

**McLaughlin-Rotman Centre**  
FOR GLOBAL HEALTH

**Cultivating Health Biotechnology  
Innovation in Developing Countries**

*Halla Thorsteinsdóttir*

*Geneva Health Forum:  
Towards Global Access to Health*

19-21 April 2010

# We have health problems that necessitate solutions



- In 2008 the estimated cases of malaria was 243 millions (85% in Africa)
- Africa is home to two-thirds of the world's people living with HIV/AIDS
- 80% of chronic disease deaths occur in low-and middle-income countries
- Low- and middle-income countries account for almost 90% of the world's deaths due to injury and trauma

WHO statistics

# Need to Invest in New Knowledge to Achieve the Millennium Development Goals

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Calestous Juma: *It is "inconceivable" that the **MDGs** can be **achieved** as planned by 2015, or even that **significant gains** can be made in meeting **health and environmental concerns**, without a focused **policy for science, technology and innovation***

UN Millennium Project: Task Force on Science, Technology and Innovation, 2005

To address global health problems we have to rely on all available tools

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Use public health measures to deliver existing solutions better

Distribution of **bed nets**

Distribution of existing **anti-malarial drugs**



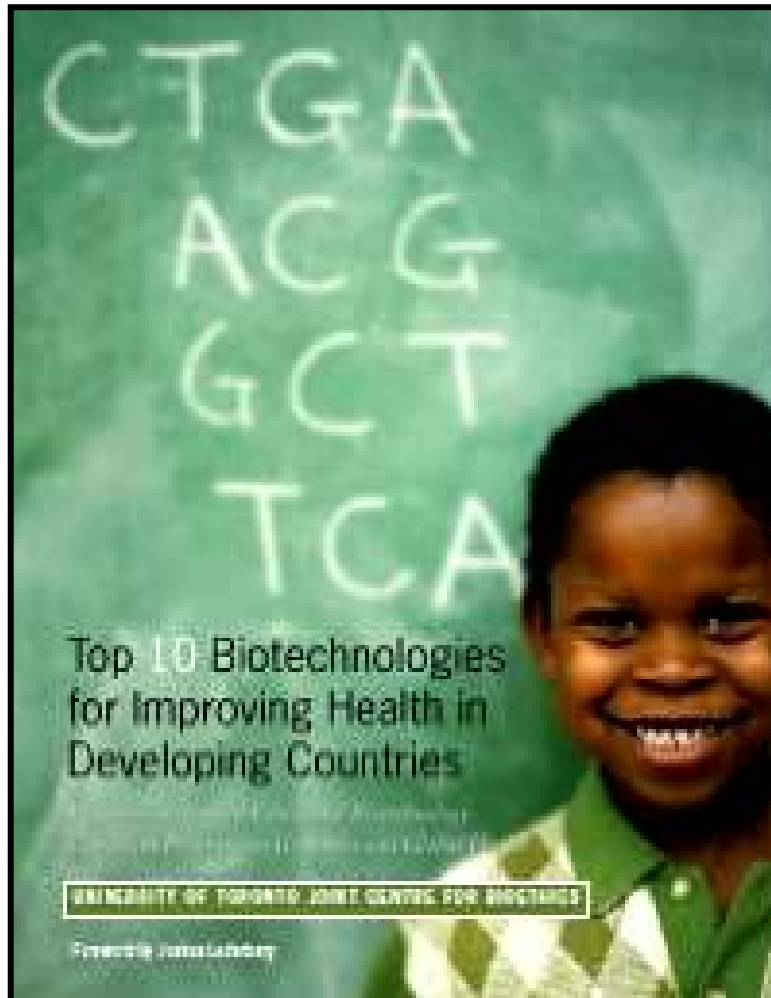
Develop science and technology intensive solutions to address disease burden in developing countries

**New drug** discovery to counter resistance

Creation of new, effective **vaccines**

Control **mosquitoes**





*commentary*

## Top ten biotechnologies for improving health in developing countries

Abdallah S. Daar<sup>1,2</sup>, Halla Thorsteinsdóttir<sup>1,2</sup>, Douglas K. Martin<sup>2-4</sup>, Alyna C. Smith<sup>1,2</sup>, Shauna Nast<sup>1,2</sup> & Peter A. Singer<sup>2,5</sup>

Most research into genomics and other related biotechnologies is concerned with the priorities of industrialized nations, and just a limited number of projects have shown that these technologies could help improve health in developing countries. To encourage the successful application of biotechnology to global health, we carried out a study in which we asked an international group of eminent scientists with expertise in global health issues to identify the top ten biotechnologies for improving health in developing countries. The results offer concrete guidance to those in a position to influence the direction of research and development, and challenge common assumptions about the relevance and affordability of biotechnology for developing countries.

*nature genetics* • volume 32 • october 2010

1. Molecular diagnostics
2. Recombinant vaccines
3. Drug & vaccine delivery systems
4. Bioremediation
5. Sequencing pathogen genomes
6. Female-controlled STI protection
7. Bioinformatics
8. Enriched GM crops
9. Recombinant drugs
10. Combinatorial chemistry

# 1. Molecular Diagnostics

- Diagnostics that detect the presence of pathogen-associated molecules, such as DNA, antibodies and antigens
- Accurate and rapid; can be modified for low-resource settings
- Examples include PCR tests and dipsticks



EXAMPLE: US and Nicaraguan researchers developed a PCR test that simultaneously tests for all 3 types of Leishmaniasis

## 2. Recombinant Vaccines



**EXAMPLE:** A malaria subunit vaccine protected 71% of Gambian adults against natural infection for the first 9 weeks in a test study

- A broad category of vaccines made by the manipulation of DNA
- Safer than traditional vaccines, and can be cheaply produced
- Examples include subunit vaccines, edible vaccines and viral vector vaccines

### 3. Vaccine & Drug Delivery Systems

- Safe and inexpensive ways of introducing vaccines and drugs into the body
- Examples include powdered vaccines, plant made vaccines, inhalers and controlled-release technology

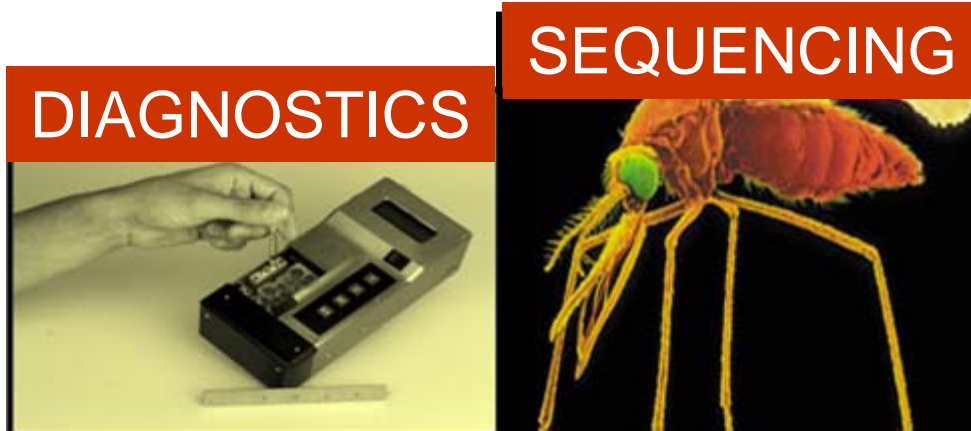


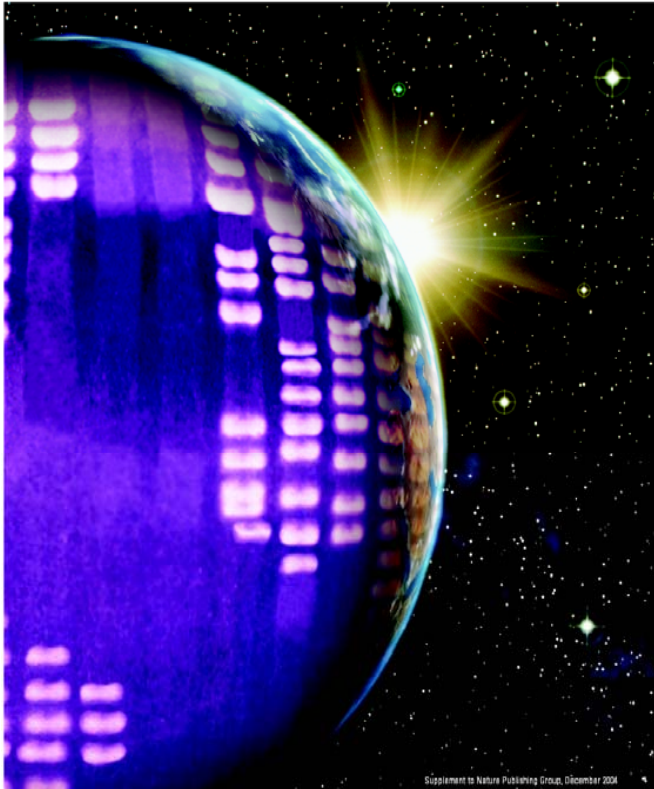
**EXAMPLE:** Powdered vaccines would eliminate the need for refrigeration and injections, making vaccination cheaper and safer



Not just in personalised genomics to address genetic/chronic diseases but a wide spectrum of applications

- Using the same technology as the Human Genome Project, researchers can sequence the genome of microorganisms that infect humans
- These data can be used to discover new diagnostics, vaccines and drugs





*Study shows significant  
developing countries' capacity  
in health biotechnology*

**Countries:** Brazil, China,  
Cuba, Egypt, India, and  
South Africa

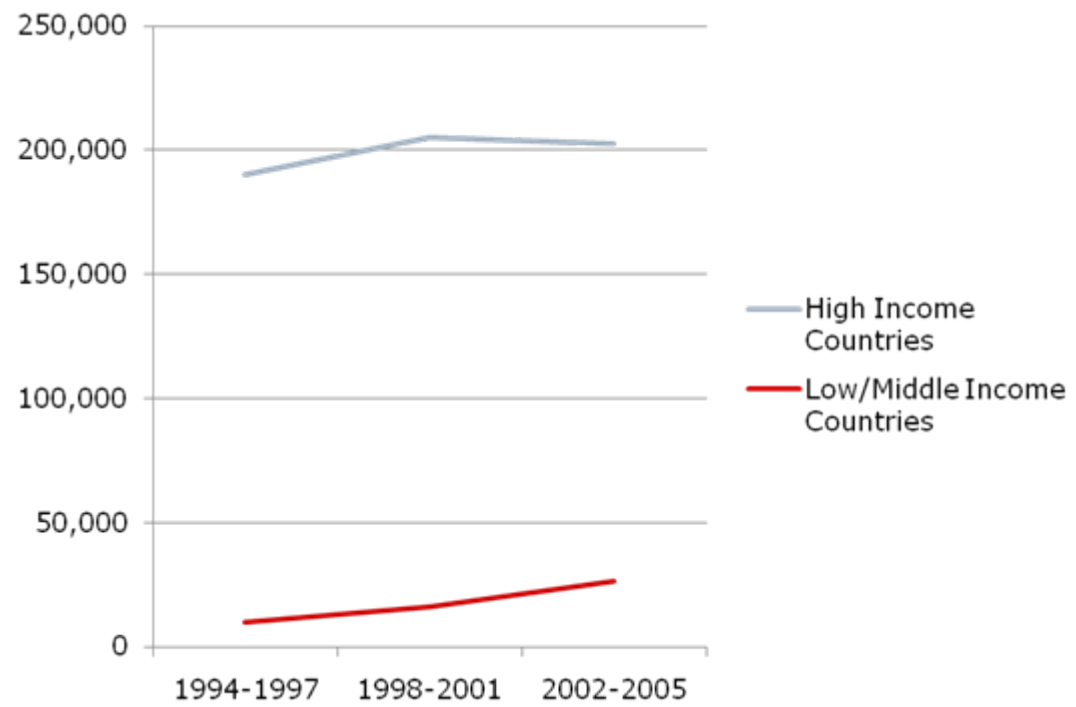
Healthcare Biotechnology Innovation  
in Developing Countries

nature  
biotechnology

nature publishing group

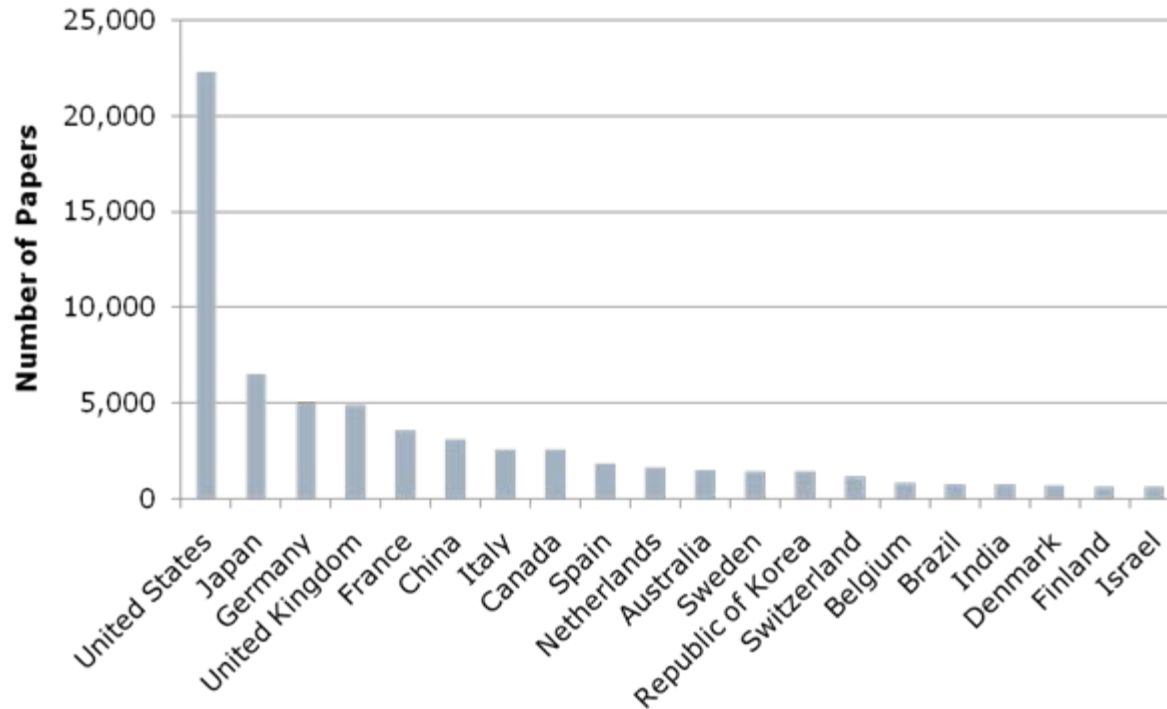


# *Increased Developing Countries' Contributions but Large Knowledge Gap*



Number of Papers in Health Biotechnology  
in SCI Expanded 1993-2005

# Top 20 publishers in health biotech



Number of Health Biotechnology Papers in  
SCI Expanded by Countries, 2004

## Cuba and Meningitis B Vaccine

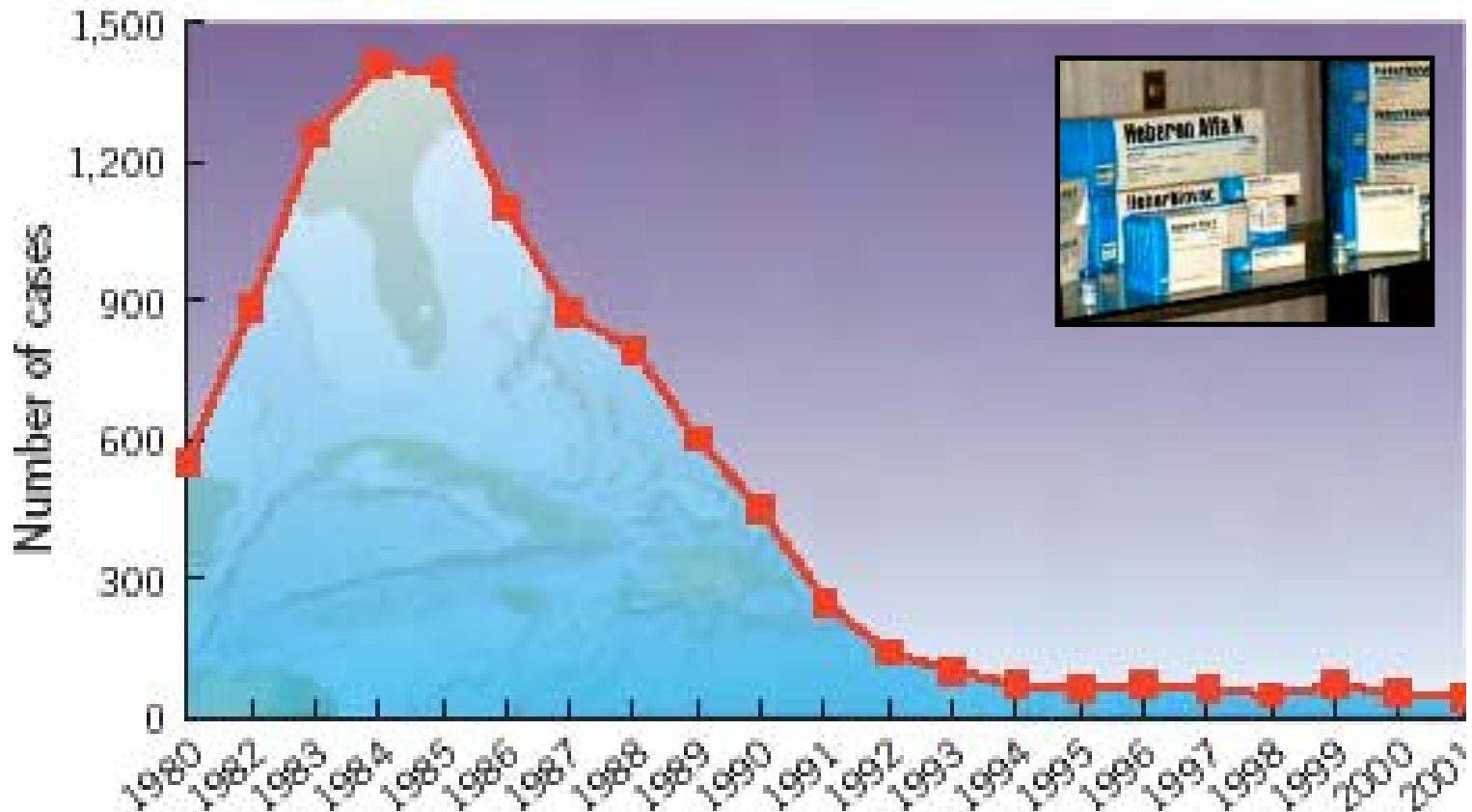


Figure 2 Incidence of meningitis in Cuba.

## India and Hepatitis B Vaccine



### Shanta Biotechnics (Hyderabad)

- Hepatitis B vaccine: **\$15 → 50¢**
- Supplies 40% of UNICEF's Hepatitis B vaccines

India's health biotech sector at a crossroads

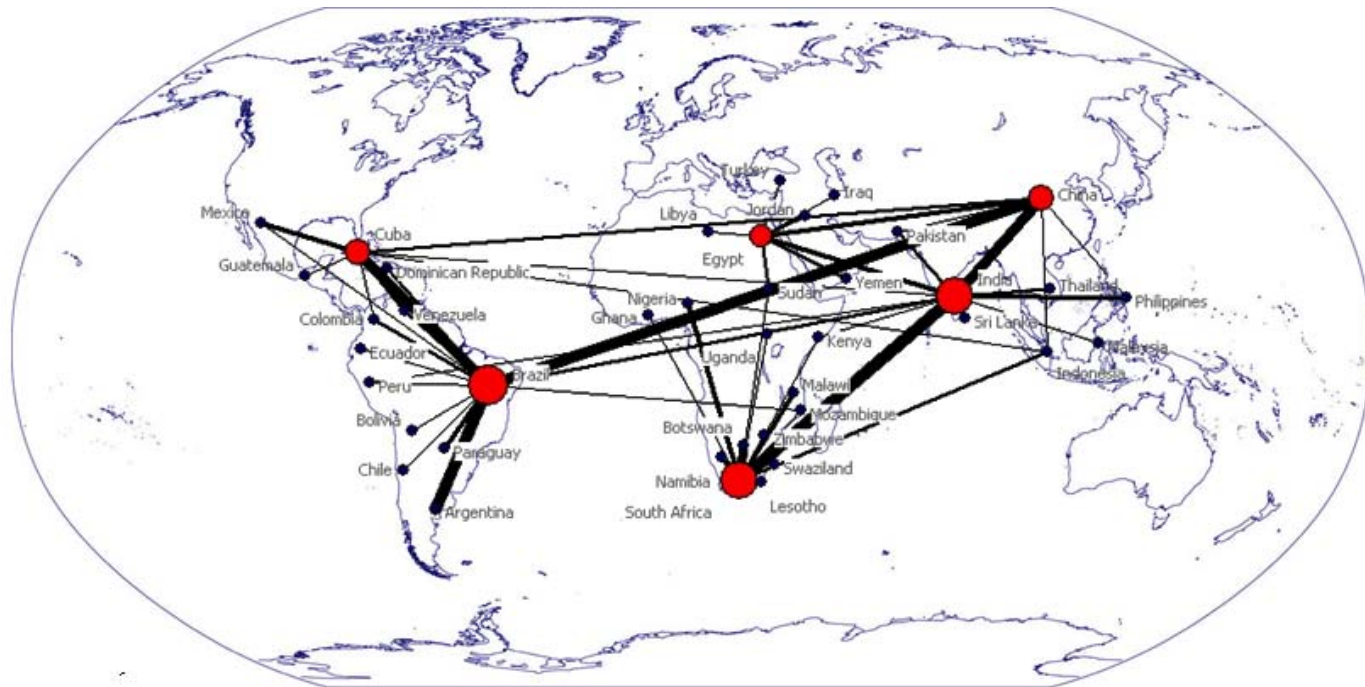
Sarah E Frew, Rahim Rezaie, Stephen M Sammut, Monali Ray, Abdallah S Daar & Peter A Singer

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# South-South Entrepreneurial Collaboration in Health Biotechnology

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Surveyed **467 firms** (Brazil, China, Cuba, Egypt, India & S. Africa)  
- **62% response rate**



- **27%** of firms involved in south-south collaboration
- **53%** of firms involved in south-north collaboration

# Impacts of the Collaboration

1. Affordable health products in developing countries' markets
2. Increased capacity to meet local health needs
3. Ability to leverage on traditional medicine
4. Increased availability of vaccines in developing countries



## Meningitis AC Vaccine Produced for Africa

- In 2007 there was a meningitis outbreak in Africa and the WHO assessed the status and production capacity of potential suppliers of a vaccine worldwide
- Collaboration between Brazil and Cuba was identified as the most suitable supplier. Finlay Institute in Cuba contributes the main vaccine technology - Biomanguinhos of Brazil contributes effective scale up and manufacturing technology
- Using complementary capabilities, the price of the vaccine produced through this partnership is much lower than that on the international market



- To support the collaboration, the regulatory agencies in both Brazil (ANVISA) and Cuba (CECMED) started to work together
- Because of the WHO's role in the project, the organizations have had more funding than they otherwise would, to work together and exchange information
- The WHO prequalified the Meningitis AC vaccine

# Key messages



- Biotech can be relevant to health needs in developing countries and we are not going to improve global health without relying on all the tools we have
- Health biotech activities are clustered in the 'north' but we are seeing an increasing role of developing countries in the field
- Great potential for south-south collaboration in health biotech, particularly to address shared health problems and reduce costs of health products
- International organisations, philanthropic organisations and donors can play a paramount role in fostering south-south collaboration and should consider south-south collaboration as a part of their global health efforts

# Thank you! Merci!

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