SOS-E (Survivor Observation System - Ebola)
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Executive Summary

Problem: The Ebola Virus has known to persist within the survivor even for years after recovery. Several survivors experience the "Post Ebola Syndrome" which causes further deterioration of health with symptoms such as muscle deterioration, ocular problems, hypertension, diabetes, and mental health problems. It is unknown how long exactly the virus persists in the survivor. There is also a lack of medical staff in regions of the Ebola outbreak, making it difficult for survivors to receive adequate treatment.

Hypotheses:

1.) Detectable changes in the pH level of the blood stream may indicate an increase in EBOV GP fusion, if occurring, which in turn indicates EBOV fusing envelope membrane within endosomal membrane to cause infection.
2.) High fluctuations in the intraocular pressure of the eye may indicate the presence of EBOV in the aqueous humour.
3.) Detectable antibody-antigen linkages in the tear film of the eye indicates that the survivor is hosting the live, transmittable virus.

Brief Overview of the Solution:

Our product is a contact lens and wristband system that would monitor the health of Ebola survivors in a discreet, non-invasive way, and communicate changes in survivors' bodies.

We will be using the contact lens to track viral levels of Ebola using changes in intraocular pressure and antigen-antibody linkage. The contact lenses will be silicone hydrogel lenses. The lenses bear a Strain Gauge sensor which detects changes in IOP by measuring changes in the corneoscleral radius. The sensor bears a piezo-resistive gauge that produces a variable resistance based on the radius of the user's eye and translates the data into voltage using an appropriate Wheatstone Bridge to yield required IOP values (in millivolts). When Intraocular pressure rises beyond 40mm of Hg, the contact lenses communicate with its secondary component to release the gel containing the necessary antibody (Immunoglobulin-G) and notes the concentration of linkages.

The antibody will be equine antibody IgG, which is a low-cost alternative to monoclonal antibodies and can be used in low-income countries in Africa where the manufacturing of equine productions are already used to produce snake-bite antivenin. Once the serum containing the antibody is released into the tear film, if there is an interaction between the antibody and potential EBOV antigens, a sensor (possibly using the ELISA method) will pick up the reaction, or lack of one, and relay the boolean to the wristband. The communication of the contact lens with the wristband is carried out using Bluetooth.

The wristband will monitor the pH of the blood. This will be done by flashing electromagnetic waves through skin and tissue to be able to detect the light signature of oxygen molecules. This will indicate the amount of oxygen molecules bound to the haemoglobin, and check if it corresponds with the Bohr effect - if the binding of the oxygen molecules is tight to the haemoglobin, then the blood pH is normal. Otherwise, it will signal low pH, as at this level it picks up hydrogen ions faster. An acidic bloodstream can lend to faster glycoprotein fusion rates, which can help render the virus pH-independent and live. Both lens and wristband are designed to communicate using Bluetooth and display readings as colors on the wristband. Both, the lens and wristband will be solar powered, with solar cells situated inside the lens and solar panels on the outer surface of the wristband.

A red LED will be accompanied by a beeping sound, indicating a positive result from the Antigen-Antibody linkage. The yellow LED will be on if only the IOP is measured to be above normal levels. The blue LED will be on if only the wristband detects an acidic bloodstream. The green LED will be on if everything is normal. The wristband will be made of the same material as sports watches, and will be solar powered. The contact lenses will be reusable and powered using solar cells present on the lens. Patients will be strongly suggested to visit their nearest clinic if the red or yellow LED is on.

Our system will ultimately provide a cost-efficient observation system that is discreet at monitoring health and effective at communicating changes in survivors' bodies to survivors. Our system can be extended (for more accuracy) to clinical settings using our recommended tests as further parameters, and to monitoring general discrepancies in health.