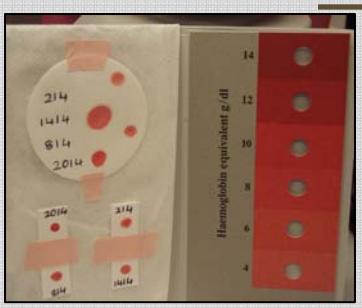
Hematocrit Tester

May 2007



"The properties of our intervention, listed below, will aim at creating an inexpensive, easy to use, and accessible test for anemia that can eventually allow health care professionals in Malawi to feel comfortable with the prescription of AZT as a first line treatment for HIV/AIDS."

-- BIOE 260 Design Team Documentation

Global Health Challenge

Malawi, one of the poorest countries in the world, has an HIV prevalence rate of 15%. Although anti-retroviral medications are free of charge, there are still difficulties in dispensing these drugs. Zidovudine (AZT) is a common drug used in AIDS patients to inhibit the reproduction of HIV inside the body. A common, yet serious side affect of AZT is anemia due to bone marrow suppression. Therefore, when a patient is taking AZT, the hematocrit level, the proportion of the blood that is red blood cells, needs to be monitored carefully. Modern lab equipment can perform this test automatically, but that technology is not feasible in the developing world. Consequently, AZT is underutilized for HIV infections in resource-poor settings.

Appropriate Solution

The BIOE 260 design team created a Hematocrit Point-of-Care Tester that is inexpensive, easy to operate, and provides rapid results. The design is based on a hemoglobin color scale. A few drops of blood are placed on a filter paper and then photographed beside a standard color scale. A MatLab program was used to automatically digitally match the color of the blood spot to the standard color scale. Various types of light and cameras were compared to find the best photographing conditions to provide accurate hematocrit results. The team's results proved that using a 1.3 megapixel camera provided the most accurate results. In all types of light, the results were significantly different from the standard hematocrit testing, indicating that further refinement of the technique is needed. Guidance was provided by Dr. Rebecca Richards-Kortum, Yvette Mirabal, Dr. Maria Oden, John Wright, Vivian Mack, Sunyoung Park, Dr. Richard Schwarz, Dr. Ellie Click, Dr. Ryan Phelps, IRB, and the Rice Bioengineering Department.

Current Status

Future investigation and research will focus on improving the accuracy of these results. Having an effective and rapid, but much less expensive, technique to measure hematocrit would greatly benefit HIV/AIDS patients and clinics in the developing world. Further work is planned on the camera and computer software to allow for accurate digital color readings could then pinpoint exact hemoglobin levels. Work is also being done to simplify the Matlab program so that it can be used in regular cell-phone cameras.

An initiative for the advancement of appropriate, high-value innovations in global health biotechnology

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