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Sustainable Water Treatment System

Prepared by Daniel Sidell

Some communities all over the world, including regions of Latin America, Africa, and Asia, do not have sufficient access to clean and sanitary water for daily use. They may not have any form of effective water treatment systems, or they may have systems that are effective, but do not have a sufficient output to reliably provide for the whole community. The mission of the Sustainable Water Treatment System project is to provide a cost-efficient water treatment system that can handle higher outputs of water. The SWTS team is partnering with the Christian engineering nonprofit organization, Water Mission, to create a design for a water treatment system that can be adapted for various locations and implemented in a rural community in the Intibuca region of Honduras. Successfully developing and implementing a system with these standards would benefit many communities, found in countries such as Honduras, Peru, and Tanzania to have sufficient access to clean and potable water for daily use. A key requirement of the project design is to develop processes that can utilize locally available materials and minimize electricity use. The project's deliverable is a complete design for a water treatment plant that Water Mission (NGO) can take and easily convert to a physical plant.

Gravity Fed Water System for Vanuatu

Prepared by Jamar A Gittens, Nathan J Hardman, Kurtis Platteel, & Ella Sobek

Approximately 30 villages in Espiritu Santo, Vanuatu have been identified to lack direct access to safe and potable water. This deficiency can have significant effects on the physical health and livelihood of the communities in Vanuatu while severely limiting their ability to grow socially and economically. Therefore, Friends in Action International has partnered with a local church in one of the villages to produce a suitable solution, specifically a gravity-fed water distribution system. The system--which has a zero-energy footprint--aims to transport safe, potable water to all the villages from a water source located at a higher altitude relative to these villages. The Gravity-Fed Water team has been working with Tim Johnston, the executive director of Friends in Action International, to design this system for the villages. It is the team's hope that the implementation of the system will also aid in improving the health and livelihood of the villagers while providing the opportunity for them to grow and achieve social and economic stability.

Village Water Ozonation System

Prepared by Brandon D Blackhurst & John M Khamis

In 2015, the United Nations established the goal to achieve universal and equitable access to safe and affordable drinking water for all by 2030. Since 2008, the Village Water Ozonation Systems team has aimed to provide communities with the cleanest water they can sustainably afford by designing and installing water treatment systems to meet local needs as part of the global effort to increase access to safe and affordable drinking water. Many people contract illnesses from consuming contaminated water. In response to this pressing health issue, increasing access to a point-of-use water treatment system capable of providing a clean drinking water source becomes paramount to enhancing the physical well-being of a community.

VWOS develops affordable, clean drinking water solutions by first recognizing that infrastructure and engagement are key aspects to transforming any community's drinking water scene.In previous years, VWOS successfully installed ozonation systems in multiple locations in Latin America. The team has the exciting the opportunity to continue work this year with the Trigo Community in Oaxaca, Mexico, where a VWOS unit was installed in 2016. In addition to working with ozonation systems, VWOS also evaluates and adapts other water treatment methods such as UV disinfection and biosand filtration to meet the needs of potential clients. The team considers past designs and investigates new water purifying technologies to formulate holistic solutions for each community based on local water quality and individual client needs.

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Sawyer Filter Test System

Prepared by Joseph C Franken

The Sawyer PointOne(TM) household water filters have been proven effective in removing microorganisms from drinking water and have been shown to reduce waterborne diseases in communities where the filters are implemented. This project is examining the long-term performance of the filters in a laboratory setting. Twenty-four filters are being run in parallel with continuous flow and periodic back-flushing. The flow and pressure though the filters is measured and the filters have been tested periodically for bacteria breakthough and all filters have shown that they continue to remove 100% of bacteria after 60,000 gallons each and meet EPA removal standards.

Sight and Sound Latch

Prepared by Brandin A Dyche, George H Noble, & Ben W Schott

The Sight and Sound Latch team is partnering with Sight and Sound Theater in Lancaster, Pennsylvania to develop a remote-operated latching system for the theater to use in its shows. Sight and Sound Theatre, a theater company which produces Biblical-based musical performances, uses massive set pieces for visual displays and stages for actors to perform on. Sometimes these need to be connected together to complete the display. Currently, Sight and Sound uses hand-operated latches to do so. Occasionally these latches are in hard-to-reach places or need to be operated at inopportune times. The goal of our team is to develop a latching mechanism which will eliminate the need for these hand-operated latches.

Our team began by looking at various latching mechanisms and ultimately decided to base our design on a common cabinet latch. The basic design involves having a pneumatic cylinder on one set piece which extends a rod with a sphere on the end towards a latching mechanism on the other set piece, which, holding onto the sphere, allows the pneumatic cylinder to pull the two set pieces together. For this use, we had to scale up this design of the latch mechanism from a common cabinet latch and modify the design significantly. Using a computer modelling program, we were able to model the mechanism parts and, using 3D printers, we were able to produce plastic prototypes of our latching mechanism. The plastic prototypes have allowed us to refine our design and detect problems that were unforeseeable in the computer model. Having optimized our design in plastic, we have begun to create a steel prototype of the latching mechanism. Additionally, we have been working on the design of the pneumatic circuits and getting the necessary components for that system.

Fire Protection for Developing Communities

Prepared by Lake K Bender & Victor J DeFrance

The Institute for Affordable Transportation (IAT) is a not-for-profit public charity “devoted to improving the lives of the world’s poor by providing simple, low-cost vehicles in order to facilitate community transformation.” The centerpiece of their work is the Basic Utility Vehicle or “BUV.” Recognizing that the communities they serve seldom have access to proper firefighting resources, IAT has partnered with Messiah College, through the Collaboratory, on developing a way to enable the BUV with firefighting capability. The proposed solution is a “firefighting insert” which can be easily placed into the bed of the BUV. This insert is a relatively simple design which minimizes maintenance requirements and initial cost while being easy to use and store. The current design utilizes a wooden frame (called the skid) which supports water storage tanks, houses the necessary plumbing, and holds a small pump, engine, and hoses. The initial design is now complete as is acquisition of all major components. Once assembled, testing will be conducted which will, in turn, inform future refinement of the design.

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Bringing Sustainable Mobility to Persons Living with Disability in Rural West Africa

Prepared by Alexander D Mantsevich & Helen R Wiley

The Sustainable Mobility Project empowers people living with a disability in the developing world to fully participate in family and community life and makes possible the pursuit of educational and work opportunities. The Collaboratory 3-wheeled off-road wheelchair design is well-regarded among mobility practitioners. Our design has already transformed the lives of dozens of clients through partnership with the Center for the Advancement of the Handicapped (CAH) in rural Burkina Faso, West Africa.

Now to reach more people in new locations with more partners, the Sustainable Mobility team is reducing manufacturing time and cost, developing supply chains to bring parts and materials to build sites, and developing a turn-key business model that puts local fabricators to work building tricycles wherever they are needed. With our client, SIM Burkina Faso, we are establishing a mobility manufacturing center in Fada, Burkina Faso. We are working towards the formation of a new independent entity to manage supply chains and to facilitate the formation of additional small businesses that will produce our design in the developing world. In the past year, the Sustainable Mobility team has made significant progress towards preparing professional-quality documentation for the fabrication and assembly of our electric tricycle, which will allow us to pursue the formation of a business model and supply chains.

Wheels for the World Wheelchair Project

Prepared by Emily D'Amico

The Wheels for the World Team strives to create a practical mobility option for individuals in developing nations who are unable to move on their own. The device will allow the same mobility as a wheelchair while remaining affordable and practical. This project is working with Wheels for the World (an outreach of Joni and Friends) to create a design which will be capable of being mass-produced in the United States, shipped anywhere in the world in a box, and then assembled in the country of use. A major requirement for the design is that it be fully adjustable to fit different users and be fully collapsible for easy storage and transportation.

The team has developed a design for this device which is similar to a tricycle; however, in this design the third wheel is in the back. This design uses plates and bolts to hold together telescoping square tubing, which acts as the backbone of the design with the seat, wheels, and a footrest attached to this tubing. A shock absorber system was also included to reduce impacts from road variations.

The team has constructed a prototype which is being used to make final modifications to the design. A manufacturing manual and assembly manual, which are to be provided with the design, have been completed.

The next step in the process that the Wheels for the World organization will begin constructing additional prototypes in their facilities. They will then determine additional adjustments to improve manufacturability to be incorporated into the final design.

Block Press

Prepared by Joshua W Charney & Kathryn J Rose

The Block Press project is developing a manual block press to produce compressed earth blocks used for building residential housing off the east coast of Nicaragua. The project will design a simple manual press requiring 1-2 people to operate. A SolidWorks model was designed, analyzed and used to fabricate a block press that was tested in Nicaragua in June, 2017. The prototype was brought back to Messiah College and modifications were made. A new Block Press will be permanently taken down to Nicaragua before May, 2018.

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Pico-Hydro Electric Power Generation for the Developing World

Prepared by Ben J. Morral & Andrew S Reedy

The goal of the Pico-hydro project is to provide Engineering Ministries International (EMI) with an in-stream, tested hydroelectric generator capable of generating between 300-800W of electric power. The driving motivation for the project is to help meet the existing electrical need of people in developing communities around the world. In the academic year 2016-2017, testing was conducted on three prototypes provided by EMI in order to determine their feasibilities. These prototypes were deemed insufficient to produce the required power output at low stream velocities. As a result, the team is no longer considering them and, in the summer of 2017, the pico-hydro team decided to pursue an undershot water wheel design that is being designed, manufactured, and tested during the academic year 2017-2018. Currently, the team is working on manufacturing a testing rig and waterwheel to be tested in the spring of 2018. In addition, the team has chosen a generator to use and is currently designing a housing system.

Mechanized Percussion Well Drilling

Prepared by Nathan A Henry & Cole D Hiduk

The Mechanized Percussion Well Drilling Project seeks to design a simple mechanized well drilling system to be used by our client for drilling shallow water wells in Burkina Faso, Africa. The goal of this project is to enhance the drilling capabilities of the local people by providing drilling equipment superior to the technology currently available and familiar to them. This system will provide the people with the ability to drill wells in places where their current technology is insufficient. Our mechanized percussion system will be able to efficiently drill through hard soil layers which are currently preventing wells from being drilled where they are needed.

One of the areas the project has focused on throughout this year was increasing the life of the capstan, a critical piece of the drilling rig which became severely worn during in-country testing in the summer of 2017. The team also made various safety improvements to the system, conducted a cost analysis of the drilling process, and continued general testing of the drilling rig. The existing casing die was redesigned and tested in the spring to improve the casing belling process.

Landmine Neutralization

Prepared by Justin L Barber, Michael A Ritenour, & Rachel D Siepelinga

This poster will be about the Landmine Neutralization Project within the Messiah College Collaboratory. The project's goal is to create a safer way to destroy landmines, IEDs, and other unexploded ordnance (UXO). To accomplish this, the project team is working with the Halo Trust, the world's largest demining NGO. The most common method of destroying UXO is to use a small explosive charge to detonate the mines in place. However, this method is dangerous and explosives are expensive and highly regulated in many areas where Halo is working. Instead of the use of secondary explosives, the team believes that with the right characteristics, mines can be burned and rendered inert without detonation. To serve as the source of flame, the team is using a hybrid-thermal lance (HTL) which is based upon a hybrid rocket motor. Over Easter break, Dr. Don Pratt, the team's project manager, travelled to Afghanistan to test the team's initial prototype. With the successful test results, proof of concept and field testing have been established. Moving forward, the team hopes to make modifications to the HTL in order to better serve Halo's needs.

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Affordable Sanitation

Prepared by Eric J Denlinger, Cheylee L Smith, & Isaac L Underhill

The Affordable Sanitation Project is working in partnership with World Vision to design pit latrine liners for the Upper East Region of Ghana. Pit latrines consist of holes dug in the ground covered by a protective slab and superstructure. Many families in the Upper East Region do not have access to affordable sanitation technologies like the pit latrine, and those who do have access are deterred from using them because latrines in this region are prone to collapse during the rainy season when the ground becomes completely saturated and the stability of the pit walls is jeopardized. Because of the lack of facilities and the collapse of existing latrines, people in Ghana resort to open defecation which can lead to the spread of diseases. World Vision has tasked the Affordable Sanitation project with designing a latrine liner that will stabilize the walls of the pit while being affordable to communities in Ghana. Over the past year, the team has finalized two designs for liners - the ferrocement and rebar-reinforced liners - and travelled to Ghana to implement these liner designs. Through the trip, the team has learned of many strengths and weaknesses of each liner and is now modifying and finalizing the designs implemented in Ghana. The team is also developing a survey to monitor the implemented liners with the hopes that they will provide a lasting, affordable solution to the issue of pit latrine collapse and open defecation in the Upper East Region of Ghana.

Aeroponics

Prepared by Lexi M Bane & Troy M Harris, Jr.

All people should have affordable access to proper nutrition. The Aeroponics team is currently working with two missionary groups: Open Door Development (ODD) and Sheltering Wings (SW). For ODD, the team is dedicated to developing a sustainable and cost efficient agriculture system that allows the community to grow tomatoes in the dry season. The goal for SW is to troubleshoot and redesign the currently installed aquaponics system. As a result, the team hopes to assist SW in producing a successful harvest.

Making Clean Water in Developing Countries Sustainable

Prepared by Matthew Eshleman, Robert D MacBride, & Owen P McCullum

In 2010, the United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realization of all human rights. NGO's throughout the world attempt to address this need by installing wells and pumps to provide access to clean water. The problem our project addresses is the sustainability of the water access points provided by our partner NGO Water4 in the smallest and poorest communities it serves in Ghana. Water4's approach is to hire community members for the construction and upkeep of wells and pumps. By charging fees for water usage, Water4 hope to lay the foundation for sustained access to clean water for the community and provide economic growth for those responsible for the wells. This will provide not only the clean water needed by each community, but also a dependable source of work for community members. The goal of our project, PumpMinder, is to enable Water4 to meter hand pump use in order to collect maintenance fees used to maintain pump equipment and ensure the long-term presence of water assets. Water4 does all the on-the-ground social work and installation in rural communities in Ghana. Our team has designed the tool necessary to monitor the fees charged by the local community member employed by Water4. This year we have focused on delivery of units for a pilot program in south west Ghana and on refining the functionality and ease of use of the system.

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Remote Monitoring of Water Pump Health in Developing Countries

Prepared by Roque O Dietrich, Nicholas H Sum, & Paul T Zwart

Millions of communities in developing countries rely on hand pumps installed by various non-governmental organizations (NGOs). Studies have shown that these pumps are often broken with significant delays before maintenance people arrive. The Intelligent Water Project (IWP) has developed an automated sensor to report failure of one of these hand pumps and provide data necessary for implementation of a proactive maintenance policy. Currently, there are 13 IWP systems installed in Ghana, Africa, the most recent installed by a site team in Summer 2017. Team efforts this past year have been in response to results obtained from the field. Testing and design changes to the battery and the accelerometer will extend system life. In an effort to gather information from fielded systems for remote diagnostics, system firmware has been modified and a new diagnostic board has been fabricated to collect and store performance data.

Flight Tracking and Messaging Systems (FTMS): Developments and Future Direction

Prepared by Jonathan J Carter & Thomas H Shifflett

Outside radar range, small planes flying in remote locations must be tracked by other means. Emergency relief, humanitarian development and missionary organizations need to follow such flights, for safety and management. The Automatic Flight Following System (AFFS) owned by JAARS has been safety tested and used extensively for this purpose, but has been replaced in many cases by new options. Thus, the Flight Tracking and Messaging Systems (FTMS) team has been working with stakeholder Cary Cupka on redesigning AFFS for more advanced technology modes to increase its value in the field. This includes replacing the existing Single Board Computer (SBC) in AFFS 1.0 with the UDOO QUAD board for prototyping, chosen to facilitate a smooth transition ultimately to the Qseven 928 industrial grade module. The team also created a redesigned space-saving pilot display board prototype and fully verified its functionality. To facilitate testing, the FTMS team bypassed the HF modem of AFFS 1.0 via an RS-232 serial communication link, successfully transmitting GPS and flight critical information from the pilot module to a ground-based monitor running AFFSWin (AFFS software for Windows). By research and testing, the team determined necessary power requirements for an Aircraft Control Unit (ACU) power supply.

Design of a Solar PV Power Plant for the Living Love Ministries Children's Home in Ol Kalou, Kenya

Prepared by Steven T Carpenter, Matt C Laven, & Trey B Witmer

A lack of reliable electricity can prove a significant hindrance to any organization. Living Love Ministries (LLM), in Ol Kalou, Kenya, has experienced just that. While trying to minister to the needs of thirty orphans living at their Children's Home, and with a hope to expand the number of children taken care of in the next few years, LLM has been impeded by the unreliable Kenyan electric grid, which can go off unexpectedly for days to weeks at a time. Without a consistent source of refrigeration for their food supply, light in the evenings for the children to complete their homework, or the power necessary for the staff to use their essential laptops and computers, LLM has been looking for a new solution. As part of that solution, the Solar PV team of the Collaboratory has designed a 3.8 kW, off-grid solar panel system, and plans to install this during a three week site team trip at the end of May. The details of this design and site team plan will be presented in this presentation.

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Energy Monitoring and Management System: Promoting Energy Availability in Developing Countries

Prepared by Trieu H Luu, Justin J Martin, & Joseph Wambach

The Energy Monitoring and Management System facilitates access to electric power in regions with limited energy by increasing energy conservation and education. The solution consists of a meter which allocates a configurable daily energy limit per facility, and a display that provides practical information to the user including reporting how much energy they have used and how much they have left before their power is automatically cut off until the next day.

The current version of the system has successfully been installed in multiple facilities in Burkina Faso and Zimbabwe. Currently, the team is working towards completing a redesign of the system's power sense module to increase performance to meet client specifications. Also, we are working to refine the manufacuturing process for the User Interface Box by using a CNC machine to increase consistency of product and lower manufacturing time.

Nicaragua Bridge

Prepared by Seth M Brewster, Daniel J Mewha, & Eric M Weaver

The Nicaragua Bridge Project is partnering with Friends in Action to aid in the development of a new, mainland Nicaragua community for the Rama Cay people. A channel on the new property is being cleared to create an inlet for the community shrimping canoes. This project has designed a new bridge to cross this channel that will unify the community by creating ease of access between the church, health clinic, and boat dock on one side and the baseball field and housing on the other side.

Oakwood Hills Pedestrian Access

Prepared by Treavor J Moore & Justin Witters

The Oakwood Hills Pedestrian Access project seeks to provide an efficient and safe way for pedestrians to travel between Messiah College and the future Oakwood Hills Development. This project serves the commercial developer, Rider Musser Development, LLC, and the Messiah College Office of Opertions. This project allows students to design and construct solutions to the issue that will affect Messiah College and the surrounding community.

Implementing a system for 3D printing prosthetics and orthotics

Prepared by Thomas C Pond & Jared R Rider

The Rapid Orthotics for CURE Kenya (ROCK) team has been working in conjunction with CURE International and their hospital in Kijabe, Kenya to implement a system to 3D print prosthetic devices. In the summer of 2017, our team successfully delivered a 3D printing system to Kenya and a conducted a two week training for hospital staff. This year, we needed to make the software associated with the system more robust. We have therefore shifted the software used in the system from a $10,000 program (Omega WillowWood) to two free programs (Blender and MeshMixer) in order to reduce cost and provide better technical support. Prosthetic sockets and two-piece AFOs can now be printed just using Blender and Meshmixer. In addition, we have created a computational model of the 3D printed protheses, so that loading consequences of design changes can be modeled prior to manufacturing. The new software and computational model have made our system much more efficient in both costs and time.

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Integrating Detection and Activation in a Myoelectric Hand Prosthesis

Prepared by Erin E Cressman & Ryan C Yoder

Children are among the primary patients needing a prosthetic device as over 2,250 children per year are born with a residual limb. However, many children do not have access to the health insurance benefits that would allow them to afford an appropriate device before the age of 14, as a realistic-looking, functioning myoelectric prosthetic costs more than $20,000. Our local partner, Eric Shoemaker of Ability Prosthetics and Orthotics, has a 9 year old patient who would particularly benefit from a myoelectric prosthetic device, an externally powered artificial limb that is controlled by the electrical signals generated by one's own muscles to give the user more freedom and movement than a mechanical prosthesis. Our team will use biomedical, electrical, and mechanical engineering principles to design a low-cost (estimated $1000) muscle-activated prosthetic utilizing 3-D printing technology to print the hand, forearm and socket customized for the anatomy of our patient. After reading electrical signals from the muscles, sensors relay vary patterns and intensities of muscle contractions to a microprocessor that then converts the data into commands for electric motors to move finger joints to set grip patterns and orientations, mimicing the anatomy and motion of the human hand. We hope through this project to make the best possible treatment available to our client and other patients in need of a prosthetic device.

Cunningham Clubfoot Brace

Prepared by Rebekah L Forshey, Dylan D Gillisse, Faith N Kerlen, & Katherine EG Prelog

Clubfoot is a congenital disorder that describes several foot abnormalities characterized by a twisted foot. The current method for correction involves several casts and a boots-and-bar brace. This method nominally takes 5 years and has issues with compliance, comfort, and social stigma. The Cunningham brace reduces treatment time to 2-3 years. It can be concealed, reducing the social stigma, and improves the child's mobility while encouraging muscle growth and development throughout treatment. The Collaboratory Cunningham Clubfoot Brace project seeks to increase accessibility to the brace. Currently, the brace can only be made by the designer Mr. Jerald Cunningham and those with training. They are taught to mold the material into the correct shape and finish it for comfort. This method has several issues with reproducibility as well as cost. To improve accessibility, lower costs and tighter production tolerances, we are exploring new molding techniques, fasteners and 3-D printing using materials that are flexible yet stiff enough to allow correction. To validate the brace, we are measuring the forces created and applied by the brace. Mr. Cunningham knows what the tolerances are based on feel and experience. Quantifying this "feeling" will allow validation of the printing and the biomechanics with empirical data. We created an apparatus that measures the acting forces as the brace is manipulated to validate the printed and molded designs. More research is being conducted on effectively measuring the biomechanical aspects of the brace.

Prosthetic Knee for Burkina Faso

Prepared by Bryson B Boettger, Vaughn W Chambers, Shane D Curry, & Jenna K Kelsey

In Mahadaga, Burkina Faso, the Centre for the Advancement of the Handicapped was once able to create full prosthetic legs. The Centre accepted prosthetic knees from a donor and made the rest of the leg with their own resources; however, they have exhausted the supply of donated knees and are no longer able to assist leg amputees. Our group aims to design a simpler prosthetic knee that can be manufactured in Mahadaga, and is compatible with the rest of the leg that the Centre has been using.

This poster will recap the testing that we did in November with a voluteer amputee using our design prototype. From this test we were able to collect large amounts of data that have been analyzed in a few different ways. We were able to collect and analyze acceleration from 8 different accelerometers placed on the volenteer as well as collect and analyze slow motion video of our subject walking. This poster will also touch on the new "pyramidal attachement" that we have been designing and how that process is coming along.

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Development of a Low-Cost Photon Correlation System for Measuring HIV-1 Viral Load

Prepared by Caleb H Bornman, Nathan Z Chan, & Lily I Gaudreau

Access to HIV diagnostics and viral load monitoring in developing nations with endemic HIV-1 infections, such as many sub-Saharan African countries is limited. Because treatment must be adjusted depending on viral load, a low-cost diagnostic that can quantitatively identify how many viral copies a patient carries would improve treatment outcome. Partnered with the Macha Research Center in Zambia, Diagnostics for Viral Diseases aims to design such a diagnostic device by combining recombinant protein engineering with an optics-based particle-sizing technique, dynamic light scattering (DLS). We have developed a custom-built DLS system using commercially available hardware, which has been characterized using polystyrene microspheres. Essential to reducing the cost of the device is the development of low-cost, single-photon-sensitive detectors. The fiber optic output from the DLS system is fed through the detector circuitry to produce a dgital signal able to be read by an FPGA, which stores the data and transmits it to a computer. The signal from these detectors must be processed by an application written for the Java Virtual Environment running on a computer. This software is outfitted with a custom driver to enable the extremely high serial baud rate used by the FPGA, and computes an autocorrelation function, a key element in deducing viral load using this technique. This system could potentially enable DVD to size probe-virus complexes and thus determine viral load. Overall equipping clinicians with the information they need, in a timely and inexpensive manner, to make informed treatment decisions for patients with HIV.

Capture of HIV-1 envelope protein gp120 using immobilized heparin

Prepared by Alicia A Decker

The HIV virus is endemic in sub-Saharan Africa with recent WHO reports estimating that over 88% of the world's HIV-positive children reside in the area. While viral load monitoring is essential for successful treatment, industry-standard nucleic acid assays are often costly or inaccessible to many regions. An important first step in our viral load testing is isolation and concentration of viruses from whole blood. We have opted to explore a viral isolation method using immobilized heparin-agarose microspheres to capture the virus and remove it from the blood sample. We are currently optimizing the protocol to achieve capture of HIV-1 envelope protein gp120 on immobilized heparin using an immunofluorescent staining protocol. To do this, we are testing heparin-agarose capture of isolated gp120 and its insect variant using gp120 specific primary antibodies followed by a fluoresecent secondary antibody. We are using different primary antibodies to target the gp120 in its natural state along with its bound state to maximize our ability to tag a gp120-heparin complex.