

## STOPPING THE SPREAD OF DISEASE

Bryan Grenfell, Alumni Professor of Biology at Penn State, is among a team of scientists to be awarded a \$10 million grant from the Bill and Melinda Gates Foundation for the study of vaccines to help stop the spread of global infectious disease outbreaks.

The grant will help to fund the Vaccine Modeling Initiative, a collaborative research partnership headquartered at the University of Pittsburgh. The grant's lead investigator is Donald S. Burke, dean of the University of Pittsburgh's Graduate School of Public Health; Grenfell will be co-principal investigator on the grant along with Neil Ferguson, of Imperial College, London.

The project aims to amass information on the incidence and prevalence of infectious diseases, and to identify patterns of spread, particularly in developing countries, in an attempt to isolate new and more effective vaccines and to improve delivery methods.

Says Donald Burke, "Infectious diseases create an enormous burden on the world's population, from both a human suffering and an economic development perspective. One of the major challenges we face in stopping infectious disease outbreaks is predicting how control strategies, such as vaccines, will work. By using computer models to conduct 'epidemiology in silicon' we will be able to test the impact of new candidate vaccine technologies and select the most effective strategies."

The initial phase of the research at Penn State, adds Grenfell, will be concerned with the control of measles in Niger, specifically the development of a new measles vaccine. "The project will then consider a variety of other infections," he explains, including dengue fever, influenza, whooping cough (pertussis), poliomyelitis, malaria and tuberculosis, which are responsible for considerable morbidity and mortality worldwide.

"We plan to explore methods for deploying existing and novel vaccines that maximize the abilities of the vaccines to reduce the spread of infections and diseases," says Grenfell, who describes himself as "a population biologist, working at the interface between theoretical models and empirical data."

The use of sophisticated computer-modeling techniques will enable investigators to simulate infectious disease outbreaks and determine the likelihood of disease spread-

Several years ago, Penn State graduate student **Nita Bharti** found herself in just the right place at the right time.

"I was an anthropology grad student," explains Bharti. "But I was primarily interested in studying human behavior and transmitted diseases. The Center for Infectious Disease Dynamics (CIDD) at Penn State was brand new and full of excellent disease researchers. I wanted to be a part of it."

Bharti's interests overlapped with Bryan Grenfell's research, so she transferred to the biology department and is currently in her fourth year with Grenfell's lab.

"I wanted my work to have elements of both theory and application," notes Bharti. "The Vaccine Modeling Initiative has given me opportunities to do some theoretical work as well as some things that may have public health implications."

Bharti recently attended a professional meeting in Ethiopia and calls Grenfell's research group a "very productive participant" in a global network of infectious disease researchers. "This work has been a fundamental part of my Penn State education," she says emphatically. "It has given me some amazing opportunities and I have met wonderful colleagues and collaborators."



James Collins

ing based on geographical specifics such as population size and density and the extent of existing herd immunity. The investigators also plan to use these models to evaluate the effectiveness of existing vaccination protocols, and to develop more effective population targeting and vaccine delivery strategies, including the use of transdermal delivery systems (i.e., passive absorption via the skin, eliminating the need for conventional needles) and vaccines that do not require refrigeration.

Notes Grenfell, "A special feature of the grant is that we'll be allowing for the impact of the logistics of vaccine delivery (in particular regional and national supply chains) in order to establish how vaccines with different characteristics can be delivered

optimally and how they might perform in different contexts."

"Many infectious diseases are preventable by simple vaccination, yet children in poor countries die of these diseases because they lack access to vaccines," Burke adds. "By providing computer models to aid in decision-making, we will support efforts by the Gates Foundation and other partners to make vaccines safer and easier to administer, and ultimately protect more children and adults against deadly infectious diseases."

To learn more about the CIDD, see: [www.cidd.psu.edu](http://www.cidd.psu.edu)