New low-cost technique to detect rotavirus

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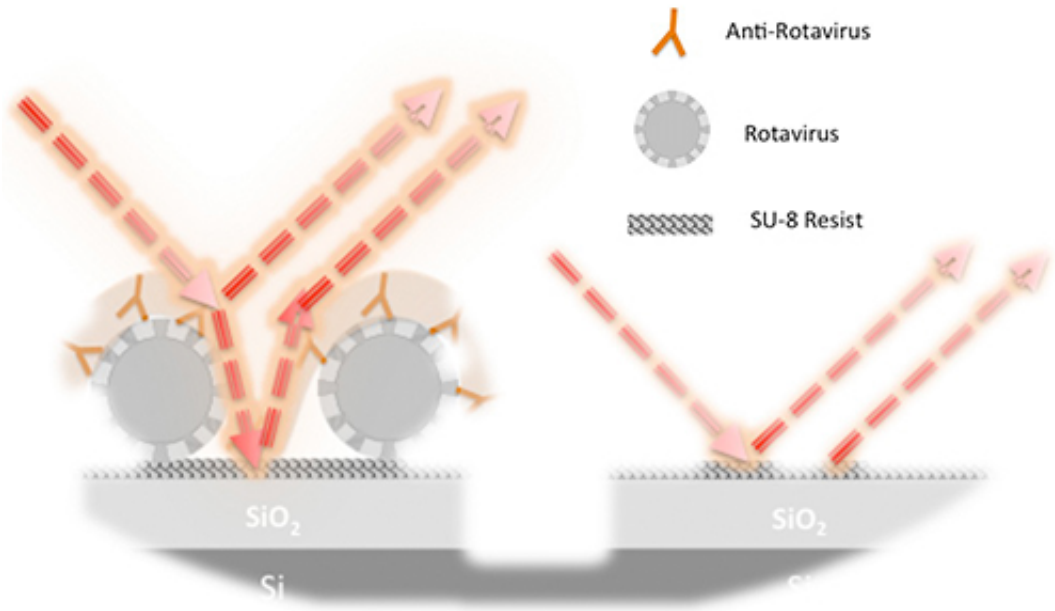

Figure: device designs. Credit: UPM

Researchers at the Universidad Politécnica de Madrid (UPM) have found a way to enhance detection capacity of small concentrations of rotavirus. All this thanks to a new way to assess the biosensing response applied to an interferometric device.

This system has been able to prove the detection of both the presence of

the virus and its antibody. This result provides an opportunity to directly discover the presence of that pathogen in the source (for example, in waters), but also this system can indirectly detect the antibody in blood plasma. According to these researchers, this new low-cost technique will allow other developing countries to reduce high infant mortality caused by the rotavirus.

Rotavirus is a sphere-shaped virus up to 75 nm in diameter that has the appearance of a wheel seen from an electron microscope. This similarity would explain its own name. Rotavirus is the most common cause of severe diarrhea in infants and children worldwide, commonly called gastroenteritis.

This viral gastroenteritis has an easy treatment which is basically to stay hydrated until the defenses overcome the disease. The immune system is boosted with every new infection in a way that symptoms tend to be relatively mild. In spite of the simplicity of treatment, nearly half million children die every year due to dehydration caused by diarrhea and vomiting, mainly in developing countries.

Rotavirus is stable under normal conditions and besides, the health measures that efficiently eliminate the bacteria and parasites do not affect this virus. The rotavirus diagnosis is usually made through an Enzyme-Linked ImmunoSorbent Assay. This type of diagnosis must be made by qualified staff in labs and require of supply of host enzymes.

Dr Miguel Holgado Bolaños, the main researcher of the Photonics and Biophotonics Optics lab at the Center for Biomedical Technology (CTB), along with his research team* of the Universidad Politécnica de Madrid focus their research on label-free optical biosensors that do not require the presence of enzymes that fix either the substance to be detected or the marker responsible for any detectable physical phenomenon. These biosensors consist of smooth or micro-nano textured

surfaces made with a polymer whose surface has been chemically treated to be similar to a bioreceptor.

Once the surface is coated by the bioreceptor, we have a biosensor which is just sensitive and selective to a determined type of biomolecule. Thus, when the substance to detect is recognized by a bioreceptor this substance produces a change on its optical response (transduction). This change is usually the movement of the maximum or minimum position of the interferometric pattern.

This study has proposed an easy interferometric system based on two Fabry Perot interferometers. One interferometer is used as a reference and the other one captures the substance or virus. Besides, different options of data are analyzed as an alternative to the traditional position shift of the endpoints. This system is easy to install in compact devices and can be used by non-expert users.

Researchers have proved that by using as transduction variable the variation of emitted overall intensity at intervals of specific wave length, the sensitivity and detection limit of these biosensors can be significantly improved. All this can reach truly competitive levels for such a simple design. This invention was patented.

By using the proposed device and reading procedure, we can detect the presence of anti-rotavirus in blood plasma or anti-rotavirus as water contaminant. Thanks to its low cost compared to other methods, this technique constitutes a promising way to reduce child mortality in developing countries.

Today, a part of these discoveries are being transferred to the industry by BIOD technology-based company. This company, along with other partners, are currently developing portable reading devices to detect pathogens and proteins in diverse application fields.

New low-cost technique to detect rotavirus

Researchers at UPM have discovered and patented a new measurement method that increases the capacity to detect biological substances found in optical biosensors.

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Provided by Universidad Politécnica de Madrid