

## New AIDS Testing Possibility for Under Developed Countries

ISB scientists are developing a quick, easy-to-use, and inexpensive method for diagnosing and monitoring the progression of an HIV infection using only a simple microscope that interfaces with a personal computer. Because of its simplicity and affordability, the test is ideally suited for third-world settings, particularly in rural areas where AIDS is having the greatest impact and where access to clinical conditions are limited.

This test is based on the identification and capture of T cells, which are special types of cells that recognize the presence of foreign proteins on other cells and thus are critical in the maintenance of the body's immune system. Since the AIDS virus attacks the immune system, the absence of certain types of T cells plays a prominent role in being able to determine the progression of the HIV virus.

The ratio of two specific types of T cells, known as CD4 and CD8 cells, is the current standard used to monitor the progression of the HIV infection to AIDS. During the course of an infection, the number of CD8 cells remains constant, while the number of CD4 cells present in the blood fall precipitously. CD4/CD8 T cell ratios in patients already being treating with pharmacological agents for the virus can be an important indicator of whether their system has developed drug-resistant viral strains.

Currently, a measurement of the CD4/CD8 ratio requires the use of a [cell sorting machine](#), or cytometer which costs upwards of \$100,000. Furthermore, specialized technical personnel with a high degree of expertise are required to operate the cytometer. However, scientists at the ISB are developing a portable and easily affordable method for identifying the CD4/CD8 T cell ratio that requires just the use of an inexpensive fluorescent microscope, a computer, and the availability of a long, skinny microorganism called a phage.

The phage has several filaments extending from one end, which can be genetically engineered to bind with either CD4 and CD8 type T cells. The phage reagent and a fluorescent dye are added to the patient's blood sample. A specially coated slide is used to capture the two populations of cells to different areas of the slide, which are then viewed under the microscope and read using image analysis software. The fluorescence from the two areas determines the amount of CD4 and CD8 cells captured, thus giving an accurate indication of the CD4/CD8 cell ratio in the patient's blood sample.

Because of its simplicity, this test is ideally suited for under-developed settings. Phage are easily reproduced in large quantities, are durable, and do not require refrigeration, which makes them uniquely suited for use in undeveloped rural areas. The microscope,

based on a toy microscope, costs only about \$90, eliminating the need for costly repairs and highly skilled technicians.

The concepts behind this test could be easily applicable to the diagnosis and monitoring of other infectious diseases as well. The microscope will be adapted for use with a hand-held computer as well, making the test even more portable and useful in rural settings.