Vaccines, Autism, and "Blue Marble" Health

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US Science Envoy
About 9 trillion gallons of rain have fallen across Southeast Texas. If that water were collected into a cube, it would cover an area of about four square miles and be two miles tall.
Global health & disease in the 2020s
New World Order

- The term "new world order" has been used to refer to any new period of history evidencing a dramatic change in world political thought and the balance of power.

- Post WWI League of Nations
- Post WWII United Nations
- Cold War

- Current New World Order
  - Anti-science
  - Regional Conflicts
  - Climate Change
  - US/UK Retreat from Globalization, China’s neo-Silk Road, & Blue Marble Health
The Global Burden of Disease 1990-2013

Expanded use of vaccines
- 83% reduction in measles deaths
- 82% reduction in tetanus deaths
- 57% reduction in diphtheria/pertussis deaths
- 45% reduction in Hib deaths

Development new vaccines
- Pneumococcal disease (36% reduction in deaths)
- Rotavirus (63% reduction in deaths)

2.5 million childhood lives saved through these initiatives
RETRACTED: Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

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Summary

Background
We investigated a consecutive series of children with chronic enterocolitis and regressive developmental disorder.

Methods
12 children (mean age 6 years [range 3–10], 11 boys) were referred to a paediatric gastroenterology unit with a history of normal development followed by loss of acquired skills, including language, together with diarrhoea and abdominal pain. Children underwent gastroenterological, neurological, and developmental assessment and review of developmental records. Ileocolonoscopy and biopsy sampling, magnetic-resonance imaging (MRI), electroencephalography (EEG), and lumbar puncture were done under sedation. Barium follow-through radiography was done where possible. Biochemical, haematological, and immunological profiles were examined.
The spread of anti-vax sentiment in California

Share of public school kindergartners with personal belief exemptions to vaccination requirements

2000

2007

2013

Source: California Department of Public Health

WASHINGTONPOST.COM/WONKBLOG
Personal belief exemptions and Texas

Texas Total
Total District Conscientious Exemptions: 38,197
Total District Enrollment: 5,100,246
% of Students with a Conscientious Exemption: 0.75 percent
• Texas ranks at the bottom of fully immunized children
• 45,000 Personal Belief Exemptions in Texas
Measles outbreak Twin Cities MN

SOMALI VACCINATION RATES FALL

The Somali backlash against the measles vaccine is new; their kids' vaccination rates matched the general population until 2008, when fears of a link between the vaccine and autism sparked a reaction among Somali parents.

Immunization rates for Minnesota-born children at age 2

- Non-Somali children: 89%
- Minnesota-born children of Somali descent: 42%

Source: Minn. Dept. of Health

MARK BOSWELL • Star Tribune
Nation of Islam and Antivaccine
Is Vaccine Hesitancy Expanding Nationally?

Donald J. Trump
@realDonaldTrump
Healthy young child goes to doctor, gets pumped with massive shot of many vaccines, doesn't feel good and changes - AUTISM. Many such cases!

Donald J. Trump
@realDonaldTrump
I am being proven right about massive vaccinations—the doctors lied. Save our children & their future.

Missing Key Vaccines
In nine states, less than two-thirds of children 19 to 35 months old have received a widely used seven-part vaccination.

PERCENT VACCINATED:
- 65% or less
- 67–71.4
- 71.8–75
- More than 75%

Source: Centers for Disease Control and Prevention
By The New York Times
Public Health and Economic Consequences of Vaccine Hesitancy for Measles in the United States

Nathan C. Lo, BS; Peter J. Hotez, MD, PhD

Key Points

Question  How does vaccine hesitancy affect annual measles cases and economic costs in the United States?

Findings  In this modeling study of children (age 2-11 years), a 5% reduction in measles, mumps, and rubella vaccination coverage resulted in a 3-fold increase in annual measles cases with an additional US$2.1 million in public sector costs.

Meaning  Even small declines in vaccination coverage in children owing to vaccine hesitancy may have substantial public health and economic consequences that will be larger when considering unvaccinated infants, adolescents, and adults.
The “Why Vaccines Don’t Cause Autism” Papers

Posted January 20, 2017 by Peter Hotez in General

PLOS NTDs co-Editor-in-Chief Peter Hotez lists the key scientific papers refuting the myth that vaccines cause autism.

I have a unique perspective on the recent headlines surrounding vaccines and their alleged links to autism. I serve as President of the Sabin Vaccine Institute, a non-profit organization devoted to vaccines and immunization. In that role I am director of its product development partnership (PDP) based at Baylor College of Medicine – the Sabin Vaccine Institute and Texas Children’s Hospital Center for Vaccine Development, which makes vaccines for neglected tropical diseases – a group of poverty-related diseases that often disproportionately affect children in low-income countries. I have also written extensively on the topic of vaccine safety.
Patches of Disorganization in the Neocortex of Children with Autism

Rich Stoner, Ph.D., Maggie L. Chow, Ph.D., Maureen P. Boyle, Ph.D., Susan M. Sunkin, Ph.D., Peter R. Mouton, Ph.D., Subhojit Roy, M.D., Ph.D., Anthony Wynshaw-Boris, M.D., Ph.D., Sophia A. Colamarino, Ph.D., Ed S. Lein, Ph.D., and Eric Courchesne, Ph.D.

ABSTRACT

BACKGROUND
Autism involves early brain overgrowth and dysfunction, which is most strongly evident in the prefrontal cortex. As assessed on pathological analysis, an excess of neurons in the prefrontal cortex among children with autism signals a disturbance in prenatal development and may be concomitant with abnormal cell type and...
The Neurobiology of Autism

- Genetic, epigenetic, environmental events pre- and post-conception
- Prenatal: Dysregulation in prefrontal + temporal cortex
- 6-12 months: Brain cortex changes seen on MRI
- 12-24 months: Brain volume overgrowth & clinical autism
Globalization of Vaccine Hesitancy

Larson H et al  EBioMedicine 2016 12, 295-301DOI: (10.1016/j.ebiom.2016.08.042)
How the Anti-Vaxxers are Winning

The New York Times
Peter Hotez:
- Wants vaccine mandates
- Opposed travel ban to Somalia during Somali MN measles outbreak
- Lives in a sanctuary city
In denial of daughter's vaccine-caused autism

Dr. Peter Hotez, latest vaccine pitchman, clueless on vaccine-autism science

My (real) apology to Dr. Hotez, and demand for the same – Medium

Dr. Hotez: THE BOY WHO CRIED WOLF
New survey findings: ResearchAmerica

Most Americans Cannot Name a Living Scientist

Can you name a living scientist?

- Yes, I can name
  - Stephen Hawking (27%)
  - Neil deGrasse Tyson (19%)
  - Bill Nye (5%)
  - Richard Dawkins (3%)
  - Jane Goodall (2%)
  - Anthony Fauci (2%)
  - Michio Kaku (2%)
  - Me (2%)
  - James Watson (1%)

- No, I cannot name/Not sure
  - 81%

Source: A ResearchAmerica poll of U.S. adults conducted in partnership with Zogby Analytics in January 2017.
Pepsi has a new Doritos-flavored Mountain Dew. No, we don't have an Ebola vaccine, but we do have the Doritos-flavored Mountain Dew.

— David Letterman —

New vaccines for a safer world
**Texas Children's Hospital Center for Vaccine Development**

### 2000 to 2004
- Built structure
- Launched Hookworm Program

### 2004 to 2011
- Expanded Hookworm Program
- Schisto Program
- Relocated to TMC

### 2011 to 2015
- Added 7 additional programs
- Expansion of capabilities

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**A Handful of ‘Antipoverty’ Vaccines Exist For Neglected Diseases, But The World’s Poorest Billion People Need More**

**Abstract** Severe neglected tropical diseases are the most common infections of the world’s poor, and are the main cause of poverty. These diseases are neglected because of their adverse effects on child growth and development, and because they are common, leading to high costs and disability. Some of these diseases are preventable, treatable, and curable. A number of vaccines are currently available for the prevention of these diseases, but many others are needed. These vaccines have the potential to save millions of lives and prevent billions of dollars in healthcare costs. The authors describe how these vaccines are developed and the challenges faced in developing them. They also discuss the potential impact of these vaccines on the world’s poor and the need for continued investment in research and development. The authors call for a global effort to develop and implement these vaccines to improve the health of the world’s poor.”

**References**

**Baylor College of Medicine**

**Texas Children’s Hospital**
Rino Rappuoli: Reverse Vaccinology

- In silico prediction of vaccine candidate antigens
- Genome sequence of Neisseria meningitidis serogroup B
- 600 potential vaccine candidates identified
- 350 proteins successfully expressed in E. coli
- 91 novel surface-exposed proteins identified
- 28 novel proteins have bactericidal activity
- Vaccine candidates selected for development
- Protein purification
- Mouse immunization
- Testing mouse sera

Nature Reviews | Immunology
Reverse vaccinology as a ‘holy grail’ for complex eukaryotic organisms

- Large genomes of similar complexity to human genome
- Inadequacy of bacterial expression systems for eukaryotic antigens
- Low throughput not high throughput
- Deficiencies in animal models
Vaccine Targeting
Hookworm and Schistosomiasis Co-Infections

A MULTIVALENT VACCINE TARGETING HOOKWORM + SCHISTO
Three Major Drivers of 21st Century NTDs

- Health system collapse
- Blue Marble Health
- Poverty
- Conflict
- Poverty
- Climate
BLUE MARBLE HEALTH: The Poor Living Among the Wealthy (G20 + Nigeria)

WHO + GBD 2013
- 73-78% Leprosy
- 61-78% Chagas
- 60-61% Dengue
- 57-60% TB
- 45-67% VL
- 50-52% Helminths
  - STH
  - Schistosomiasis
  - Lymphatic Filariasis
  - Onchocerciasis

G20 + Nigeria = 54% Population and 86% Global Economy
US Gulf Coast: America’s Underbelly

• NTDs
  - Toxocariasis 2.2 M
  - Trichomoniasis 1.4 M
  - Chagas disease 58,000
  - WNV 8,365
  - Typhus 1,762
  - Leprosy
  - Dengue, Zika, chik
  - Cysticercosis

• 21st Century Forces
  - Poverty
  - Climate Change
  - Urbanization
  - Human migrations
  - Transportation

Gulf of Mexico
Experimental Chagas disease vaccine improves Cardiac Echocardiography function
CONFLICT & POLITICAL DESTABILIZATION:

ISIS-occupied Syria, Iraq, Libya, Yemen

- Measles/Polio
- Leishmaniasis
- Schistosomiasis
- Brucellosis
- MERS CoV
- Dengue and RVF
- Malaria/TB
- Cholera
Leishmaniasis Vaccine

- Bivalent recombinant vaccine
  - NH36
  - Sandfly antigens: LJM19 LJM143
  - GLA or CpG
Coronaviruses

- 3 groups of coronaviruses. MERS-CoV is the 6th new type of coronavirus like SARS-CoV.
- SARS-CoV and MERS-CoV are β coronaviruses.
- MERS-CoV was first identified in 2012, and causes increased cases of infections in humans and camels.
U.S. Science Envoy Program

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