – another coenzyme required for the glucose dehydrogenase enzyme reaction.



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