ACADEMIA BRASILEIRA DE CIENCIAS

água e saúde humana

UNIVERSIDADE FEEVALE

Water and Human Health

Viral Gastroenteritis in Brazil

Gastroenterites Virais no Brasil

José Paulo Gagliardi Leite

Laboratory of Comparative and Environmental Virology

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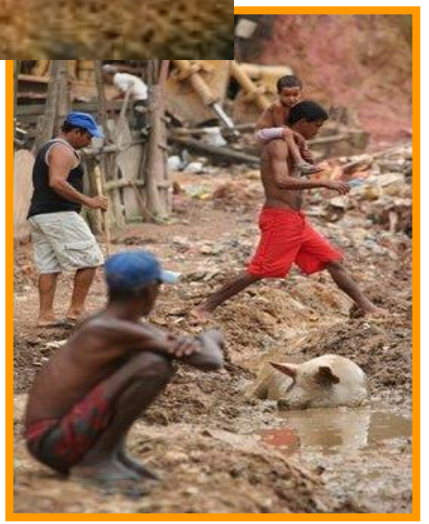
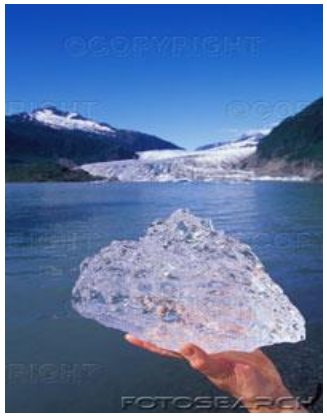
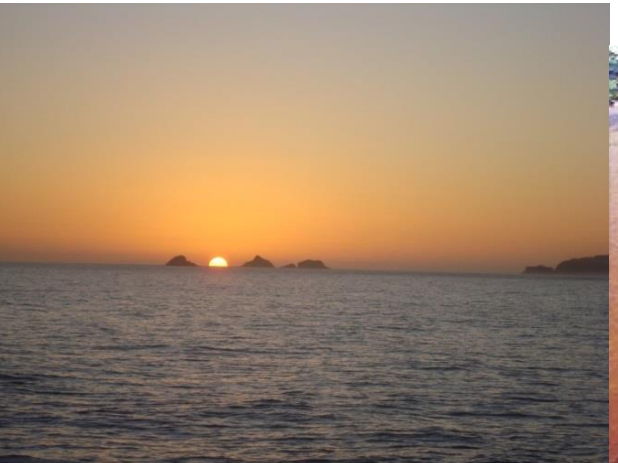
Environmental, Cultural, Social and Health Sanitation Conditions



http://g1.globo.com/Noticias/Mundo/foto/0,,17724557-FMM,00.jpg

O QUE RECEBEMOS ....



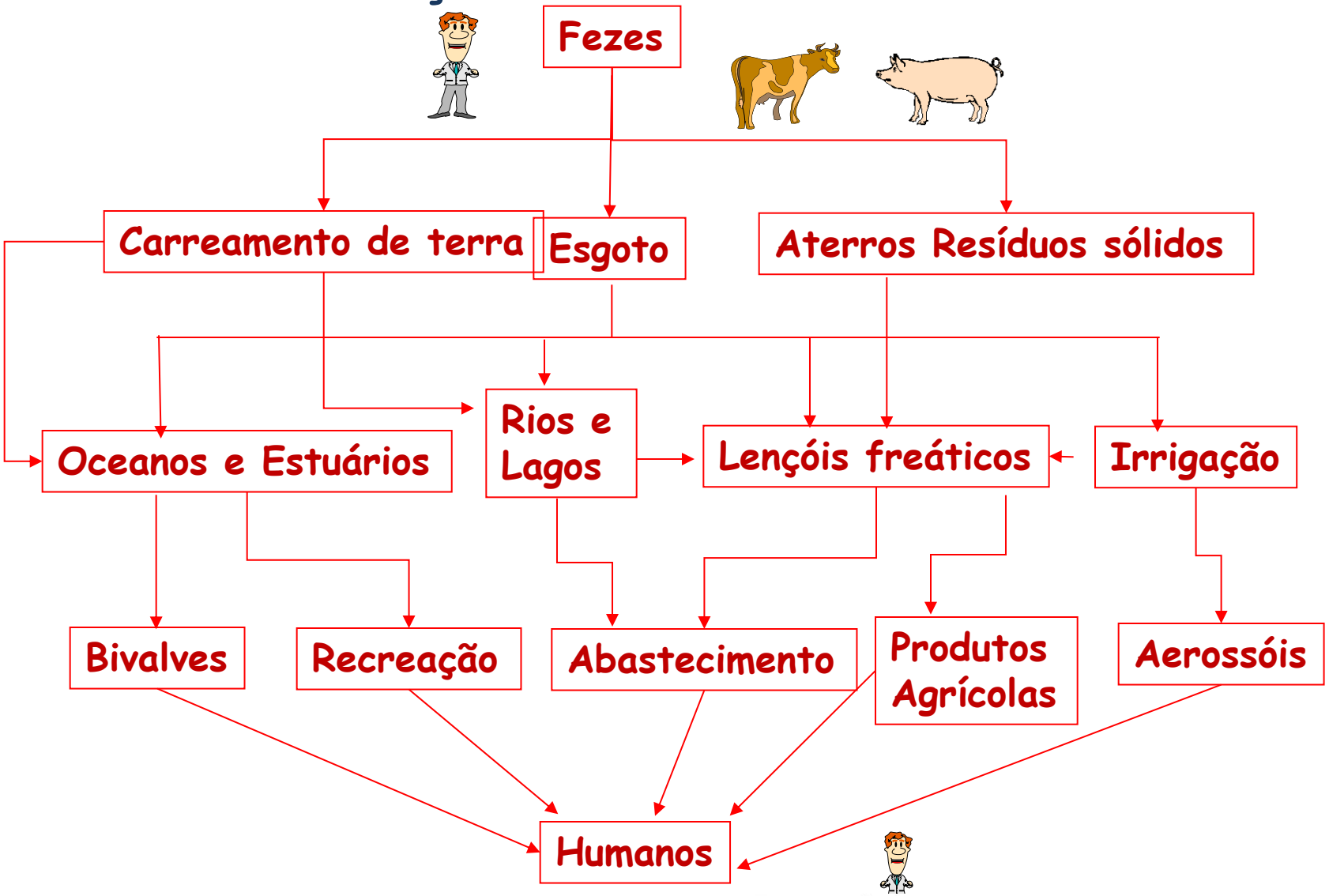


O QUE DEVOLVEMOS ….

WATER
X
PUBLIC HEALTH

DE ONDE CHEGAM?

VIAS DE DISSEMINAÇÃO DE VÍRUS ENTÉRICOS NO AMBIENTE



Metcalf TG, Melnick JL, Estes MK.
Annu Ver Microbiol 1995, 49:461-87

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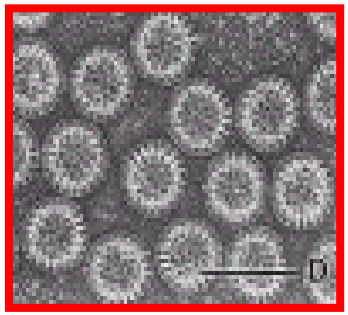
Published as: *Lancet*. 2007 November 10; 370(9599): 1622–1628.

Effect of city-wide sanitation programme on reduction in rate of childhood diarrhoea in northeast Brazil: assessment by two cohort studies

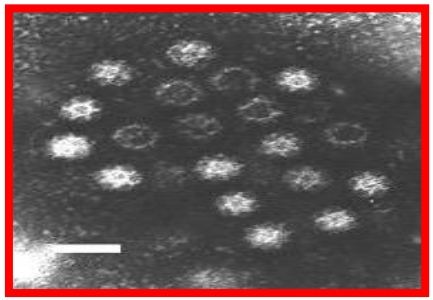
Mauricio L Barreto[a*], **Bernd Genser**[a], **Agostino Strina**[a], **Maria Gloria Teixeira**, **Ana Marlucia O Assis**[c], **Rita F Rego**[d], **Carlos A Teles**[a], **Matildes S Prado**[a], **Sheila MA Matos**[a], **Darci N Santos**[a], **Lenaldo A dos Santos**[a], and **Sandy Cairncross**[b]

Findings—Diarrhoea prevalence fell by 21% (95% CI 18–25%)—from 9·2 (9·0–9·5) days per child-year before the intervention to 7·3 (7·0–7·5) days per child-year afterwards. After adjustment for baseline sewerage coverage and potential confounding variables, we estimated an overall prevalence reduction of 22% (19–26%).

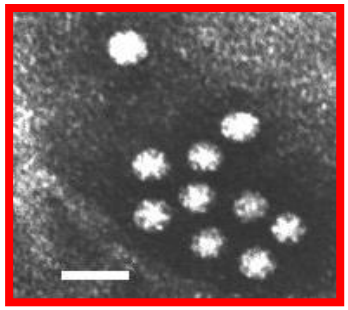
WATER, PUBLIC HEALTH and GASTROENTERIC VIRUSES



Rotaviruses

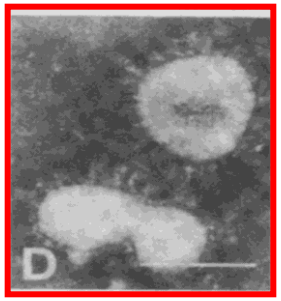


Human Caliciviruses

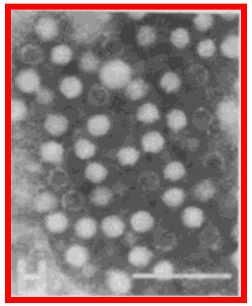


Astroviruses

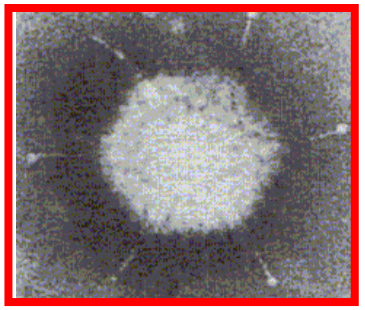
coronavirus



bredavirus



bocavirus



Enteric adenoviruses

Gut metagenomic analysis: new enteric viruses !!

12450–12455 | PNAS | July 23, 2013 | vol. 110 | no. 30 www.pnas.org/cgi/doi/10.1073/pnas.1300833110

Rapid evolution of the human gut virome

Samuel Minot[a], Alexandra Bryson[a], Christel Chehoud[a], Gary D. Wu[b], James D. Lewis[b,c], and Frederic D. Bushman[a,1]

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Fastidious!

Experimental model?

Interspecies infections !?

Genetic diversity

Antigenic diversity

Diversity of hosts

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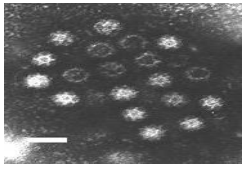
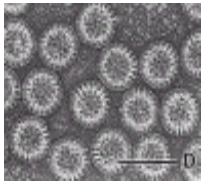
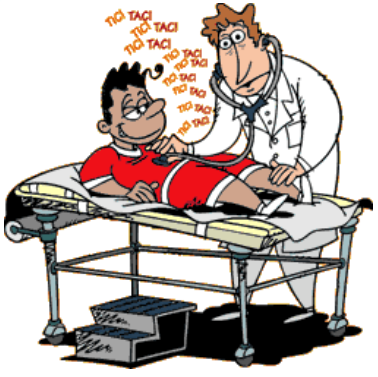
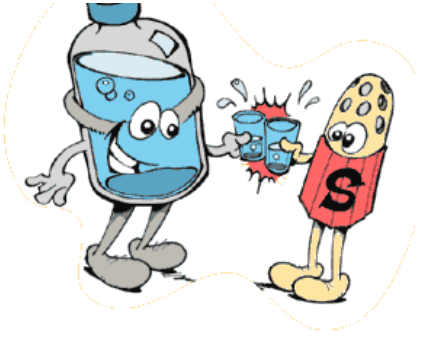
Associated Food and Water Borne Gastroenteritis



Noroviruses **Rotaviruses**













CNI-0588


PEPSI
Twist


RISCO PARA SAÚDE PÚBLICA

1. GRANDE NÚMERO DE PARTÍCULAS VIRAIS ELIMINADAS NAS FEZES DE INDIVIDUOS INFECTADOS (10^5 - 10^{11}/G)

1 grama de fezes = 10.000.000 Vírus

1.000.000 Bactérias

1.000 Parasitas

100 Ovos de parasita

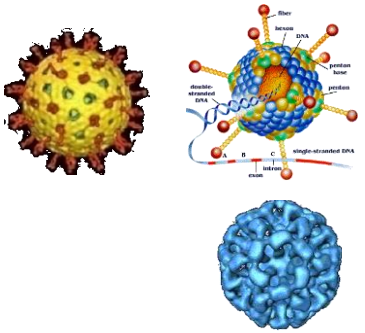
2. BAIXA DOSE INFECCIOSA - O CONTATO COM APENAS UMA ÚNICA PARTÍCULA VIRAL É CAPAZ DEDESENCADENAR UMA INFECÇÃO

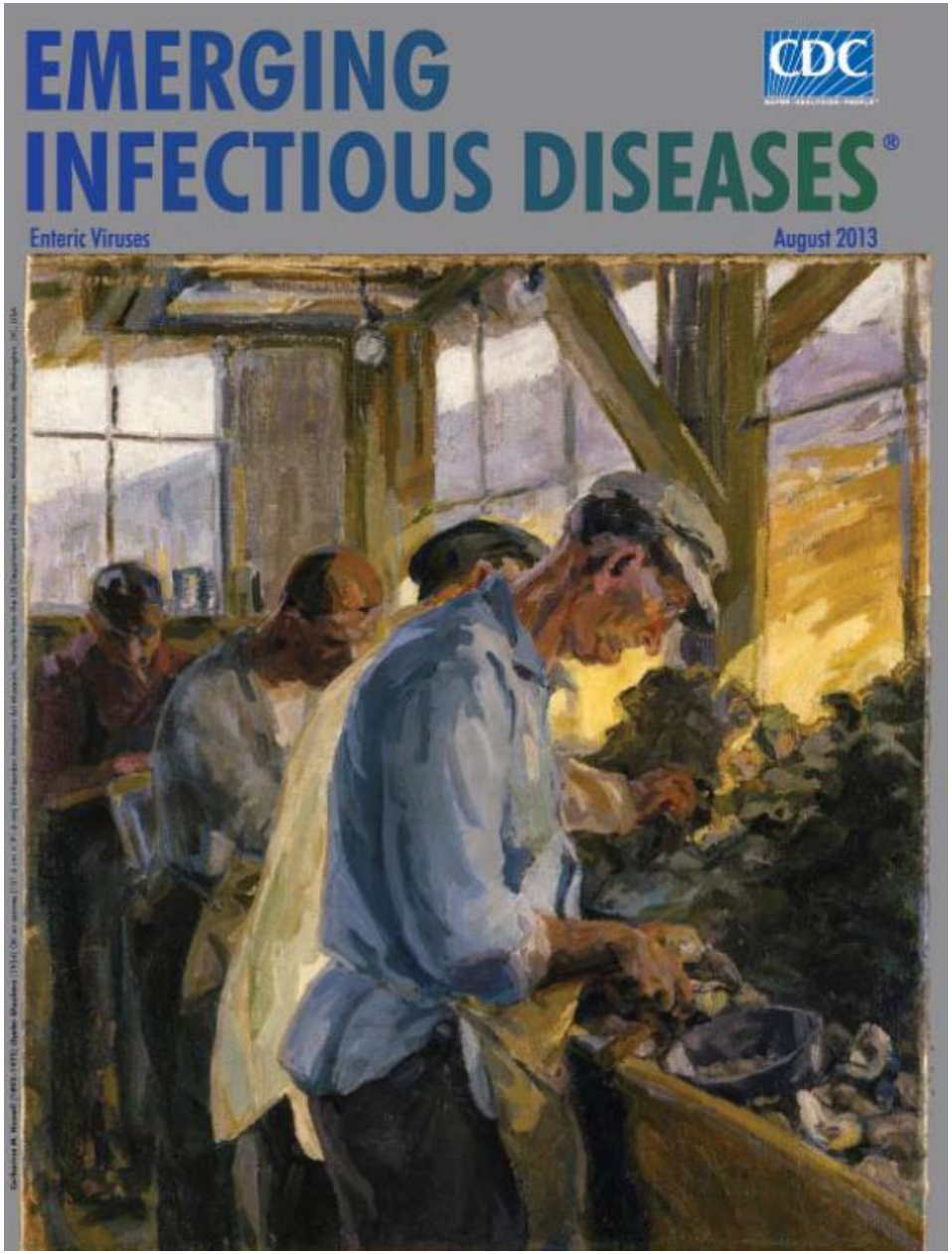
10 a 10000 vezes > risco de bactérias

Haas & Gerba, 1991

3. ESTABILIDADE E RESISTENCIA

- NO ESGOTO: RESISTEM AOS TRATAMENTOS SECUNDARIOS
- NOS SEDIMENTOS: ADSORVEM-SE AOS SEDIMENTOS ⇒ ALTA ESTABILIDADE
- NOS MOLUSCOS: ADSORVEM-SE AOS TECIDOS (BRÂNQUIAS E TRATO GASTROINTESTINAL) ⇒ ALTA ESTABILIDADE





EMERGING INFECTIOUS DISEASES

August 2013

On the Cover

Catherine M. Howell (1892–1975)
Oyster Shuckers (1934)
Oil on canvas (101.4 cm × 91.6 cm)
Smithsonian American Art Museum, Transfer from the US Department of the Interior, National Park Service, Washington, DC, USA

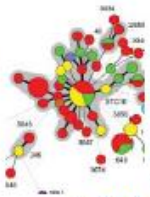
About the Cover p. 1354

Commentaries

Perspectives

Research

Medscape EDUCATION ACTIVITY



p. 1210

p. 1236

Medscape EDUCATION ACTIVITY

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Health

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Rapid Advances in Understanding Viral Gastroenteritis from Domestic Surveillance

Daniel C. Payne and Umesh D. Parashar

COMMENTARY

Beyond Discovering the Viral Agents of Acute Gastroenteritis

Roger I. Glass

PERSPECTIVE

The New Global Health

Kevin M. De Cock, Patricia M. Simone, Veronica Davison, and Laurence Slutsker

PERSPECTIVE

Norovirus Disease in the United States

Aron J. Hall, Ben A. Lopman, Daniel C. Payne, Manish M. Patel, Paul A. Gastañaduy, Jan Vinjé, and Umesh D. Parashar

Travel-associated Diseases, Indian Ocean Islands, 1997–2010

Hélène Savini, Philippe Gautret, Jean Gaudart, Vanessa Field, Francesco Castelli, Rogelio López-Vélez, Poh Lian Lim, Marc Shaw, Frank von Sonnenburg, Louis Loutan, and Fabrice Simon, for the GeoSentinel Surveillance Network[1]

Data collected by the GeoSentinel Surveillance Network for 1,415 ill travelers returning from Indian Ocean islands during 1997–2010 were analyzed. Malaria (from Comoros and Madagascar), acute nonparasitic diarrhea, and parasitoses were the most frequently diagnosed infectious diseases. An increase in arboviral diseases reflected the 2005 outbreak of chikungunya fever.

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"People are beginning to understand there is nothing in the world so remote that it can't impact you as a person."

"As pessoas estão começando a entender que não existe nada no mundo, mesmo tão remoto, que não possa afeta-la como pessoa"

William H. Foege

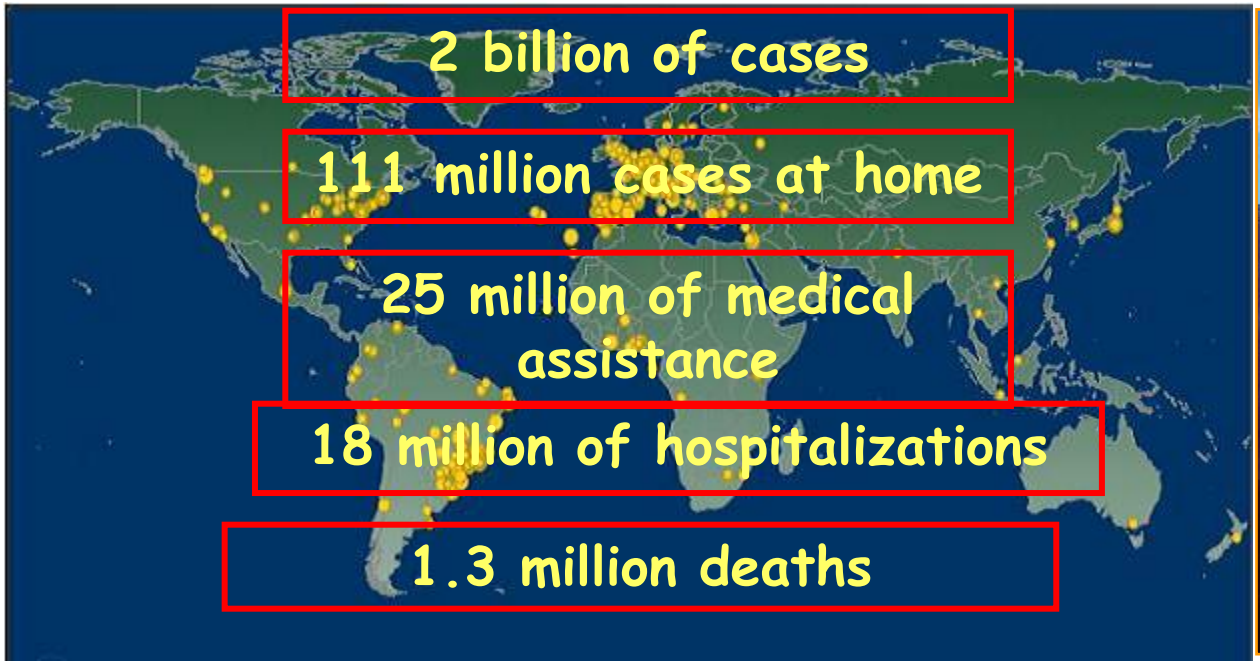
Director, US Centers for Disease Control, 1977-1983

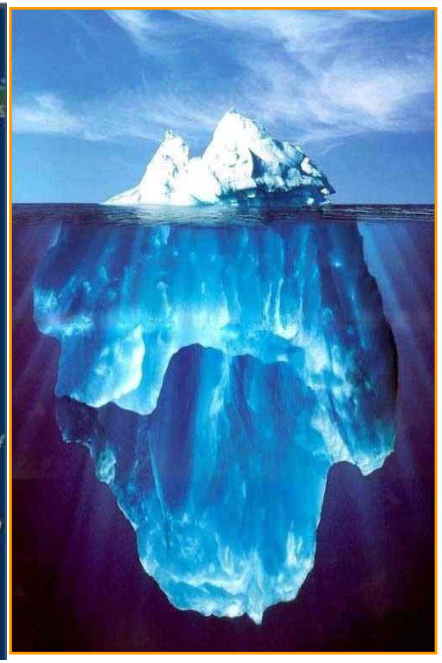
Cláudio Paiva

claudio.paiva@oglobo.com.br

GASTROENTERITIS

MORBIDITY AND MORTALITY IN CHILDREN <5 YEARS OLD / YEAR

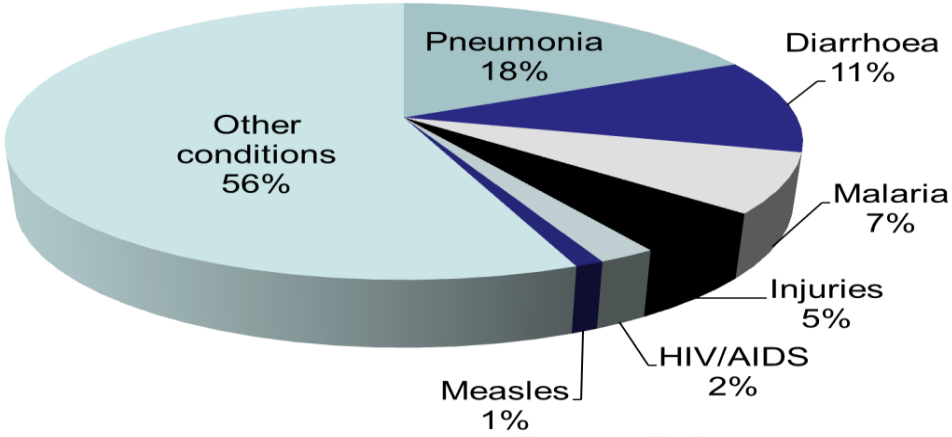




Parasites

Bacteria

viruses



Aho *et al.*2000; Mitchell, 2002; Kosek, 2003; WHO 2005; Parashar *et al.*, 2007.

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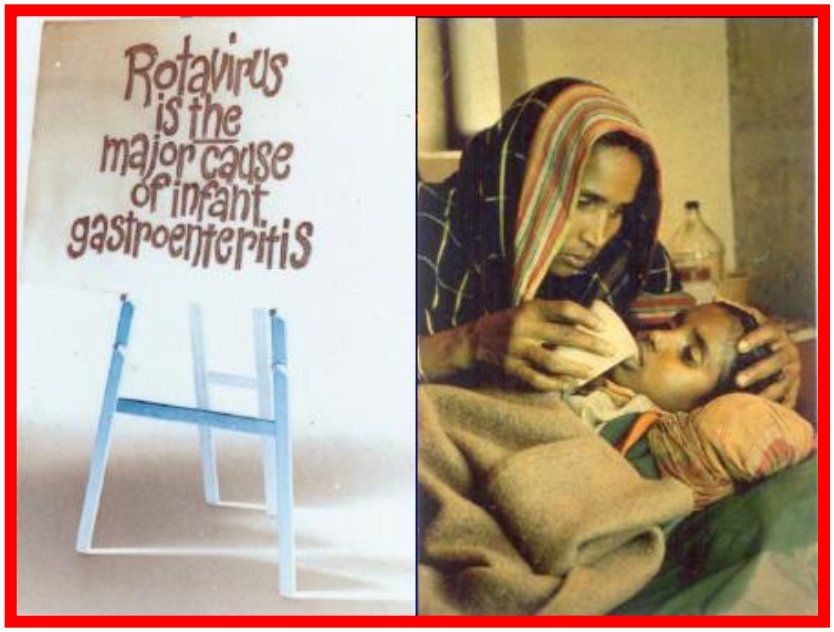

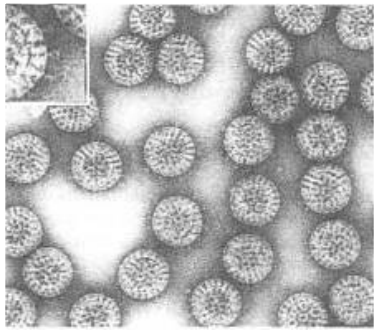

Major Clinical Symptoms
Diarrhea
Vomiting
Dehydration
Shock
Death

- MOST COMMON CAUSE OF SEVERE DIARRHEA IN CHILDREN
- ALL CHILDREN WORLDWIDE INFECTED BY AGE 5
- STRAINS DIVERSITY CIRCULATION:

  DEVELOPING COUNTRIES >
  DEVELOPED COUNTRIES
- IMPROVEMENTS IN SANITATION WON'T SUBSTANTIALLY REDUCE DISEASE INCIDENCE : VACCINE !

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www.thelancet.com Published online May 14, 2013 http://dx.doi.org/10.1016/S0140-6736(13)60844-2

Burden and aetiology of diarrhoeal disease in infants and young children in developing countries (the Global Enteric Multicenter Study, GEMS): a prospective, case-control study

Karen L Kotloff, James P Nataro, William C Blackwelder, Dilruba Nasrin, Tamer H Farag, Sandra Panchalingam, Yukun Wu, Samba O Sow, Dipika Sur, Robert F Breiman, Abu S G Faruque, Anita K M Zaidi, Debasish Saha, Pedro L Alonso, Boubou Tamboura, Doh Sanogo, Uma Onwuchekwa, Byomkesh Manna, Thandavarayan Ramamurthy, Suman Kanungo, John B Ochieng, Richard Omore, Joseph O Oundo, Anowar Hossain, Sumon K Das, Shahnawaz Ahmed, Shahida Qureshi, Farheen Quadri, Richard A Adegbola, Martin Antonio, M Jahangir Hossain, Adebayo Akinsola, Inacio Mandomando, Tacilta Nhampossa, Sozinho Acácio, Kousick Biswas, Ciara E O'Reilly, Eric D Mintz, Lynette Y Berkeley, Khitam Muhsen, Halvor Sommerfelt, Roy M Robins-Browne, Myron M Levine

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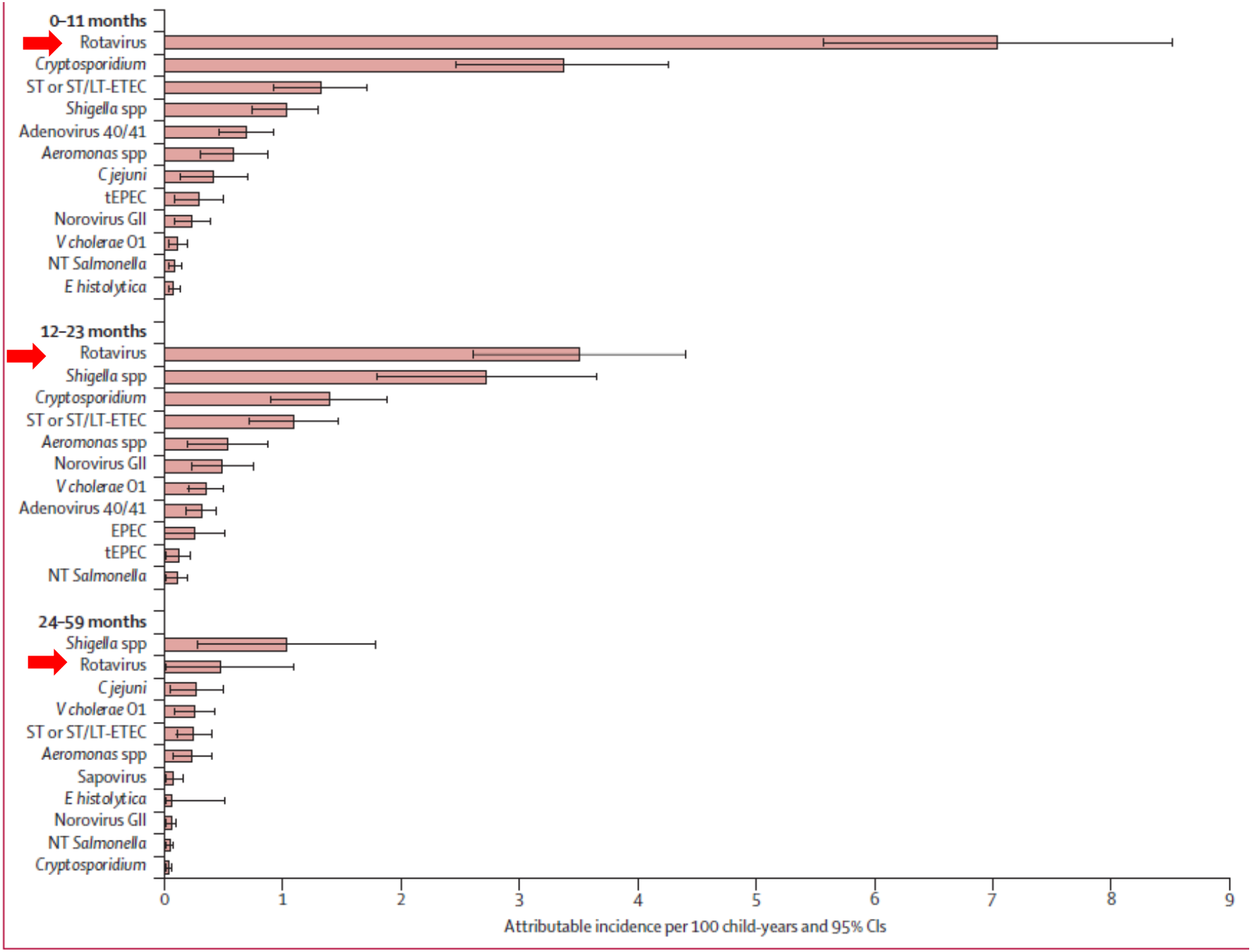
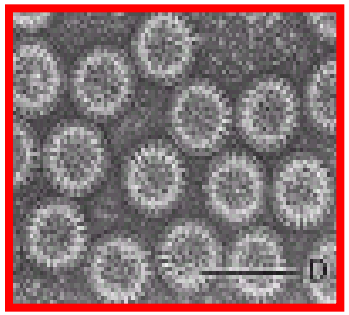
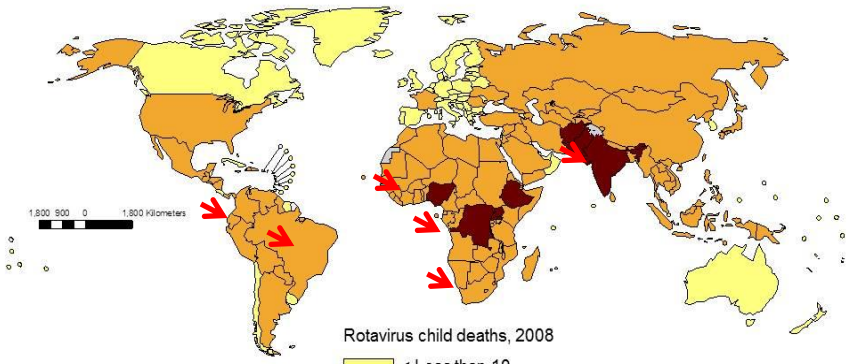


Figure 4: **Attributable incidence of pathogen-specific moderate-to-severe diarrhoea per 100 child-years by age stratum, all sites combined**
The bars show the incidence rates and the error bars show the 95% CIs.



453 000 global child rotavirus deaths, 2008



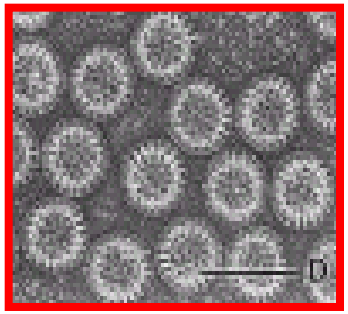
Data Source: WHO/IVB Rotavirus diseases burden estimates, January 2012

Map production: Immunization Vaccines and Biologicals, (IVB), World Health Organization

Date of slide: 02 February 2012

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

World Health Organization



1 death / 12 minutes

Table 3 Deaths due to rotavirus in children aged younger than 5 years, stratified by region

World bank Region	Rotavirus deaths	
	Total	Per 100,000 children younger than 5 y
Africa	236,519	155.8
Asia	144,095	39.6
Europe	167	0.4
Latin America and Caribbean	5,000	8.8
North America	3	0.0
Oceania	328	11.6

Aruna Chandran[1]
Sean Fitzwater[1]
Anjie Zhen[2]
Mathuram Santosham[1]

Biologics: Targets & Therapy
29 July 2010

Ministry of Health

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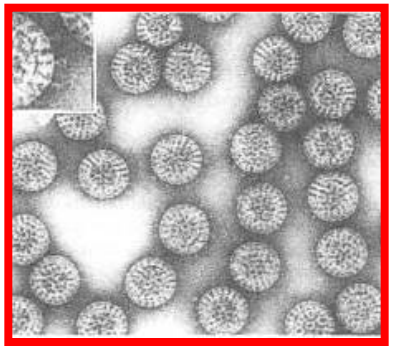
ROTAVIRUS CLASSIFICATION



Family: *Reoviridae*

Genus: *Rotavirus*

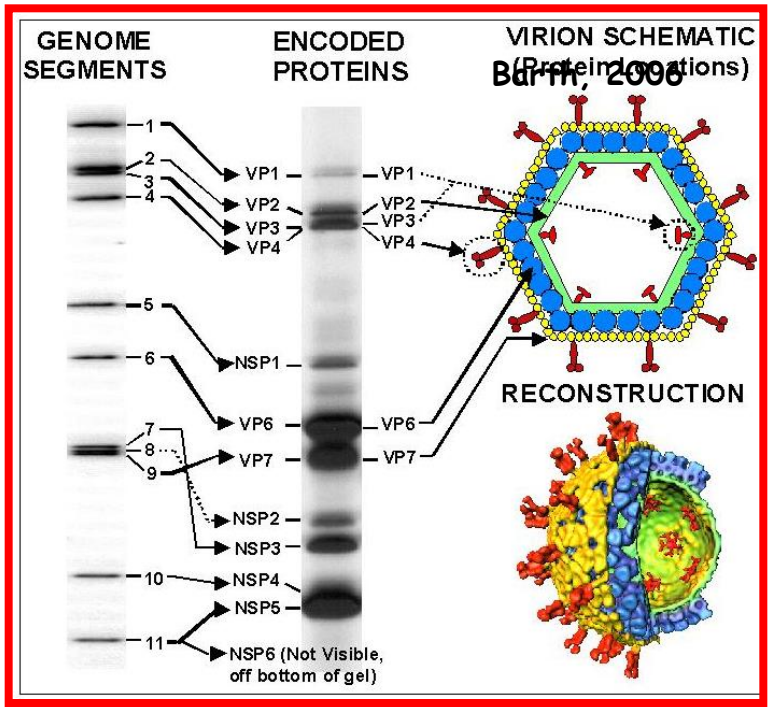
Species: **A** – G (H?) (Wakuda et al., 2011)

Virus Particle: 100 nm, non-enveloped, icosahedral with triple capsid protein.

Genome: dsRNA with 11 segments

Proteins: 6 structural (VP)
6 non-structural (NSP)

NSP4: enterotoxine
vomiting (Svensson 2009)



Modified from Estes, 2001 Estes & Kapikian, 2006

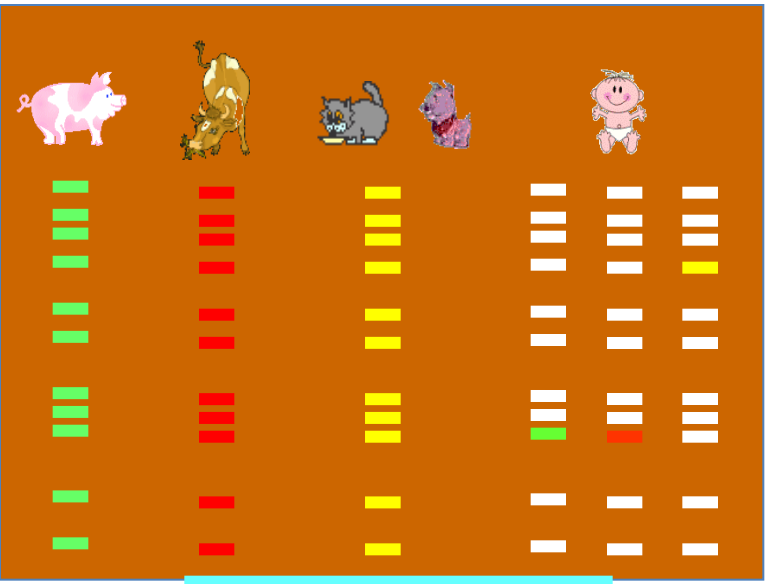
MECHANISMS FOR ROTAVIRUS EVOLUTION

Ponctual Mutation(s)

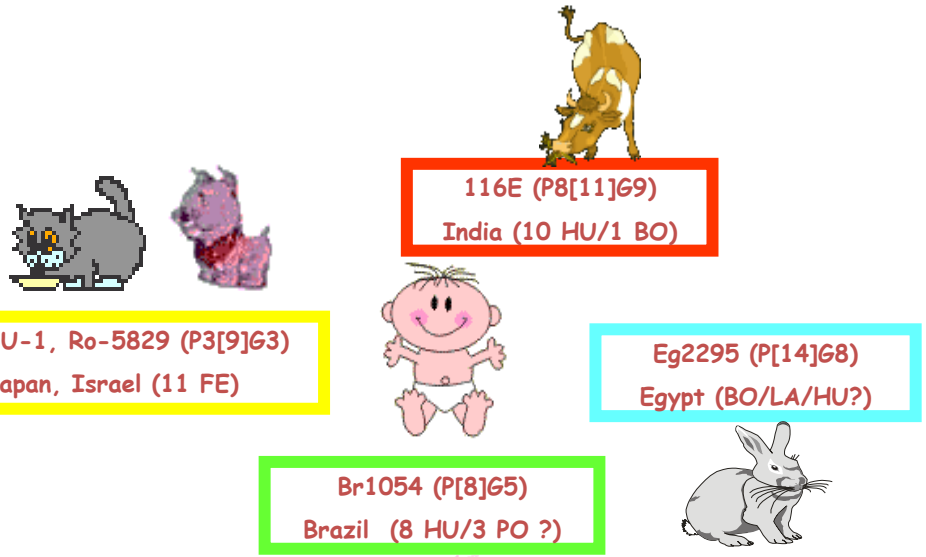
Rearrangements

Reassortments

- Reassortment of RV-A strains
  - P and G antigen combinations
  - Intragenogroup reassortment of all genes
- Role of animal RV-A in diversity
  - Examples of interspecies infections
  - Human-animal RV-A reassortants



reassortments



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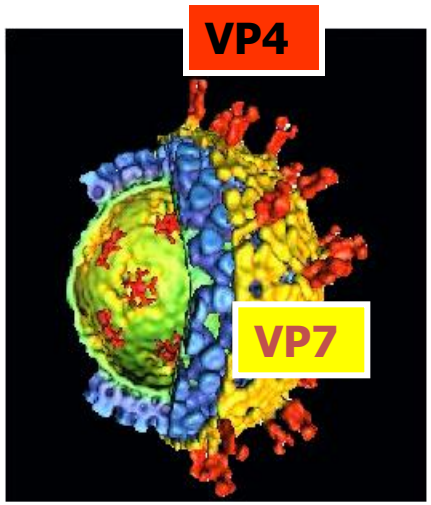
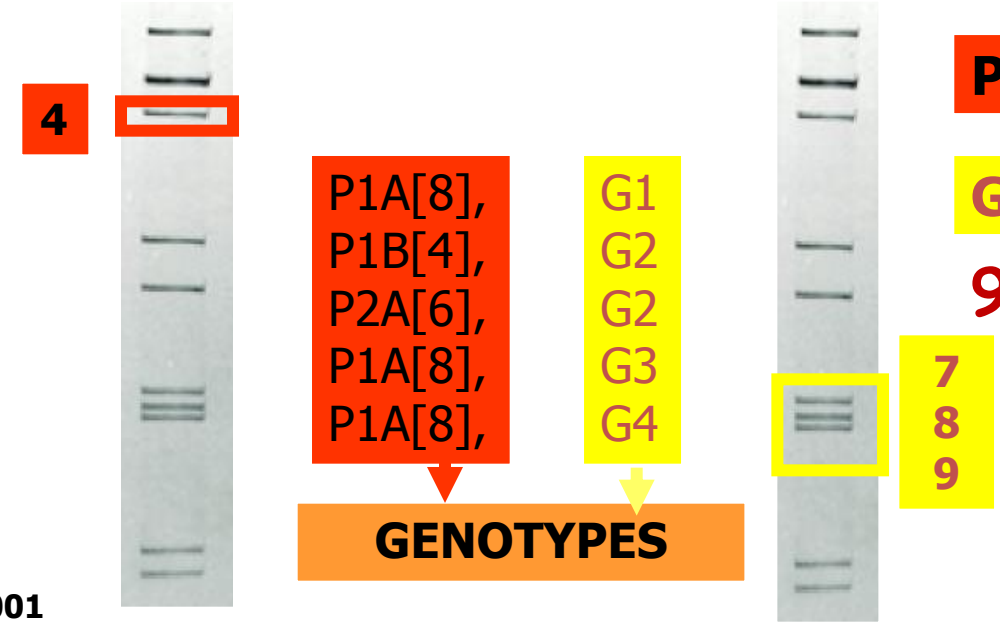
ROTAVIRUS SPECIE A

A BINARY CLASSIFICATION SYSTEM RVA: P and G GENOTYPES



Modified from Estes, 2001



P genotypes: 35

G genotypes: 27

945 genotypes

Prevalent worldwide human strains: **Wa-like: P[8]G1, P[8]G3, P[8]G4, P[8]G9, a**
DS-1 like: P[4]G2

Prevalent in Asia and Africa human strains: G5, G8, G10, G12, P6, P9, P10

Khamrin et al., 2007; Martella et al., 2007; Matthijnssens et al., 2008, 2012; Albe et a l., 2009

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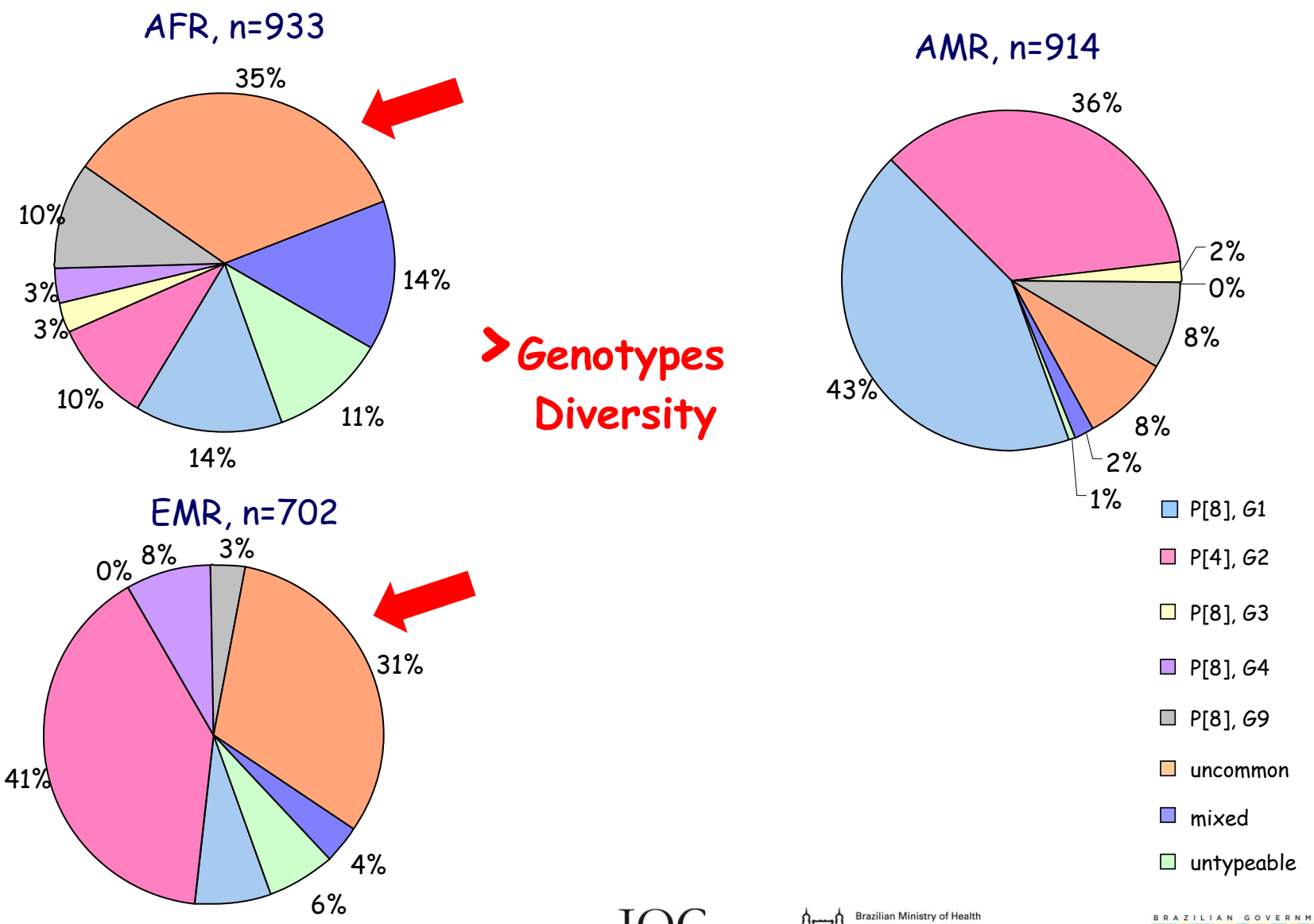
Distribution of Rotavirus Genotypes by WHO Regions, 2010



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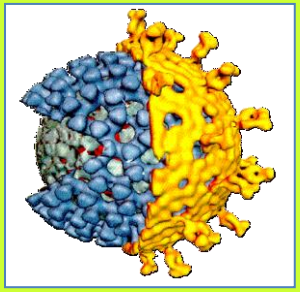
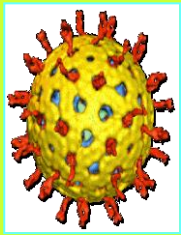
Human Origin



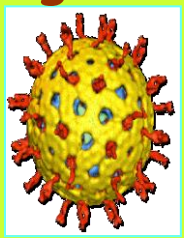
G1P[8]

Rotarix® (GSK-Bio)

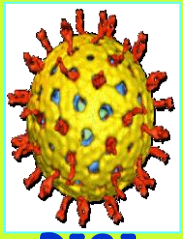
Human-Bovine Origin



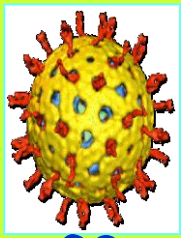
G1



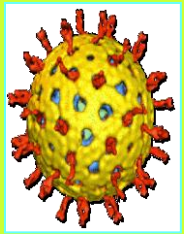
G3



P[8]



G2



G4

RotaTeq® (Merck)

GSK – BioManguinhos / Fiocruz - Brazil

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Vaccine 31S (2013) C99–C108

Contents lists available at SciVerse ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Review

Temporal trends in diarrhea-related hospitalizations and deaths in children under age 5 before and after the introduction of the rotavirus vaccine in four Latin American countries

L.H. De Oliveira[a,d,*], N. Giglio[b,d], A. Ciapponi[c,d], S. García Martí[c,d], M. Kuperman[e,d], N.J. Sanwogou[a,d], C. Ruiz-Matus[a,d], M.F. Marinho de Sousa[a,d]

Table 2
Number of observed and expected deaths related to all-cause diarrhea following rotavirus vaccine introduction in children, by age group, in selected countries.

Country	Age range	Integral method			
		Observed deaths	Expected deaths	Difference	Δ% (CI 95%)
Bolivia	0–1 year	303	430 ± 4	127 ± 4	29.5% (28.2%–30.8%)
	0–5 years	314	487 ± 5	173 ± 5	35.5% (34.1%–36.9%)
El Salvador	0–1 year	188	178 ± 2	−10 ± 2	−5.6% (−8.0%–−3.2%)
	0–5 years	253	240 ± 3	−13 ± 3	−5.4% (−8.3%–−2.8%)
Honduras	0–1 year	85	99 ± 4	14 ± 4	14.1% (7.2%–21.1%)
	0–5 years	129	153 ± 2	24 ± 2	15.7% (13.5%–17.9%)
Venezuela	0–1 year	1010	2510 ± 10	1500 ± 10	59.8% (59.4%–60.1%)
	0–5 years	1535	3550 ± 32	2015 ± 32	56.8% (56.0%–57.5%)
Argentina	0–5 years	423	425 ± 1	–	0.4% (0.3%–0%)
Total[a]	0–1 year	1586	3217 ± 20	1631 ± 20	50.7% (50.1%–51.3%)
Total[a]	0–5 years	2231	4430 ± 42	2199 ± 42	49.6% (48.7%–50.6%)

Note: Deaths for the entire period, from the introduction of rotavirus vaccination through the last inf

[a] The total does not include Argentina.

DEATHS

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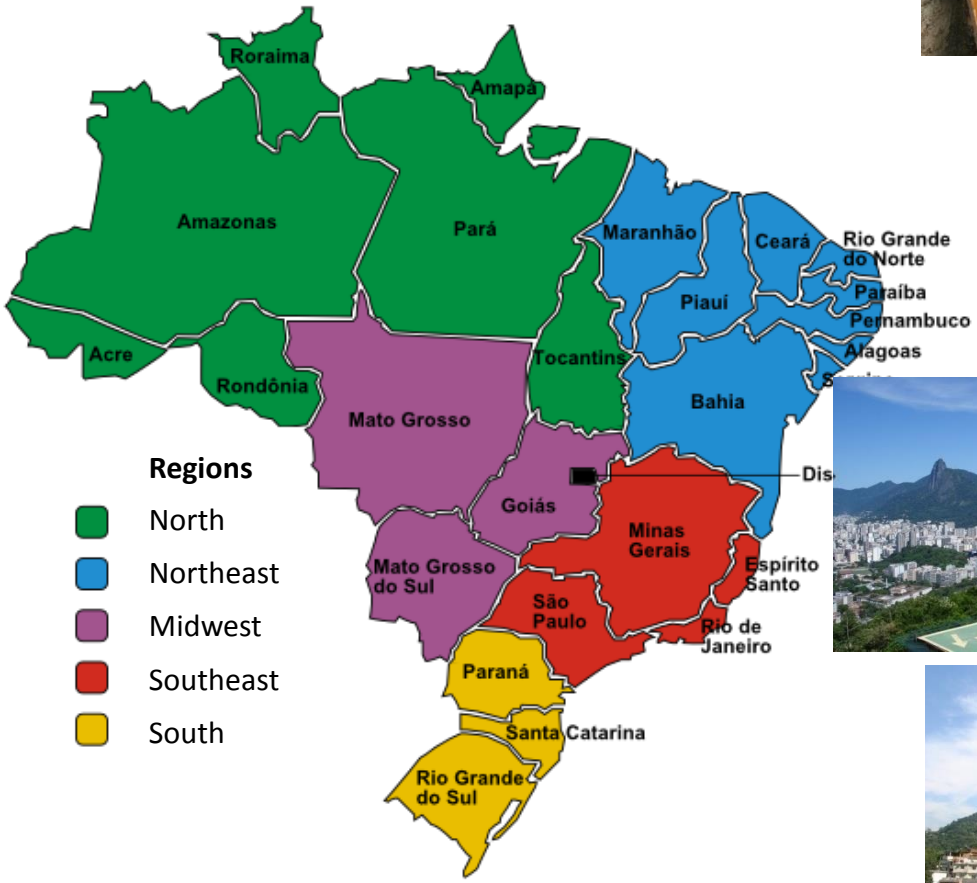
BRAZIL

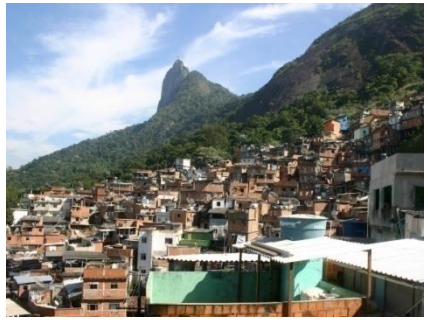
- Area: 8.514.876,599 km^2 (~40% LA)
- 190.755.799 inhabitants



REGIONAL DIFFERENCES

Economical – Social

Environmental



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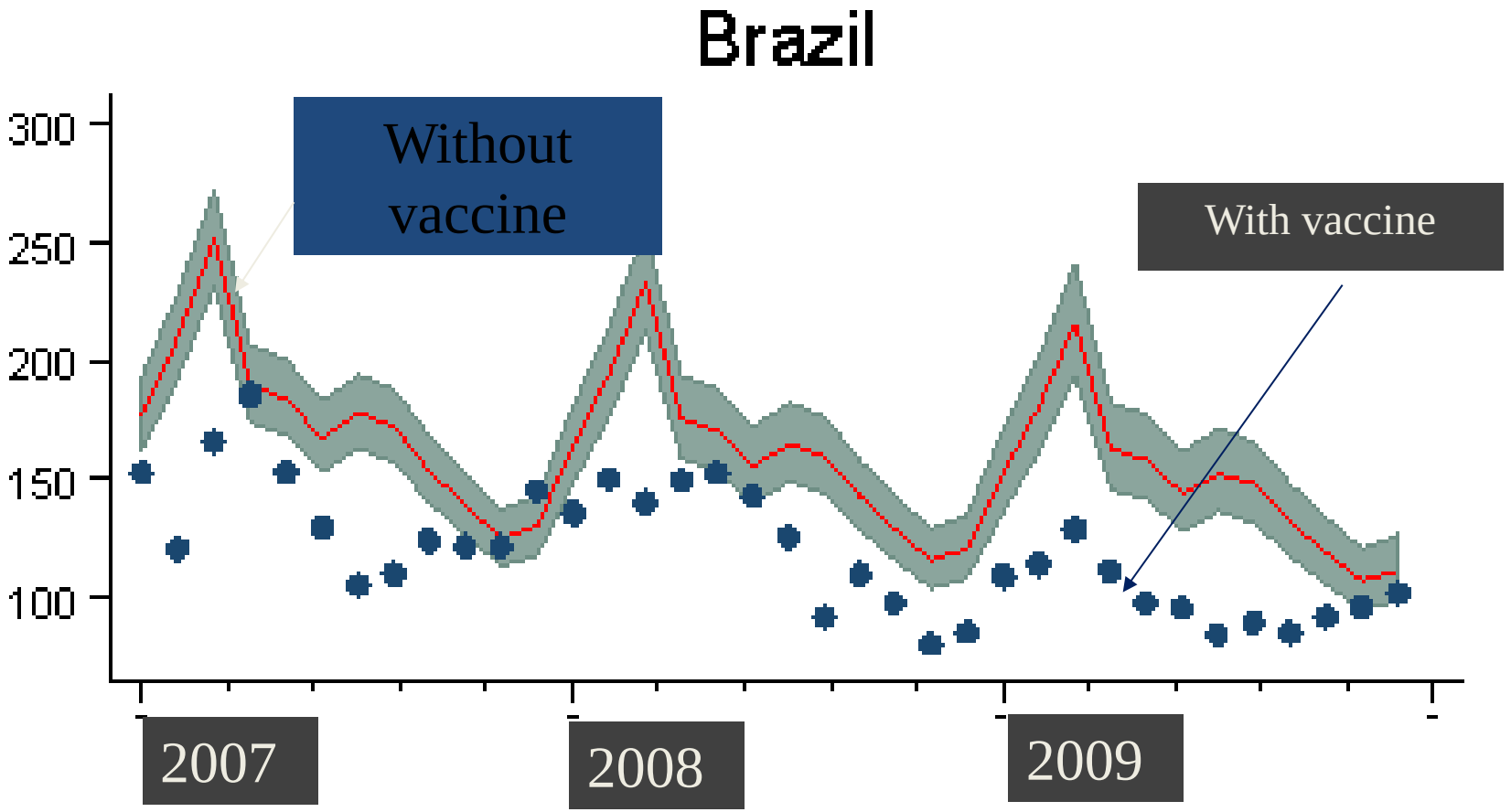
After the introduction of the Rotavirus vaccine , Brazil had *1500* fewer deaths under 5 due to diarrhea (2007-2009)



Carmo,G. et al. Plos Medicine, April 2011, Vol 8, Issue 4.

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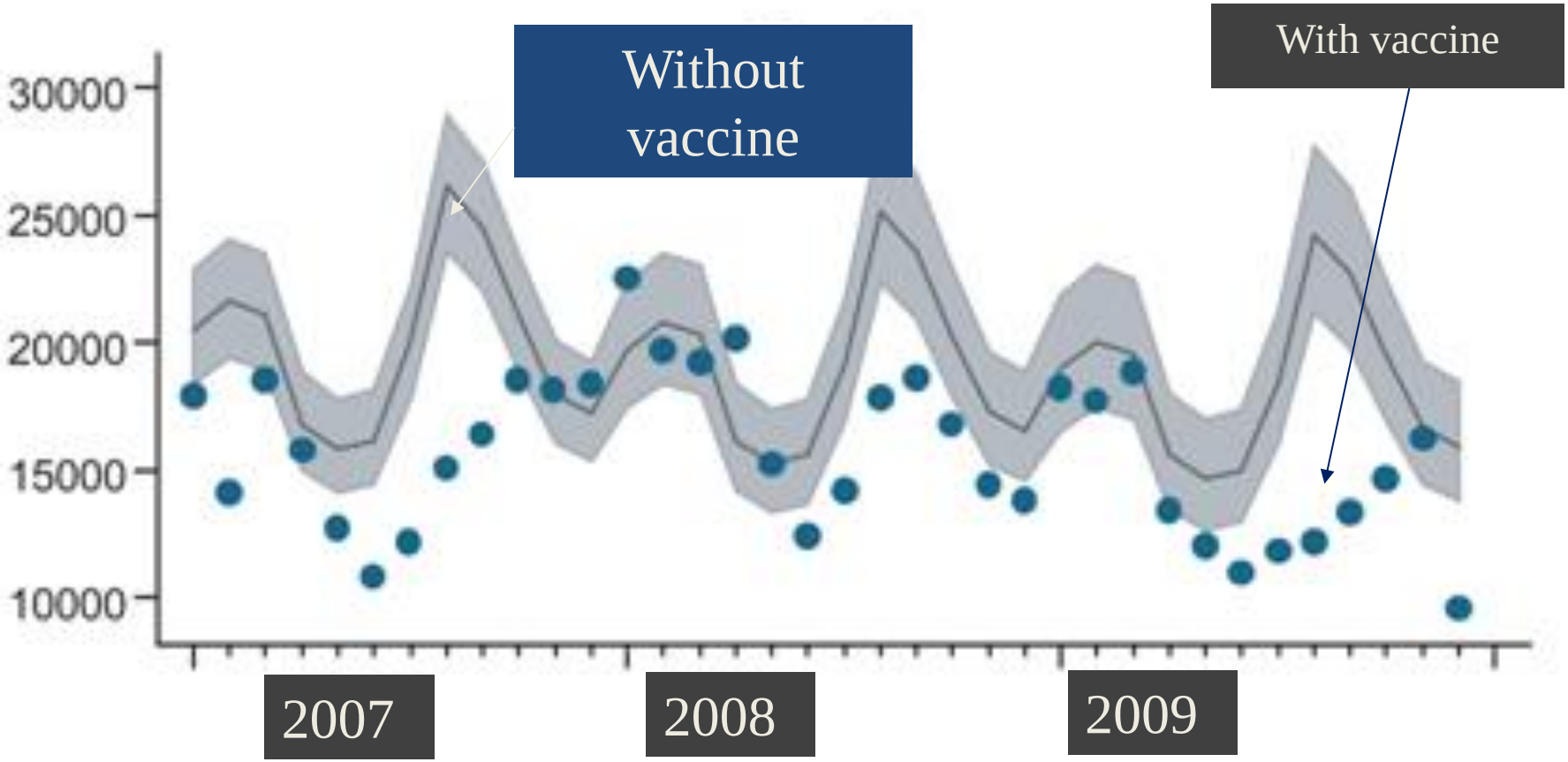
After Rotavirus vaccine introduction, Brazil had *130,000* fewer under 5 diarrhea admissions during 2007-2009



Carmo,G. et al. Plos Medicine, April 2011, Vol 8, Issue 4.

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The Pediatric Infectious Disease Journal • Volume 30, Number 1, January 2011

Laboratory-based Rotavirus Surveillance During the Introduction of a Vaccination Program, Brazil, 2005–2009

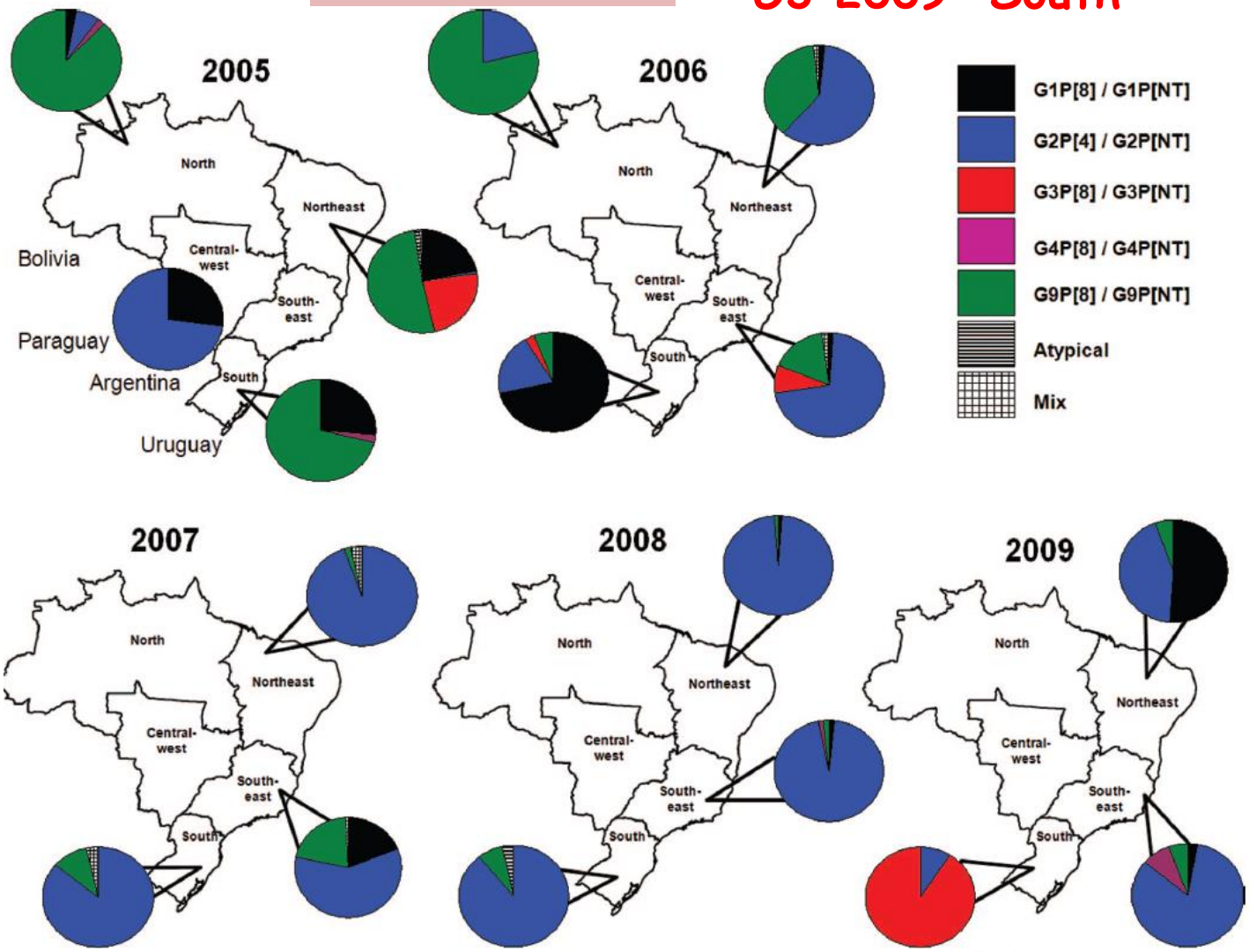
Filipe Anibal Carvalho-Costa, MD, PhD, Eduardo de Mello Volotão, PhD, Rosane Maria Santos de Assis, BSc, Alexandre Madi Fialho, BSc, Juliana da Silva Ribeiro de Andrade, BSc, Ludmila Nascimento Rocha, MSc, Luis Fernando López Tort, MSc, Marcelle Figueira Marques da Silva, MSc, Mariela Martinez Gómez, MSc, Pamella Macedo de Souza, BSc, and José Paulo Gagliardi Leite, PhD

Rotarix Introduction

G5 before 2005 / G9 after 2005

Prevalence of G2P[4] after 2005

G3 2009 South



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Rotavirus surveillance, assessment of Rotarix (RV1) effectiveness and trends in diarrhea-associated mortality following massive vaccination in Brazil

Carvalho-Costa et al em preparação

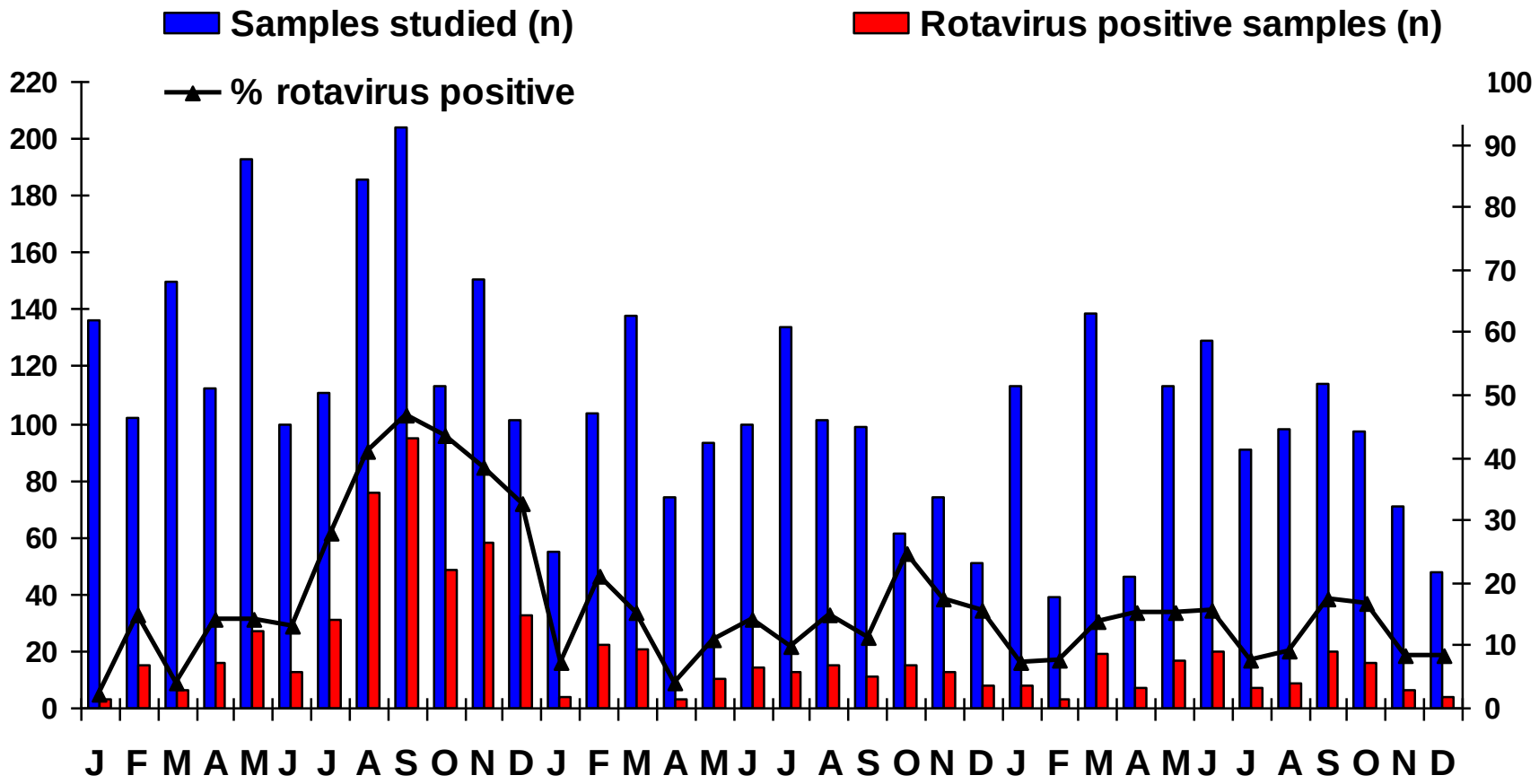

Figure 1. Monthly rates and seasonality of rotavirus detection in cases of acute diarrhea in Brazil, 2010 to 2012.

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Conclusions:

RVA detection rate in subjects with acute diarrhea declined significantly from 2010 to 2012.

A clear shift in RVA genotypes distribution could be observed between 2010-2012.

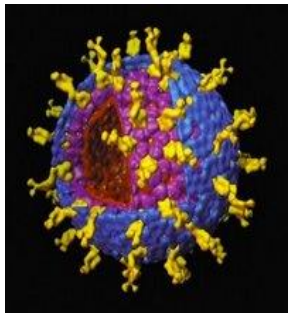
This shift may have influenced positively RV1 performance due to reduction on prevalence of heterotypical strains.

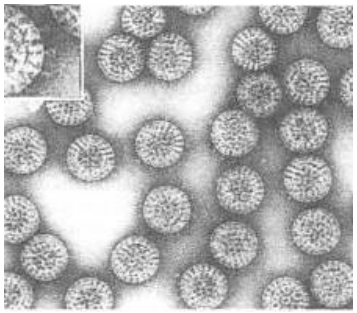
RVA infection, presents a changing epidemiological profile in Brazil. RV1 vaccine, introduced in 2006, can be considered as one of several measures being implemented in Brazil with the goal of reducing diarrhea morbidity.

CHALLENGES RVA VACCINES

Biological Characteristics of RVA

Rotavirus Specie A





- Infectivity: 10 -100 particles
- Shedding: 1 billon of infectious particles
- Environmental

JOURNAL OF CLINICAL MICROBIOLOGY, June 2006, p. 2046–2050 Vol. 44, No. 6

Molecular Epidemiology of Group A Rotavirus Diarrhea among Children in Buenos Aires, Argentina, from 1999 to 2003 and Emergence of the Infrequent Genotype G12

A. A. Castello,[1,2]* M. H. Argüelles,[2] R. P. Rota,[2] A. Olthoff,[3] B. Jiang,[1] R. I. Glass,[1] J. R. Gentsch,[1] and G. Glikmann[2]

National Rotavirus Surveillance in Argentina: High incidence of G9P[8] strains and detection of G4P[6] strains with porcine characteristics

Juan A. Stupka [a], Paola Carvalho [a], Alberto A. Amarilla [b], Mario Massana [c], Gabriel I. Parra [b,*]
the Argentinean National Surveillance Network for Diarrheas[1]

Rotavirus infections with multiple emerging genotypes in Sri Lanka

Kamruddin Ahmed · Ranjith Batuwanthudawe · T. G. A. Nilmini Chandrasena · Marcelo Takahiro Mitui · Shaman Rajindrajith · Geethani Galagoda · Sher Bahadur Pun · Ryuichi Uchida · Osamu Kunii · Kazuhiko Moji · Nihal Abeysinghe · Akira Nishizono · Osamu Nakagomi

Secular Variation in United States Rotavirus Disease Rates and Serotypes

Implications for Assessing the Rotavirus Vaccination Program

Daniel C. Payne, PhD, MSPH, Peter G. Szilagyi, MD, MPH,† Mary Allen Staat, MD, MPH,‡ Kathryn M. Edwards, MD,§ Jon R. Gentsch, PhD,¶ Geoffrey A. Weinberg, MD,† Caroline B. Hall, MD,† Aaron T. Curns, MPH,* Haley Clayton, MPH,*‖ Marie R. Griffin, MD, MPH,** Gerry Fairbrother, PhD,‡ and Umesh D. Parashar, MB BS, MPH**

Genetic characterization of rotavirus subtypes in Pakistan-first report of G12 genotype from Pakistan under WHO-Eastern Mediterranean region

Muhammad Masroor Alam [a], Salman Akbar Malik [b], Shahzad Shaukat [a], Asif Naeem [a], Salmaan Sharif [a], Mehar Angez [a], Muhammad Suleman Rana [a], Adnan Khurshid [a], Sohail Zahoor Zaidi [a,*]

Characterization of Genotype P[9]G12 Rotavirus Strains From Argentina: High Similarity With Japanese and Korean G12 Strains

Alejandro A. Castello,[1,2]* Toyoko Nakagomi,[3] Osamu Nakagomi,[3] Baoming Jiang,[2] Jung O. Kang,[4] Roger I. Glass,[2] Graciela Glikmann,[1] and Jon R. Gentsch[2]

Arch Virol (2012) 157:135–139
DOI 10.1007/s00705-011-1111-z

BRIEF REPORT

Identification of lineage III of G12 rotavirus strains in diarrheic children in the Northern Region of Brazil between 2008 and 2010

Luana da Silva Soares · Patrícia dos Santos Lobo · Joana D'Arc Pereira Mascarenhas · Darivaldo Luz Neri · Sylvia de Fátima dos Santos Guerra · Alessilva do Socorro Lima de Oliveira · Régis Piloni Maestri · Darleise de Souza Oliveira · Euzeni Maria de Fátima Costa de Menezes · Alexandre da Costa Linhares

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Rose et al., 2013 Emerg. Infect. Dis. In press

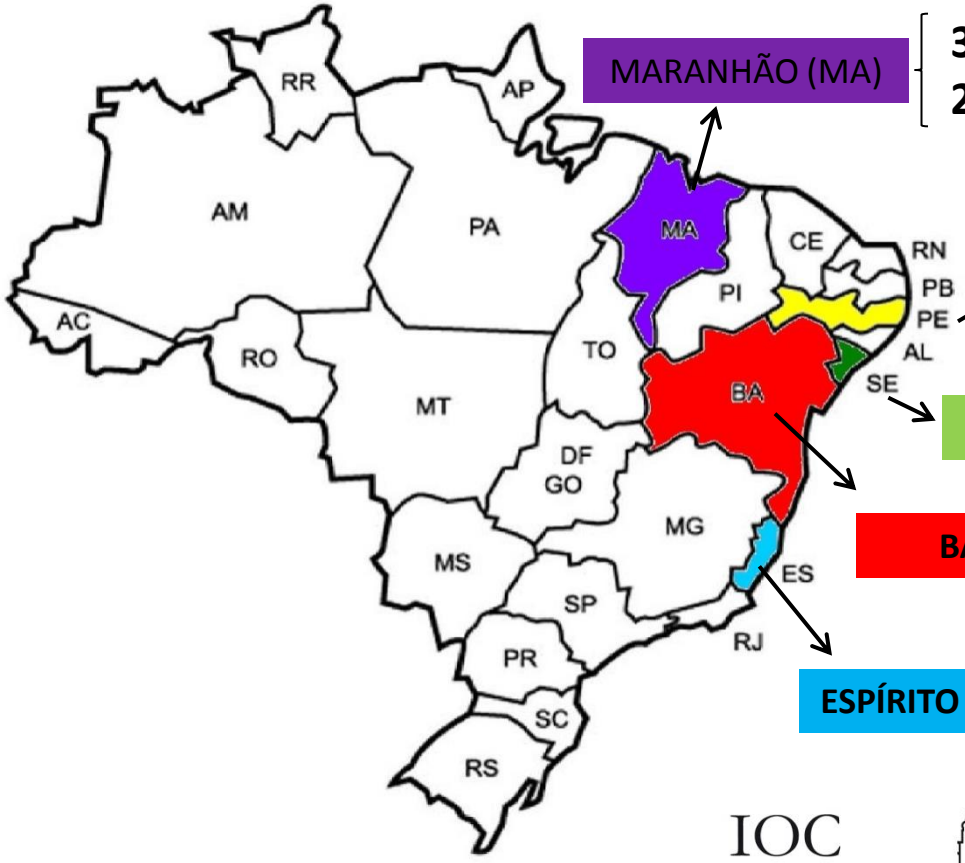
5 sentinel surveillance hospitals / 1 for each region

- 27 G1 P[8] < 5 years old
- 18 vaccinated / 9 unvaccinated
- May 2008 –August 2010

18 vaccinated from Northeastern

08 unvaccinated from Northeastern

1 unvaccinated from Southeastern



MARANHÃO (MA) — 3 unvaccinated, 2 vaccinated

PERNAMBUCO (PE) — 2 unvaccinated, 2 vaccinaed

SERGIPE (SE) — 2 unvaccinated, 14 vaccinated

BAHIA (BA) — 1 unvaccinated

ESPÍRITO SANTO (ES) — 1 unvaccinated

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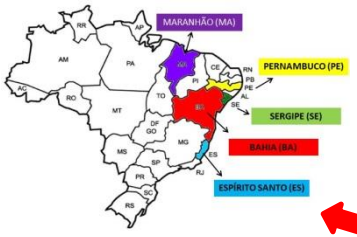
Intra-genotypic reassortment

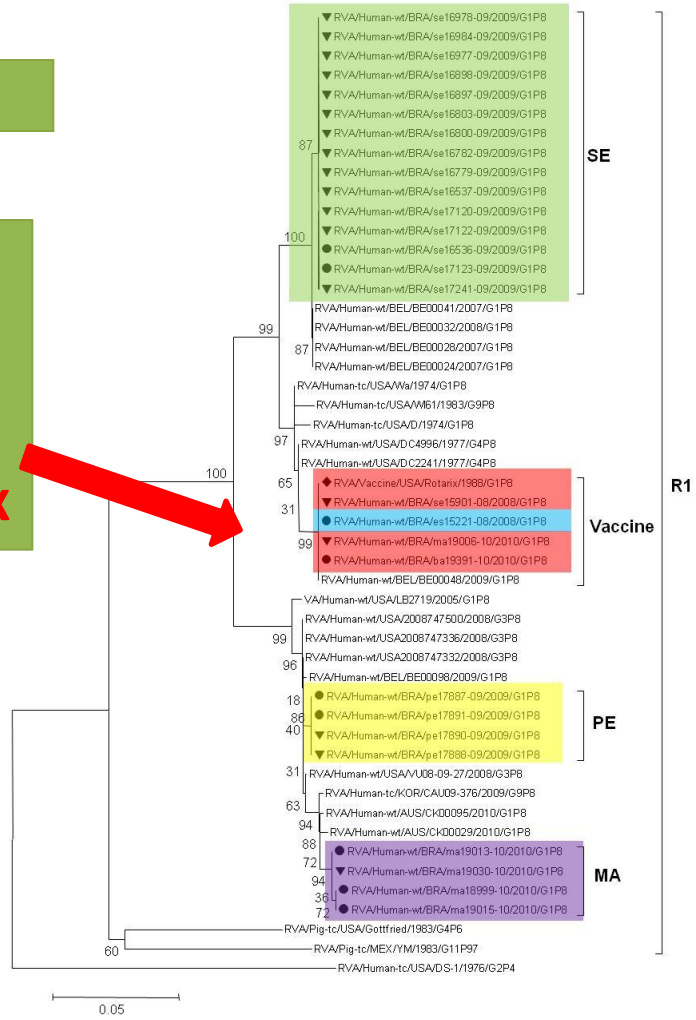
(VP1)



Southeast

VP2

unvaccinated
child
42 months
VP1 from Rotarix



Infection, Genetics and Evolution xxx (2013) xxx–xxx

Contents lists available at SciVerse ScienceDirect

Infection, Genetics and Evolution

journal homepage: www.elsevier.com/locate/meegid

Phylogenetic analysis of G1P[6] group A rotavirus strains detected in Northeast Brazilian children fully vaccinated with Rotarix™

Mariela Martínez Gómez [a,*], Marcelle Figueira Marques da Silva [a], Mark Zeller [c], Elisabeth Heylen [c], Jelle Matthijnssens [c], Maria Yuri Travassos Ichihara [b], Tatiana Lundgren Rose [a], Eduardo de Mello Volotão [a], Jose Paulo Gagliardi Leite [a]

Table 2

Genotype constellation comparison. The six Brazilian G1P[6] RVA strains analyzed in the current study are represented by RVA/Human-wt/BRA/BA17290/2009/G1P[6] strain. Green and red indicate Wa-like and DS-1-like gene segments, respectively. The P[6] VP4 genotype is colored yellow, and blue is used to indicate a gene segment of porcine origin. Brazilian strains are shown in bold.

	Strain	Origin	Genotypes									
			VP7	VP4	VP6	VP1	VP2	VP3	NSP1	NSP2	NSP3	NSP4	NSP5
Wa-like	RVA/Human-tc/USA/Wa/1974/G1P[8]	Human	G1	P[8]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/USA/Rotarix-A41CB052A/1988/G1P[8]	Human	G1	P[8]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-wt/BGD/Dhaka12/2003/G12P[6]	Human	G12	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-wt/ZAF/3176WC/2009/G12P[6]	Human	G12	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-wt/BGD/Matlab13/2003/G12P[6]	Human	G12	P[6]	I1	R1	C1	M1	A1	N1	T2	E1	H1
	RVA/Human-tc/KOR/CAU195/200X/G12P[6]	Human	G12	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-wt/DEU/GER172/2008/G12P[6]	Human	G12	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-wt/ECU/EC2184/200x/G11P[6]	Human	G11	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-tc/GBR/ST3/1975/G4P2A[6]	Human	G4	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-tc/AUS/RV3/1977/G3P[6]	Human	G3	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
	RVA/Human-wt/BRA/BA17290/2009/G1P[6]	Human	G1	P[6]	I1	R1	C1	M1	A1	N1	T1	E1	H1
DS-1-like	RVA/Human-tc/USA/DS-1/1976/G2P1B[4]	Human	G2	P[4]	I2	R2	C2	M2	A2	N2	T2	E2	H2
	RVA/Human-wt/BEL/F01322/2009/G3P[6]	Human	G3	P[6]	I2	R2	C2	M2	A2	N2	T2	E2	H2
	RVA/Human-wt/COD/DRC86/2003/G8P[6]	Human	G8	P[6]	I2	R2	C2	M2	A2	N2	T2	E2	H2
	RVA/Human-wt/BGD/N26/2002/G12P[6]	Human	G12	P[6]	I2	R2	C2	M2	A2	N1	T2	E6	H2
	RVA/Human-wt/BGD/RV161/2000/G12P[6]	Human	G12	P[6]	I2	R2	C2	M2	A2	N2	T2	E1	H2
	RVA/Human-wt/BGD/RV176/2000/G12P[6]	Human	G12	P[6]	I2	R2	C2	M2	A2	N2	T2	E6	H2
	RVA/Human-wt/USA/06-242/2006/G2P[6]	Human	G2	P[6]	I2	R2	C2	M2	A2	N2	T2	E2	H2

relationship with contemporary typical human Wa-like RVA strains. These results suggests that the fact that these strains were able to cause acute gastroenteritis in vaccinated children is likely not due to the genetic background of the strains, but rather to other factors such as host related factors, co-infecting pathogens or vaccine efficacy. P[6] RVA strains

WATER RESEARCH 45 (2011) 5755–5763

Available online at www.sciencedirect.com
SciVerse ScienceDirect
journal homepage: www.elsevier.com/locate/watres

Table 1 – Rotavirus specie A (RVA) detection from influent (24) and effluent (24) sewage samples by quantitative (qPCR) and qualitative (NSP4, VP4, VP7) PCR protocols for genotyping.

Year	Month	Sewage influent				Sewage effluent			
		qPCR	NSP4	VP4	VP7	qPCR	NSP4	VP4	VP7
2009	Aug	+	–	–	G2	–	–	–	–
		+	+	P[4]	G2	+	–	–	–
	Sep	+	+	P[4]	G2	+	–	–	–
		+	+	–	G2	+	–	–	–
	Oct	+	+	P[6]	G2	+	–	–	G2
		+	+	P[4]	G2	+	+	P[4]	G2
	Nov	+	+	P[6]	G2	+	+	–	G2
		+	+	P[4]	G2	+	–	–	–
	Dec	+	+	P[4]	G2	+	–	–	–
		+	+	P[6]	G2	–	–	–	–
2010	Jan	+	+	P[6]	G2	+	–	–	–
		+	+	–	G2	+	–	–	–
	Feb	+	+	P[6]	G2	+	–	–	–
		+	+	–	G2	–	–	–	–
	Mar	+	+	–	G2	–	–	–	–
		+	+	–	G2	+	+	–	G2
	Apr	+	+	–	G2	+	+	–	G2
		+	+	–	G2	+	–	–	G2
	May	+	+	P[4]	G2	–	–	–	–
		+	+	–	G2	+	–	–	–
	Jun	+	–	–	G2	+	–	–	–
		+	+	P[4]	G2	–	–	–	–
	Jul	+	+	P[6]	G2	–	–	–	–
		+	+	P[4]	G2	+	–	–	–

+: Positive; and –: negative.

One year environmental surveillance of rotavirus specie A (RVA) genotypes in circulation after the introduction of the Rotarix® vaccine in Rio de Janeiro, Brazil

Tulio Machado Fumian [a,*], *José Paulo Gagliardi Leite* [a], *Tatiana Lundgreen Rose* [a], *Tatiana Prado* [b], *Marize Pereira Miagostovich* [a]

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APPLIED AND ENVIRONMENTAL MICROBIOLOGY, Jan. 2008, p. 375–382 Vol. 74, No. 2
0099-2240/08/$08.00+0 doi:10.1128/AEM.00944-07

Molecular Detection and Characterization of Gastroenteritis Viruses Occurring Naturally in the Stream Waters of Manaus, Central Amazônia, Brazil[▽]

Marize P. Miagostovich,[1] Fabiana F. M. Ferreira,[1] Flávia R. Guimarães,[1] Túlio M. Fumian,[1] Leonardo Diniz-Mendes,[1] Sérgio Luiz B. Luz,[2] Luciete A. Silva,[2] and José Paulo G. Leite[1]*

TABLE 2. Frequencies of the viruses investigated and fecal coliforms detected in the areas studied

Pathogen	No. (%) found in:		Chi square	*P* value
	Urban area ($n = 24$)	Rural and forest areas ($n = 28$)		
Any enteric virus	21 (87.5)	10 (35.7)	14.4	<0.001
RV	15 (62.5)	8 (28.6)	6.0	0.014
NoV	3 (12.5)		3.7	0.09
HAstV	6 (25.0)	2 (7.1)	3.2	0.08
HAdV	15 (62.5)	1 (3.6)	21.1	<0.001
Fecal coliforms	24 (100.0)	14 (50.0)	16.4	<0.001

RV = HAdV > HAsTV > NoV

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Journal of Virological Methods 170 (2010) 42–46

Detection of rotavirus A in sewage samples using multiplex qPCR and an evaluation of the ultracentrifugation and adsorption-elution methods for virus concentration

Tulio M. Fumian[a,*], José Paulo G. Leite[a], Alejandro A. Castello[b], Aldo Gaggero[c], Maria Susana L. de Caillou[d], Marize P. Miagostovich[a]

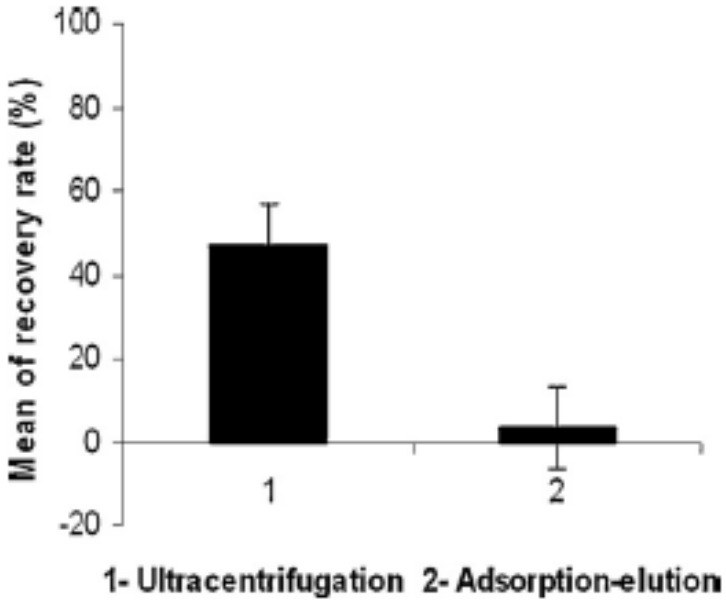


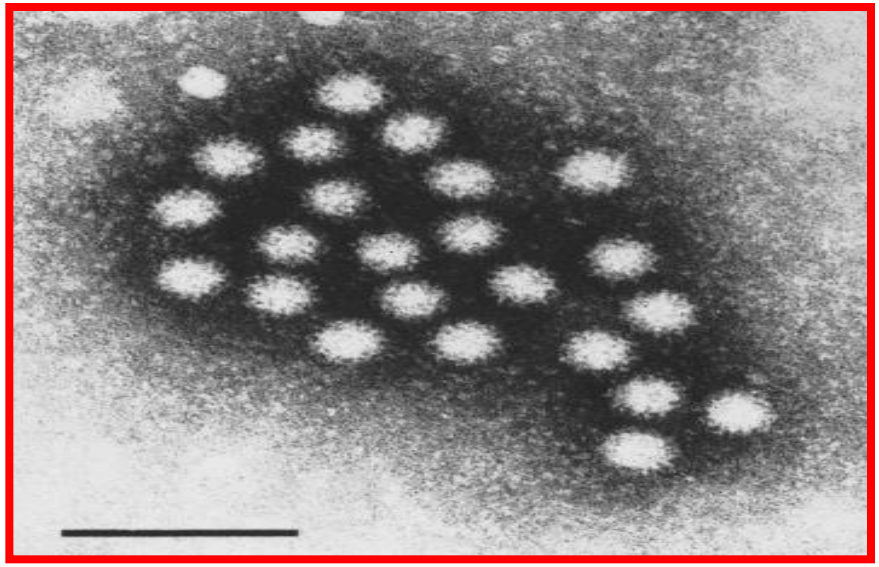
Fig. 1. The mean recovery rate of RV-A from sewage water following concentration using either the ultracentrifugation or adsorption-elution method ($n = 6$).

Burden of Norovirus infections

Patel et al. *Emerg. Infect. Dis*. 2008, 14(8):1224-31.

- **Developed countries:** ~900,000 episodes of diarrhea.
  ~64,000 hospitalization of children <5 years.

- **Developing countries:** ~1.1 million of hospitalizations
  ~218,000 deaths/year in children.



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Kapikian. *J Infect Dis*. 2000 ,181(2): S295-302..

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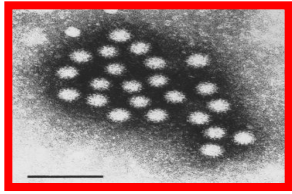
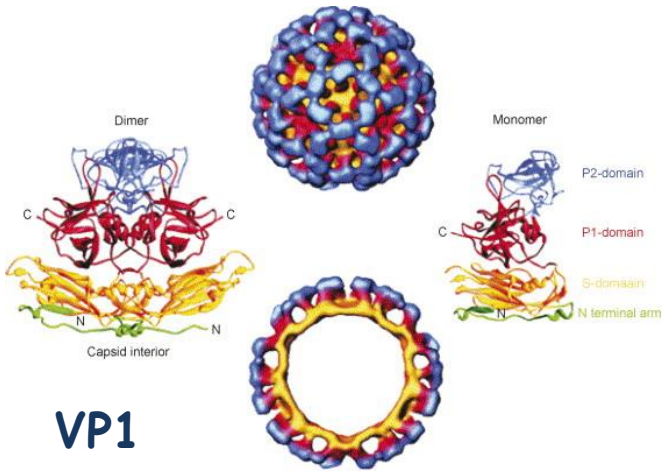
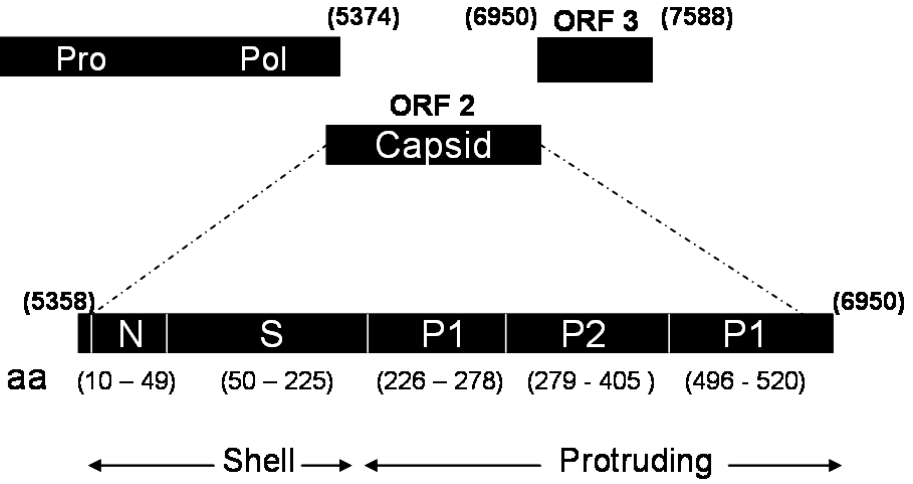
Norovirus properties



- Non-enveloped virus, 38-40 nm in diameter
- Icosahedral symmetry, 180 VP1
- Single stranded positive RNA
- Non-cultivable
- Virus receptor seems to be an HBGA
- Replication in cytoplasm
- Exit probably by Cell lysis



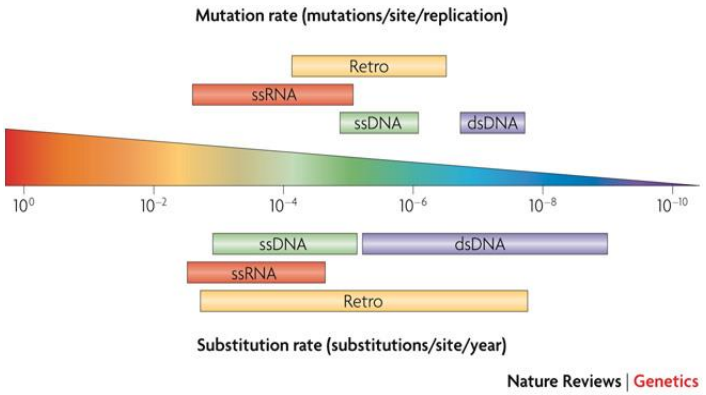


MECHANISMS FOR NOROVIRUS EVOLUTION

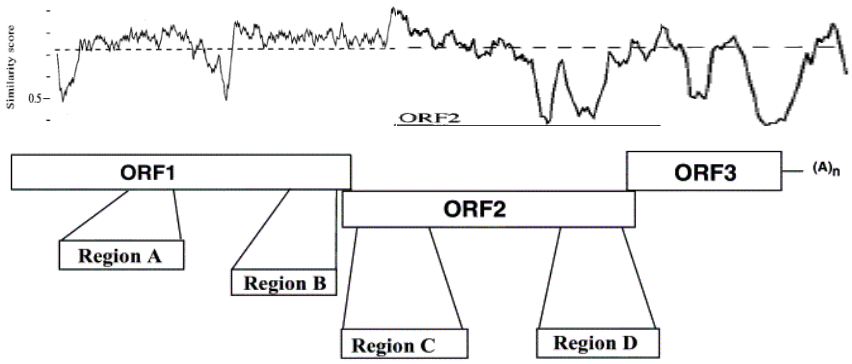
- **Ponctual Mutation(s)**

  estimated mutation rate:

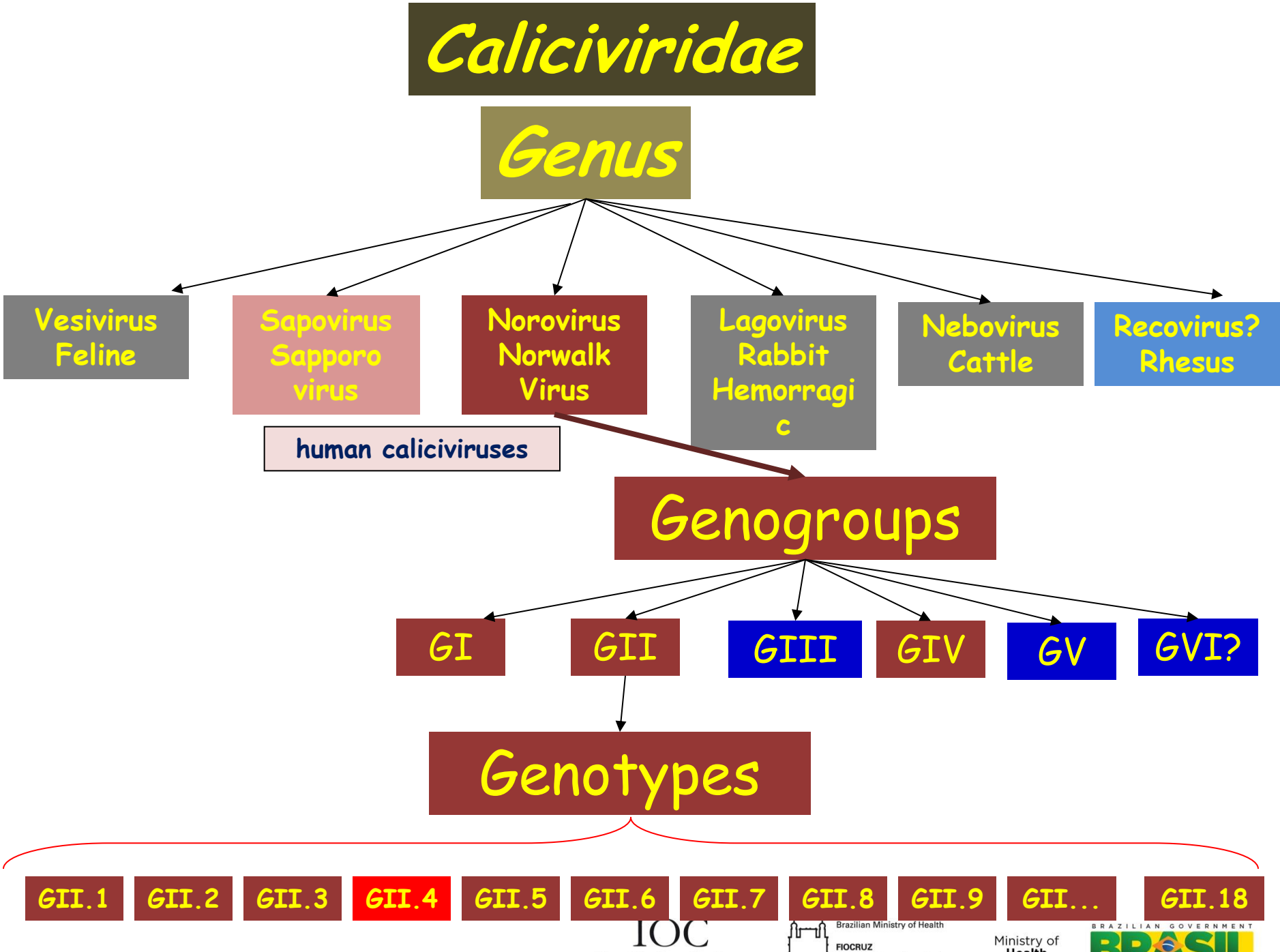
  1.21×10^{-2} to 1.41×10^{-2} substitutions per site per year



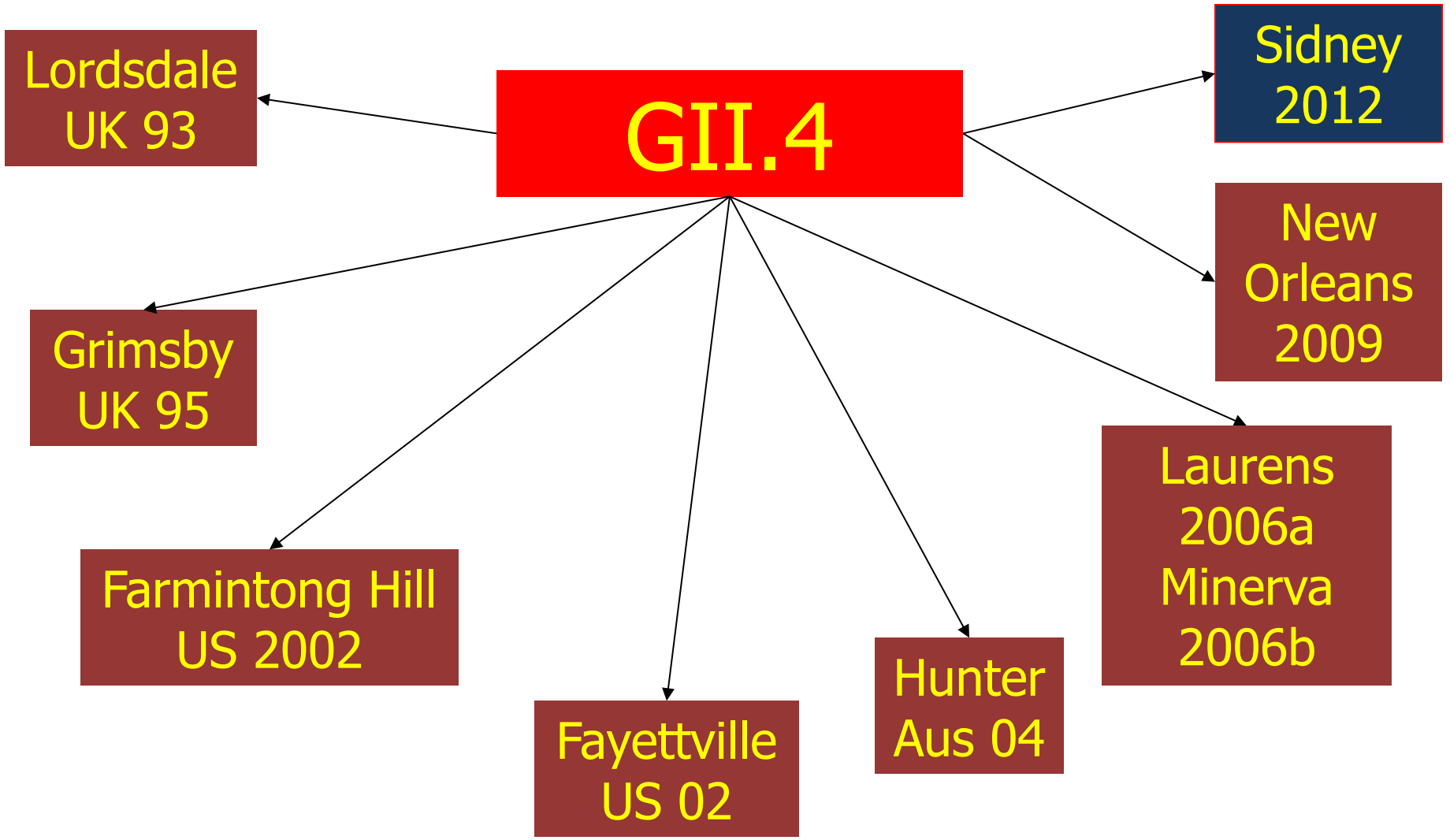
- **Recombination**



Victoria et al., Bayesian coalescent inference reveals high evolutionary rates and expansion of Norovirus populations. Infect Genet Evol. 2009 ; Rates of evolutionary change in viruses: patterns and determinants. Duffy S, Shackelton LA, Holmes EC. Nat Rev Genet. 2008 Apr;9(4):267-76.


Caliciviridae
Genus
Vesivirus
Feline
Sapovirus
Sapporo
virus
Norovirus
Norwalk
Virus
Lagovirus
Rabbit
Hemorragi
c
Nebovirus
Cattle
Recovirus?
Rhesus
human caliciviruses
Genogroups
GI
GII
GIII
GIV
GV
GVI?
Genotypes
GII.1
GII.2
GII.3
GII.4
GII.5
GII.6
GII.7
GII.8
GII.9
GII...
GII.18

Representatives Strains of GII.4 Genotype



Rowena Bull et. Al 2006, Ramirez et.al 2006, Monroe S et. al 2004, Dingle et. al 1995

Treatment

- No specific treatment
- Fluids replacement recommended
- Antiemetic
- VLPs Vaccine?

Norovirus vaccine development: next steps

Expert Rev. Vaccines 11(9), 1023–1025 (2012)

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"Although the disease is often self limited and recovery is the rule, norovirus infection is estimated to cause up to 10% of hospitalizations for gastroenteritis in the USA, up to 200,000 deaths in children under 5 years of age in developing countries, and mortality in the elderly."

Noroviruses (NoVs) are a common cause of acute gastroenteritis in humans, with an estimated 21 million cases occurring in the USA annually [1]. Although the disease is often self limited and recovery is the rule, NoV infection is estimated to cause up to 10% of hospitalizations for gastroenteritis in the USA [2], up to 200,000 deaths in children under 5 years of age in developing countries [3], and mortality in the elderly [4]. T

NoVs, in that failure to express certain HBGAs owing to a nonfunctional glycosylase has been associated with absolute resistance to infection (e.g., Norwalk virus and fucosyl transferase 2 [7]). HBGAs have been proposed to be an attachment factor or receptor for these NoVs. Adaptive immunity also influences susceptibility to infection in that the presence of serum antibodies that bind to VLPs and then

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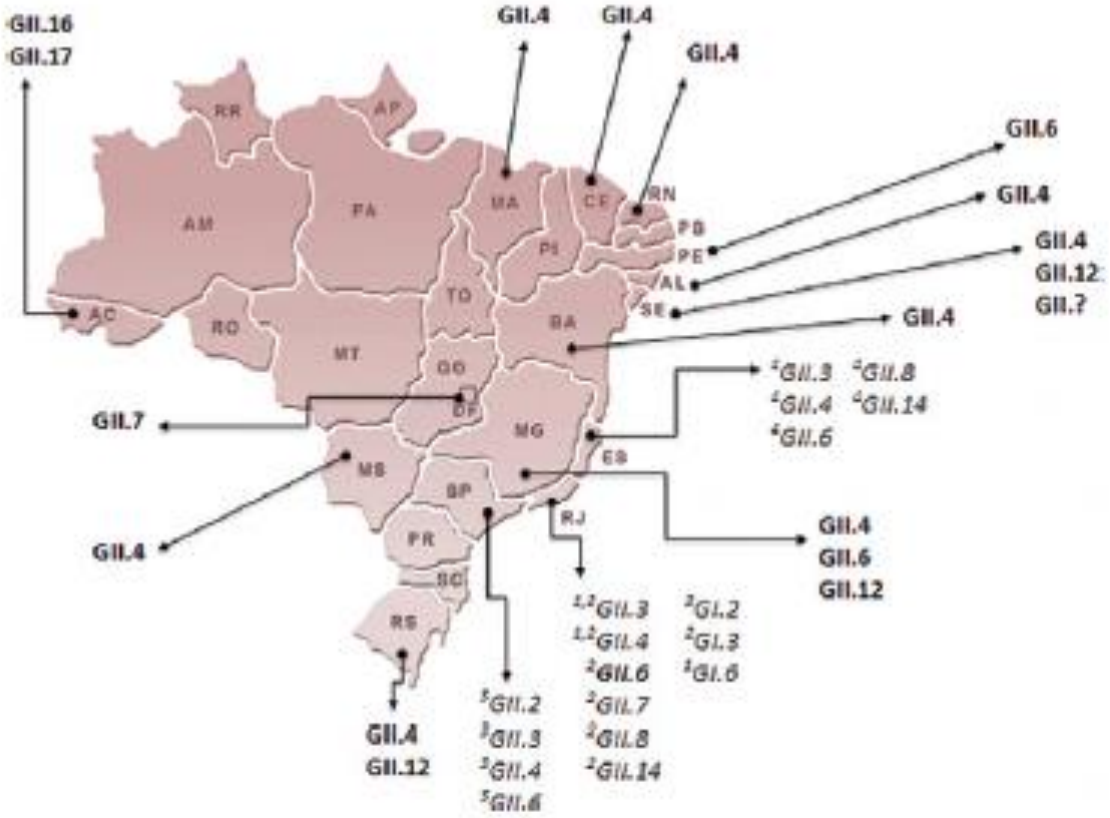
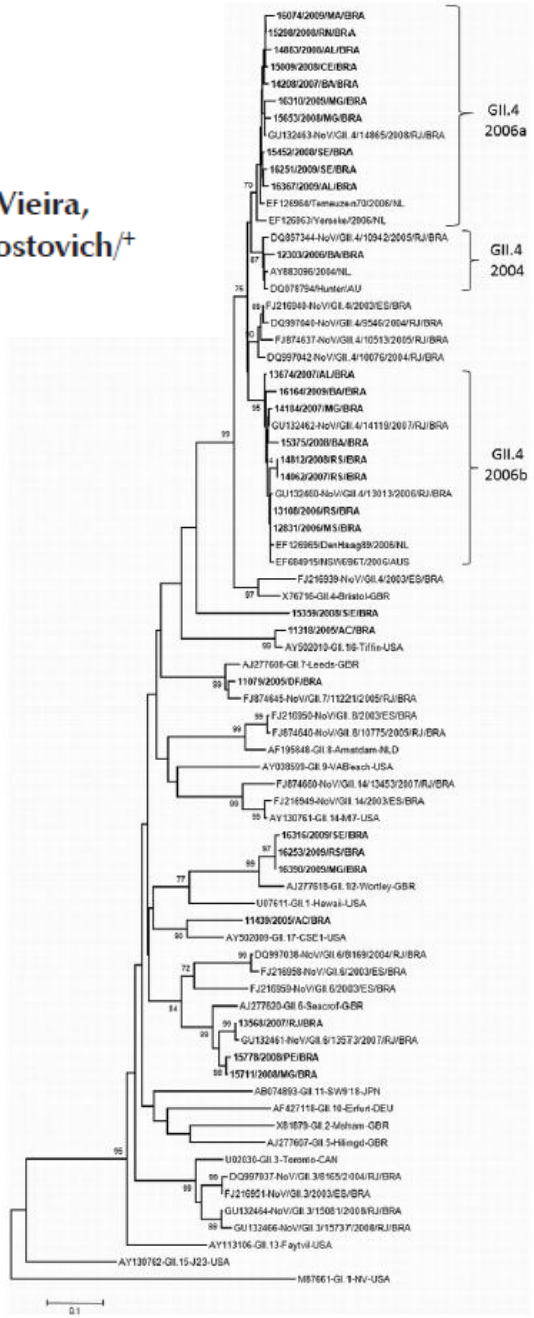
Genetic diversity of noroviruses in Brazil

Julia Monassa Fioretti, Mônica Simões Rocha Ferreira, Matias Victoria, Carmen Baur Vieira, Maria da Penha Trindade Pinheiro Xavier, José Paulo Gagliardi Leite, Marize Pereira Miagostovich/+

Laboratório de Virologia Comparada e Ambiental, Instituto Oswaldo Cruz-Fiocruz, Rio de Janeiro, RJ, Brasil





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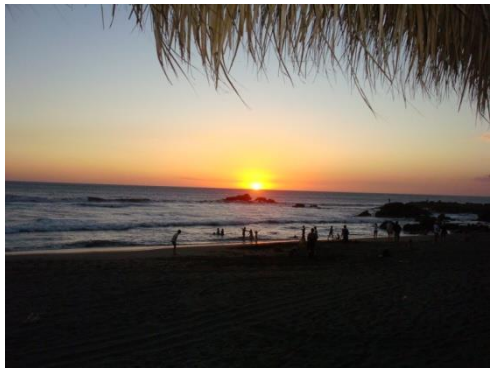
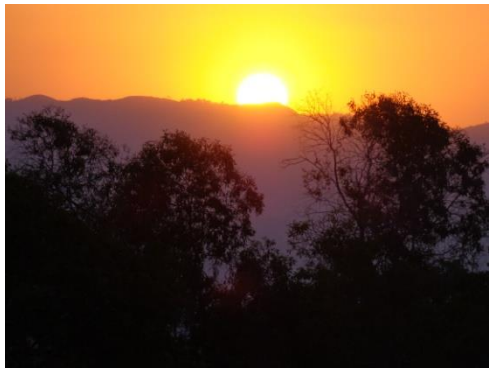
"There is nothing permanent except change"

Heraclitus

Webster *et al. Microbiol. Rev., 56:* 152 - 179, 1992



estadao.com.br
28 de Janeiro de 2008 | Atualizado às 12:40h

TEMPO: São Paulo 24°C 16°C Umidade: 80% Outras Cidades >>

MERCADO: US$ Comercial: R$ 1,792 +0,28% | US$ Paralelo: R$ 2,000 0,00% | Ibovespa: 56828,4 -1,10% | Hora: 11:58 | Fonte: AE | delay: 30'

VIDA& | SAÚDE

terça-feira, 15 de janeiro de 2008, 08:01 | Online

0 comentário(s)

Teclado infectado causa ga

Doença altamente contagiosa é provocada por

BBC Brasil - BBC

- Um teclado de computador e um mouse inf
que atingiu 103 pessoas em uma escola prim

Quarta-feira, 16 de Janeiro de 2008

Teclado infectado provoca surto de gastroenterite

Os utilizadores de computador não estão expostos apenas aos vírus informáticos. Prova disso, aconteceu numa escola em Washington, nos EUA, onde 103 pessoas, que partilhavam o aparelho, foram contaminados pelo vírus responsável pela gastroenterite.

Segundo um relatório divulgado recentemente pelo Centro norte-

American Journal of Hospital Infection

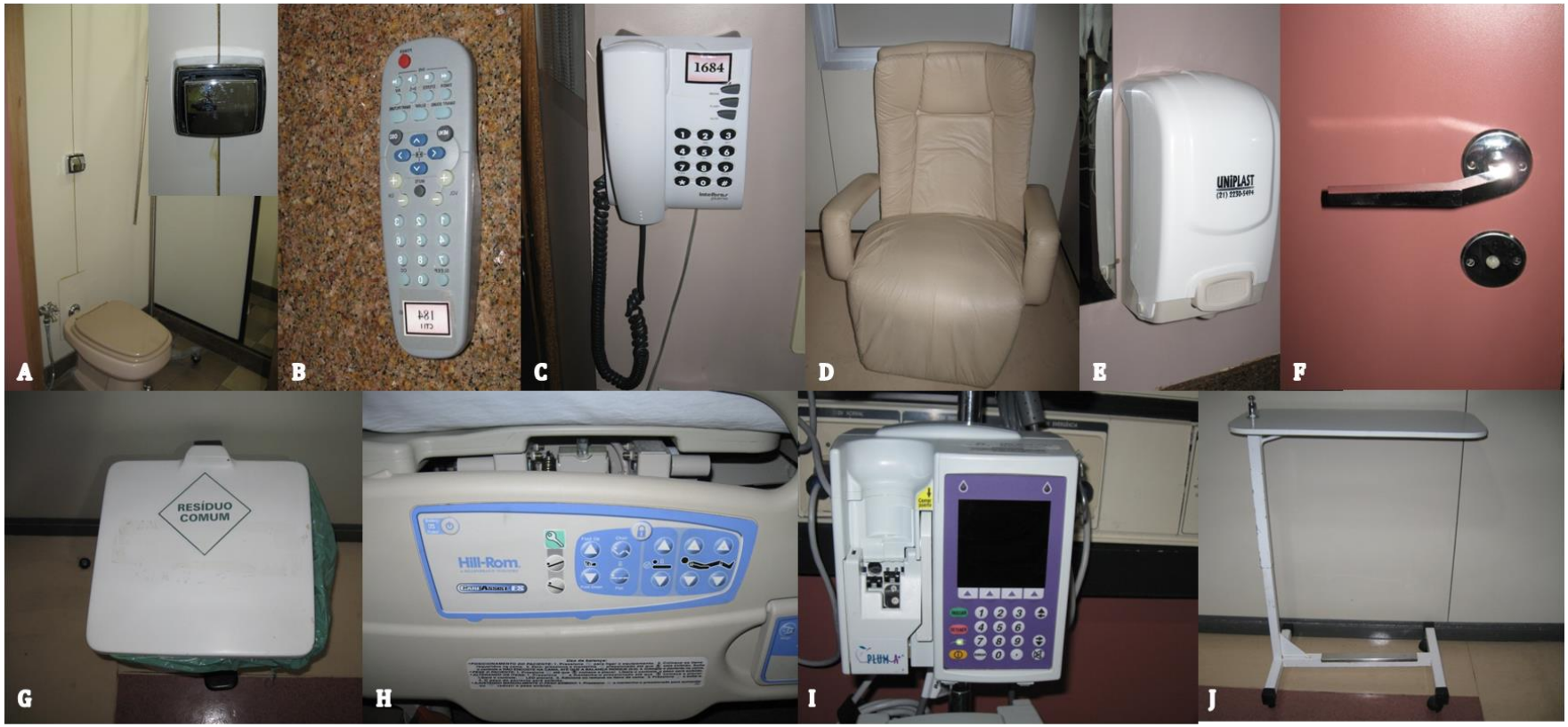
Group A Rotavirus detection on environmental surfaces in hospital ICU ward.

Ana Carolina Ganime, MSc[1]; Filipe A Carvalho-Costa, MD, PhD[2]; Marcos Cesar L Mendonça, PhD[1]; Carmen B VieiraMSc[1]; Marisa Santos, PhD[3]; Rubens Costa Filho, MD, MBA[4]; Marize P Miagostovich, PhD[1]; José Paulo G Leite, PhD[1*]

Table I: Monthly detection of group A rotavirus by nested-RT-PCR from environmental surface samples of an Intensive care unit in a hospital in Rio de Janeiro.

Fomites [a]	Months of year 2009						
	January	February	March [c]	April	May	June	Total + /fomite [b]
Keyboard infusion pumps	+ 2R	+ 1R	+ 1R	-	-	-	4 (9%)
Interior door handles	+ 3R	+ 2R	+ 1R	-	-	-	6 (14%)
Telephones	+ 1R	+ 1R	+ 1R	-	-	-	3 (7%)
Coffee support tables	+ 2R	-	-	-	+ 1R	-	3 (7%)
Exterior bathroom door handle	+ 2R	+ 3R	-	-	-	-	5 (12%)
Alcohol gel supports	+ 6R	+ 4R	-	-	-	+ 1R	11 (26%)
Chlorhexidine® supports	+ 3R	+ 5R	-	-	-	-	8 (19%)
Common trash bin covers	+ 2R	+ 5R	-	-	-	+ 1R	8 (19%)
TV remote controls	-	+ 1R	-	-	+ 2R	-	3 (7%)
Bed controls	+ 1R	-	-	+ 1R	+ 3R	-	5 (12%)
Flushing buttons	+ 2R	+ 1R	+ 1R	+ 2R	+ 3R	-	9 (21%)
Companion chairs	+ 2R	+ 1R	-	+ 4R	+ 1R	-	8 (19%)
Total + /month	26 (31%)	24 (29%)	4 (5%)	7 (8%)	10 (12%)	2 (2%)	73/504 (14%)

+ : positive samples; - : negative samples. Number R = number of positive rooms. [a] 12 samples were collected from each of 7 rooms; [b] 42 samples were collected from each fomite; [c] Cleaning protocol changed .



Representação dos pontos de coleta. A) botão de descarga, B) controle remoto da TV, C) telefone, D) cadeira do acompanhante, E) suporte para álcool gel e clorexidina, F) maçaneta interna da porta do leito e maçaneta externa do banheiro, G) tampa da lixeira de resíduos comuns, H) controle da cama, I) teclado da bomba de infusão, J) mesa de apoio.

Detection of enteric viruses in recreational waters of an urban lagoon in the city of Rio de Janeiro, Brazil

Carmen Baur Vieira[1], Anna Carolina de Oliveira Mendes[2], Flávia Ramos Guimarães[1], Tulio Machado Fumian[1], José Paulo Gagliardi Leite[1], Ana Maria Coimbra Gaspar[2], Marize Pereira Miagostovich[1/+]

Mem Inst Oswaldo Cruz, Rio de Janeiro, Vol. *108*(1): 77-83, February 2013

The efficiency of concentration methods used to detect enteric viruses in anaerobically digested sludge

Tatiana Prado[1/+], Wilma de Carvalho Pereira Bonet Guilayn[2], Ana Maria Coimbra Gaspar[3], Marize Pereira Miagostovich[1]

Water Research, Volume 47, Issue 8, 15 May 2013, Pages 2797–2810

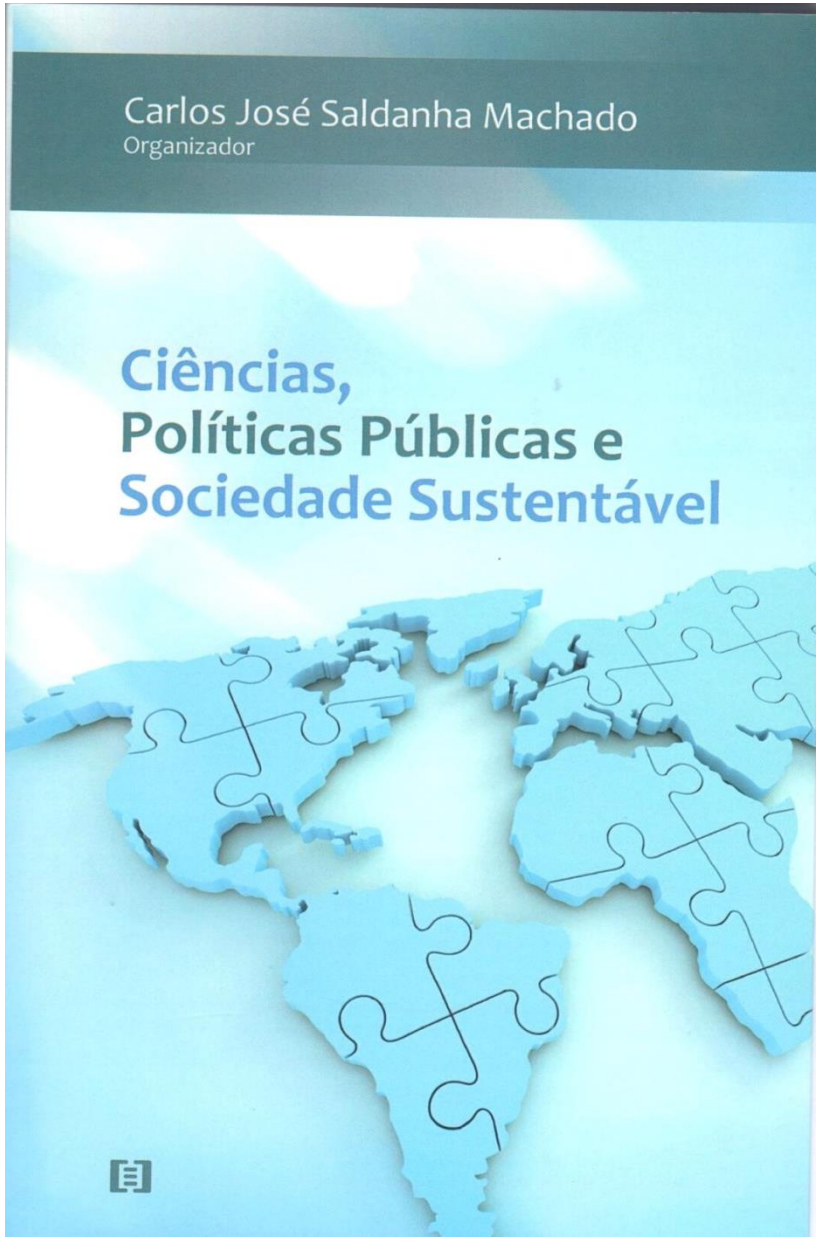
Detection and quantification of classic and emerging viruses by skimmed-milk flocculation and PCR in river water from two geographical areas

Byron Calgua[a], Tulio Fumian[b], Marta Rusiñol[a], Jesus Rodriguez-Manzano[a], Viviana A. Mbayed[c], Silvia Bofill-Mas[a], Marize Miagostovich[b], Rosina Girones[a,]

Food and Environmental Virology, September 2013, Volume 5, Issue 3, pp 144-149

Optimization of an Adsorption–Elution Method with a Negatively Charged Membrane to Recover Norovirus from Lettuce

Adriana de Abreu Corrêa, Marize Pereira Miagostovich



CAPÍTULO 4

Colaboração entre sociologia e virologia ambiental para a implementação de políticas públicas nacionais

Carlos José Saldanha Machado
Marize Pereira Miagostovich
Rodrigo Machado Vilani

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Promoção da relação saúde–saneamento–cidade por meio da Virologia Ambiental

CARLOS JOSÉ SALDANHA MACHADO
MARIZE PEREIRA MIAGOSTOVICH
JOSÉ PAULO GAGLIARDI LEITE
RODRIGO MACHADO VILANI

1. Introdução. 2. Constituição Federal, direito à saúde e visão holística da cidade. 3. Características da metodologia da Virologia Ambiental. 4. Estatuto da Cidade – Lei nº 10.257/2001. 5. Política Nacional de Meio Ambiente – Lei nº 6.938/81. 6. Política Nacional de Recursos Hídricos – Lei nº 9.433/97. 7. Política Federal de Saneamento Básico – Lei nº 11.445/2007. 8. Síntese das relações entre as políticas públicas analisadas e a Virologia Ambiental. 9. Reflexões, conclusões e recomendações.

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World Day for Water
March 22nd, 1993
United Nations General Assembly

Iguaçu Falls

Laboratory of Comparative and Environmental Virology

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Ministério da Saúde

GOVERNO FEDERAL BRASIL PAÍS RICO É PAÍS SEM POBREZA

FAPERJ
Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro

CAPES

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Conselho Nacional de Desenvolvimento Científico e Tecnológico

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Thank you and Welcome

Obrigado e Bem Vindos

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Efficacies of Sodium Hypochlorite and Quaternary Ammonium Sanitizers for Reduction of Norovirus and Selected Bacteria during Ware-Washing Operations

Lizanel Feliciano, Jianrong Li*, Jaesung Lee, Melvin A. Pascall*

Cross-contamination of ready-to-eat (RTE) foods with pathogens on contaminated tableware and food preparation utensils is an important factor associated with foodborne illnesses. To prevent this, restaurants and food service establishments are required to achieve a minimum microbial reduction of 5 logs from these surfaces. This study evaluated the sanitization efficacies of ware-washing protocols (manual and mechanical) used in restaurants to clean tableware items. Ceramic plates, drinking glasses and stainless steel forks were used as the food contact surfaces. These were contaminated with cream cheese and reduced-fat milk inoculated with murine norovirus (MNV-1), *Escherichia coli* K-12 and *Listeria innocua*. The sanitizing solutions tested were sodium hypochlorite (chlorine), quaternary ammonium (QAC) and tap water (control). During the study, the survivability and response to the experimental conditions of the bacterial species was compared with that of MNV-1. The results showed that current ware-washing protocols used to remove bacteria from tableware items were not sufficient to achieve a 5 log reduction in MNV-1 titer. After washing, a maximum of 3 log reduction in the virus were obtained. It was concluded that MNV-1 appeared to be more resistant to both the washing process and the sanitizers when compared with *E. coli* K-12 and *L. innocua*.