

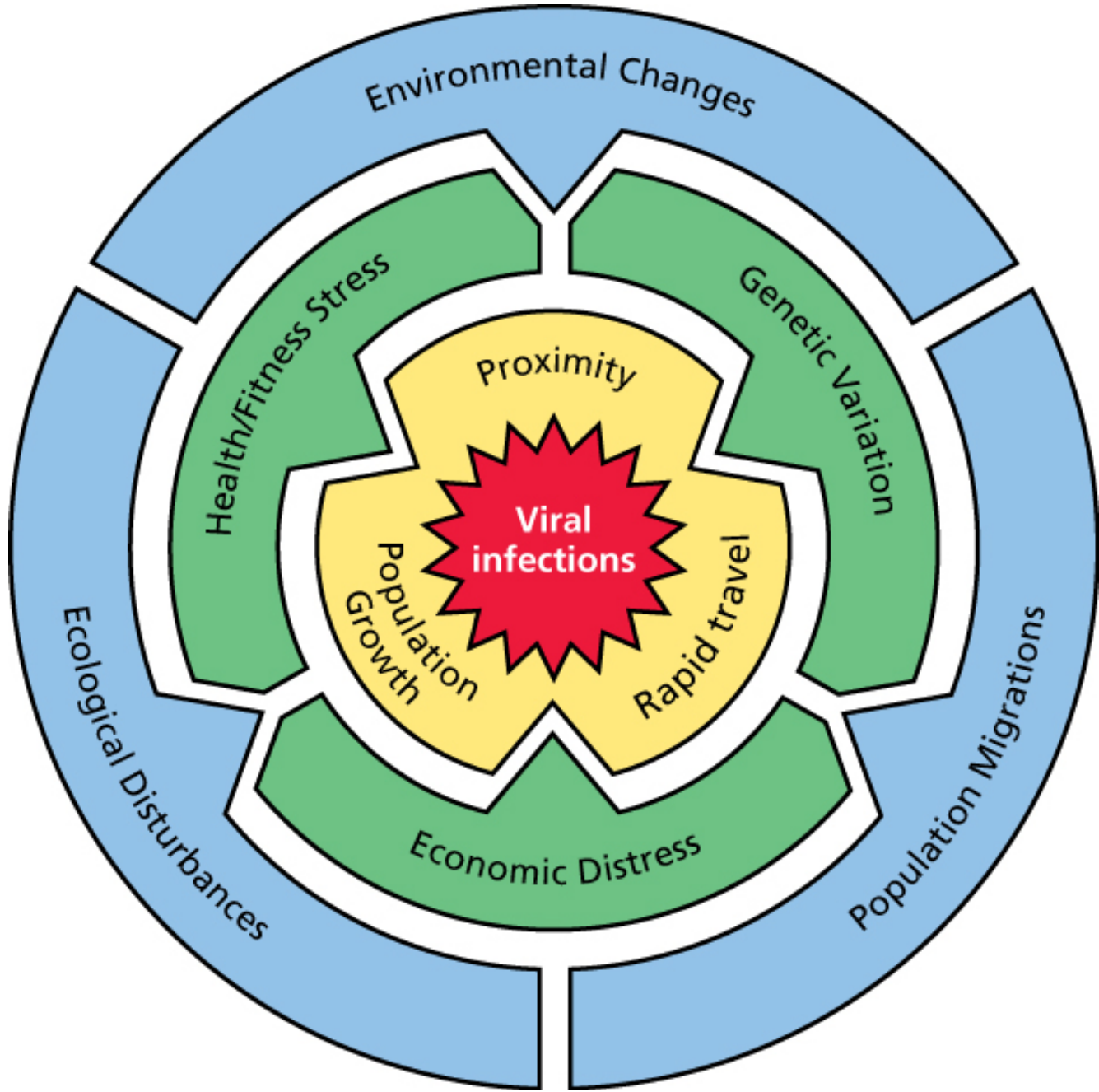
Crónica de una pandemia anunciada

o

Autopsia en Vivo

Gary A. Toranzos, Ph.D.
Catedrático UPR

- Emerging Pathogens
- Reservoirs
- Disinfectants
- Science needed **AND WHAT WE CAN DO RIGHT NOW!!!!**



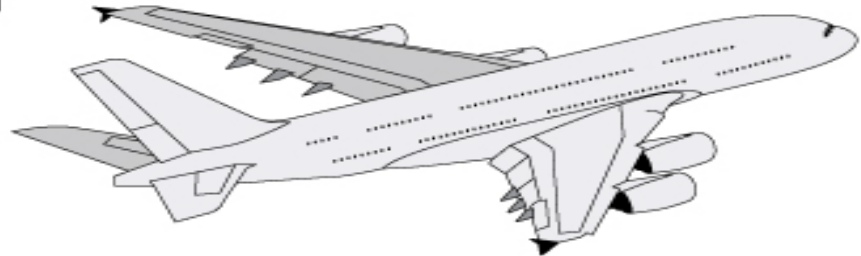
Migraciones de Europa a America

Human actions



Dams and water impoundments
Irrigation
Massive deforestation
Rerouting of wildlife migration patterns
Wildlife parks
Long distance transport of livestock and birds

Air travel
Uncontrolled urbanization
Day care centers
Hot tubs
Air conditioning
Millions of used tires



Blood transfusion
Xenotransplantation
Societal changes with regard to drug abuse and sex

More virulent...



**...less chance
for transmission**

Less virulent...



**...greater chance
for transmission**



Photograph courtesy of Juliet Pulliam, Princeton University.

Table 11.3 Ecological and social parameters facilitate transmission of infection to new hosts

Transmission parameter	Action or example
Contact with bodily fluids of infected hosts	Hunting and consumption of wild game; intimate contact with infected animals in the wild, in farms, at zoos, or in the home
Sharing a resource with different species	Infected fruit bats, pigs, rodents, and humans share food or inhabit the same or nearby space
Being host to the same insect vector	Japanese encephalitis virus infection is spread by mosquitoes that feed on herons, people, and pigs
Encroachment by one species into the habitat of another	Humans enter the jungle and are bitten by mosquitoes that are part of an established host-virus interaction or cycle

CORONAVIRUS-ABOUT 121nm

Sizes of Viruses/Bacteria

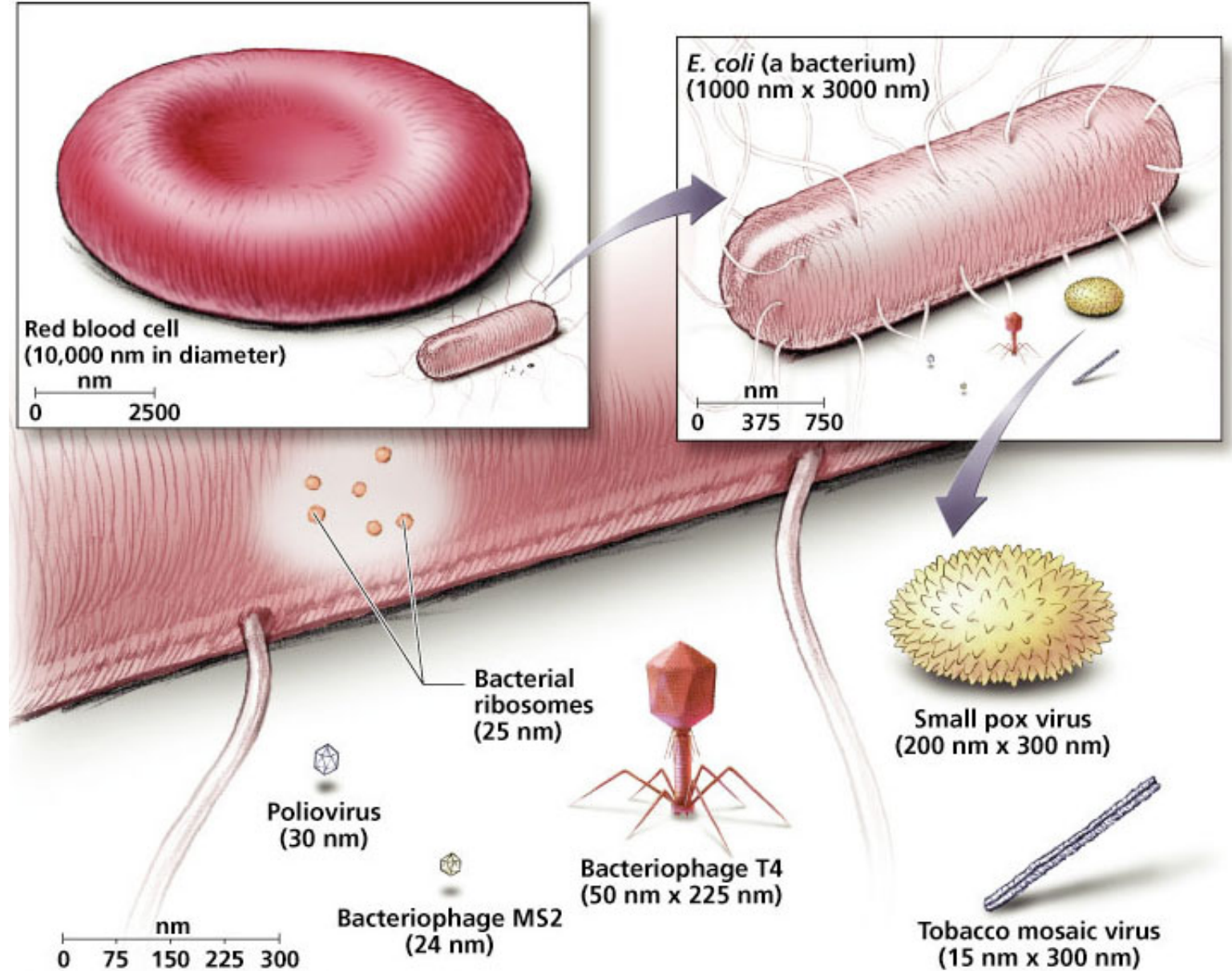
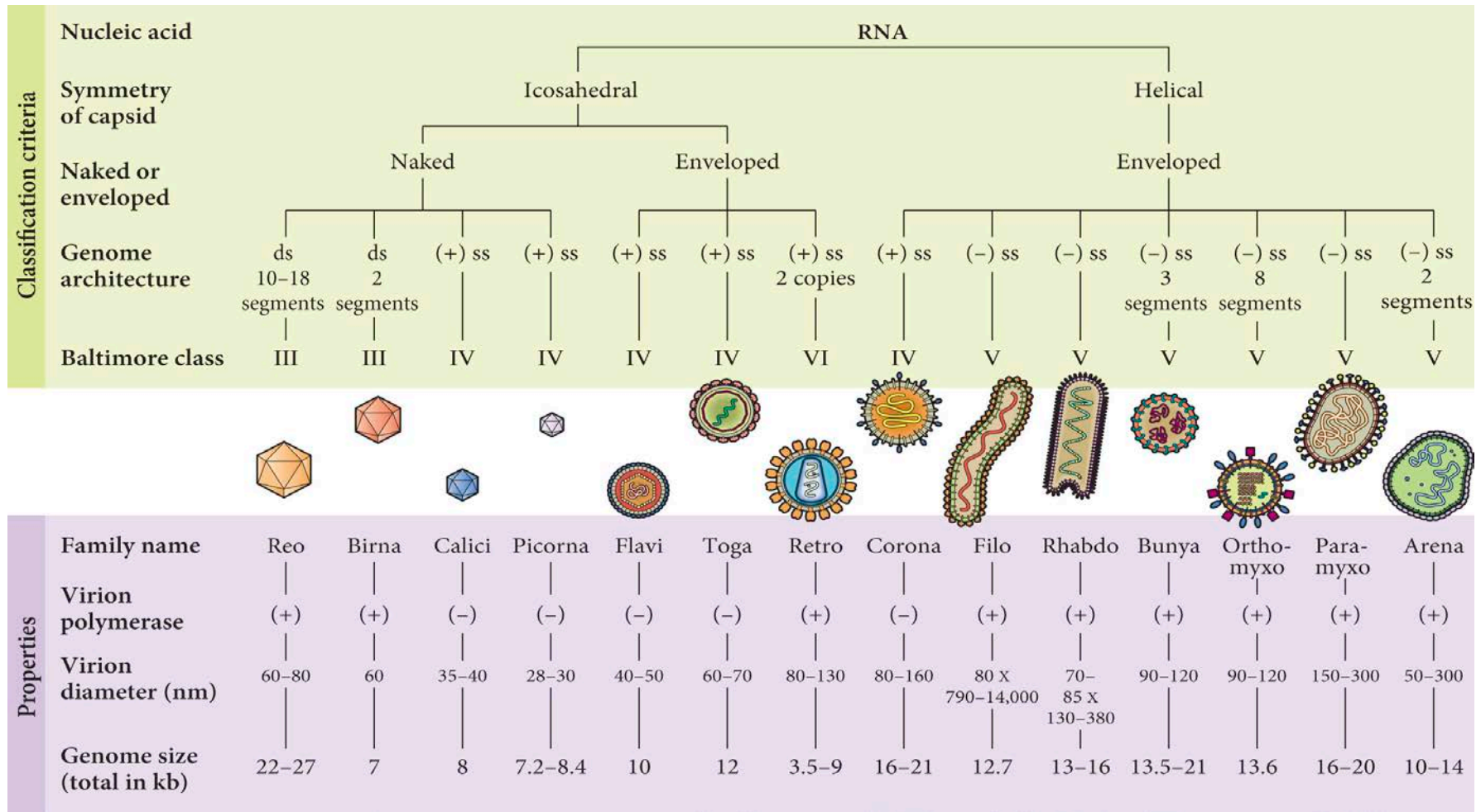


Figure 13.4

Virus Classification

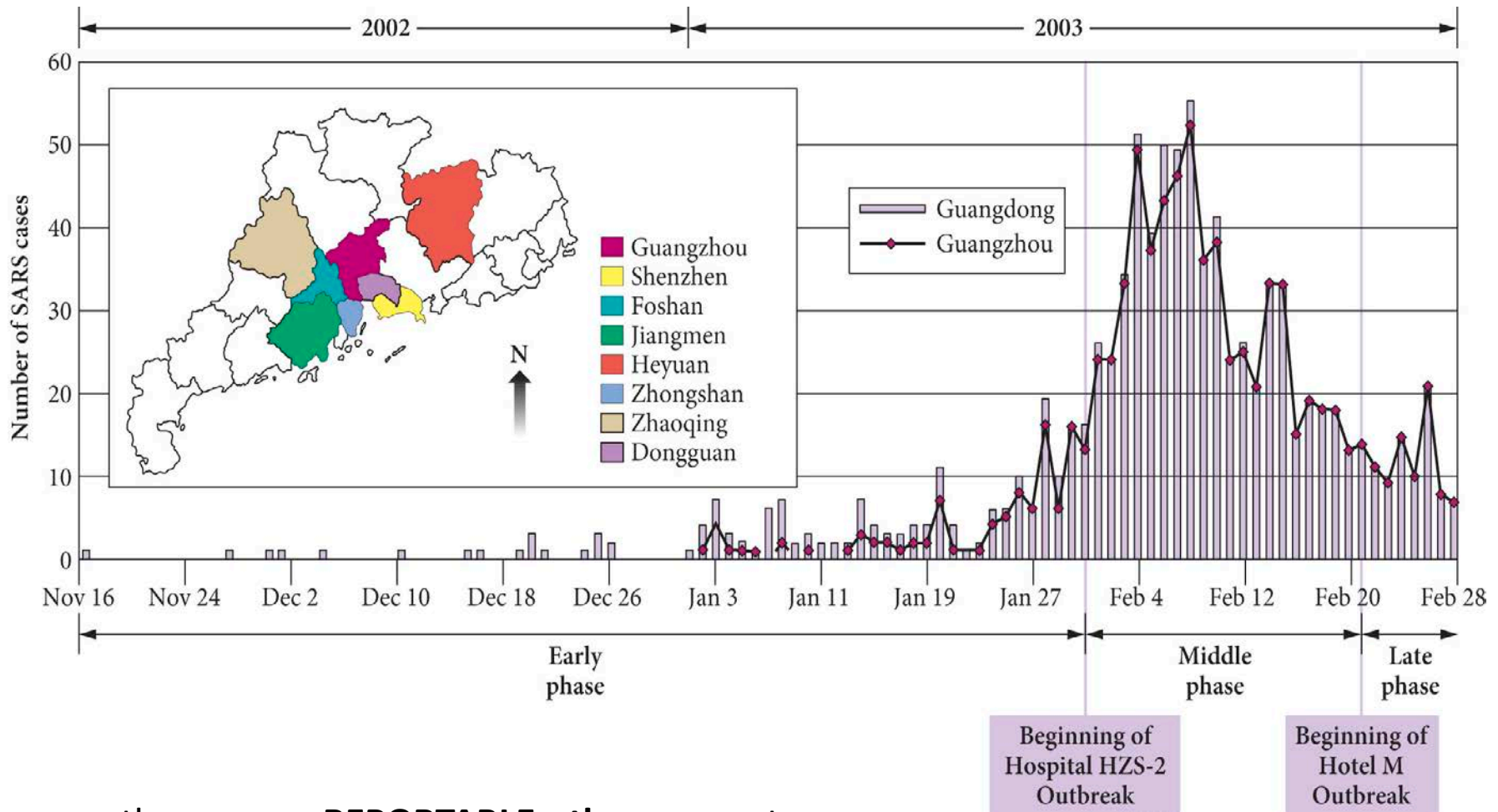


Adapted from M. H. V. van Regenmortel et al. (ed.), *Virus Taxonomy Classification and Taxonomy of Viruses: Sixth Report of the International Committee on Taxonomy of Viruses* (Springer-Verlag, Vienna, Austria, 1995), as appears in S. J. Flint, L. W. Enquist, R. M. Krug, V. R. Racaniello, and A. M. Skalka, *Principles of Virology: Molecular Biology, Pathogenesis, and Control*, 2nd ed. (ASM Press, Washington, DC, 2003).

Virus Tropisms: They will infect specifically certain tissues as a result of the presence of viral receptors that allow for infection of the cell ACE2 in the case of SARS CoV2

Location	Virus(es)
Skin	
Arthropod bite	Bunyavirus, flavivirus, poxvirus, reovirus, togavirus
Needle puncture, sexual contact	Hepatitis C and D viruses, cytomegalovirus, Epstein-Barr virus, hepatitis B virus, human immunodeficiency virus, papillomavirus (localized)
Animal bite	Rabies virus
Respiratory tract	
Localized upper tract	Rhinovirus; coxsackievirus; coronavirus; arenaviruses; hantavirus; parainfluenza virus types 1–4; respiratory syncytial virus; influenza A and B viruses; human adenovirus types 1–7, 14, 21
Localized lower tract	Respiratory syncytial virus; parainfluenza virus types 1–3; influenza A and B viruses; human adenovirus types 1–7, 14, 21; severe acute respiratory syndrome coronavirus
Entry via respiratory tract followed by systemic spread	Rubella virus, arenaviruses, hantavirus, mumps virus, measles virus, varicella-zoster virus, poxviruses
Alimentary tract	
Systemic	Enterovirus, reovirus, adenovirus types 40 and 41
Localized	Coronavirus, rotavirus
Urogenital tract	
Systemic	Human immunodeficiency virus type 1, hepatitis B virus, herpes simplex virus
Localized	Papillomavirus
Eyes	
Systemic	Enterovirus 70, herpes simplex virus
Localized	Adenovirus types 8, 22

Coronaviruses

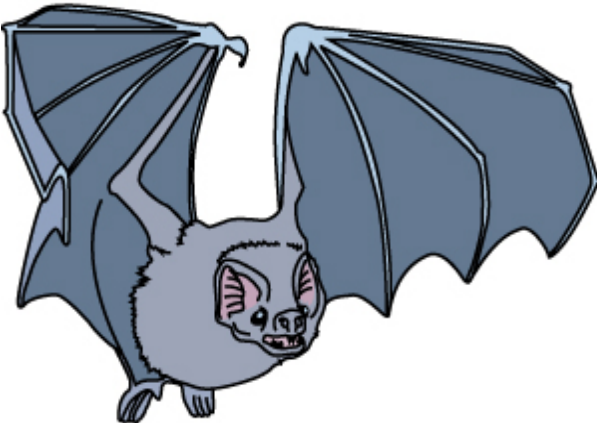
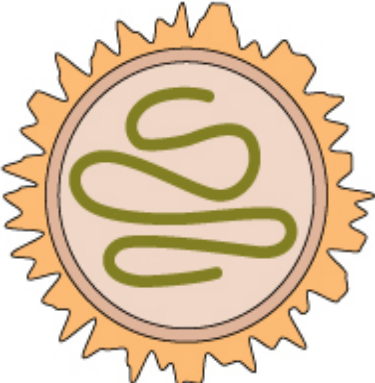


Some pathogens are **REPORTABLE**-others are not

Adapted from the Chinese SARS Molecular Epidemiology Consortium, *Science* **303**:1666–1669, 2004, with permission.



SARS-CoV



Bats

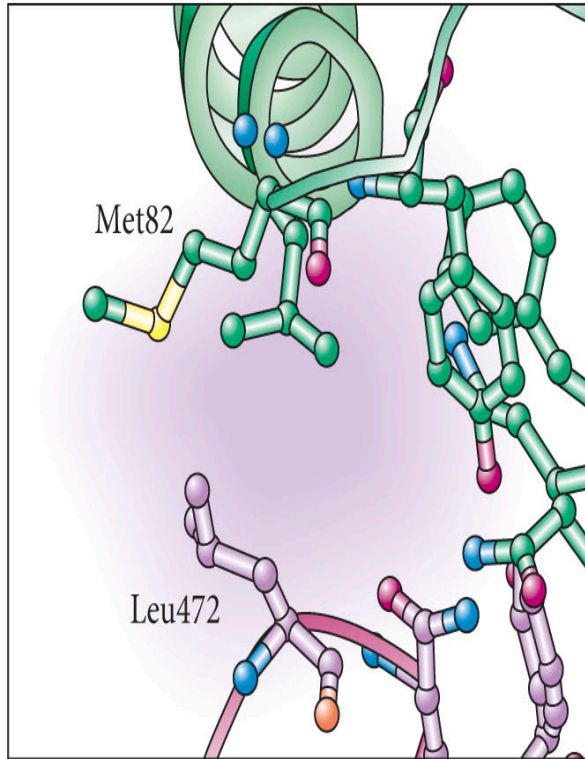
?



Civets

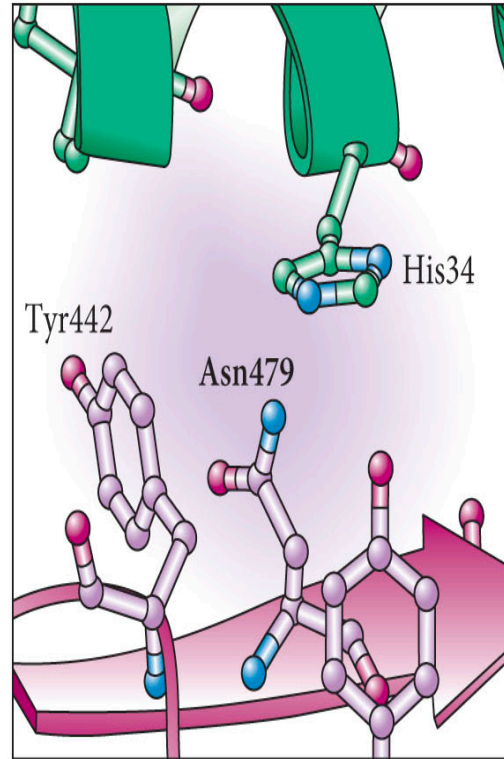
Coronaviruses

A possible attenuation mutation: L472P



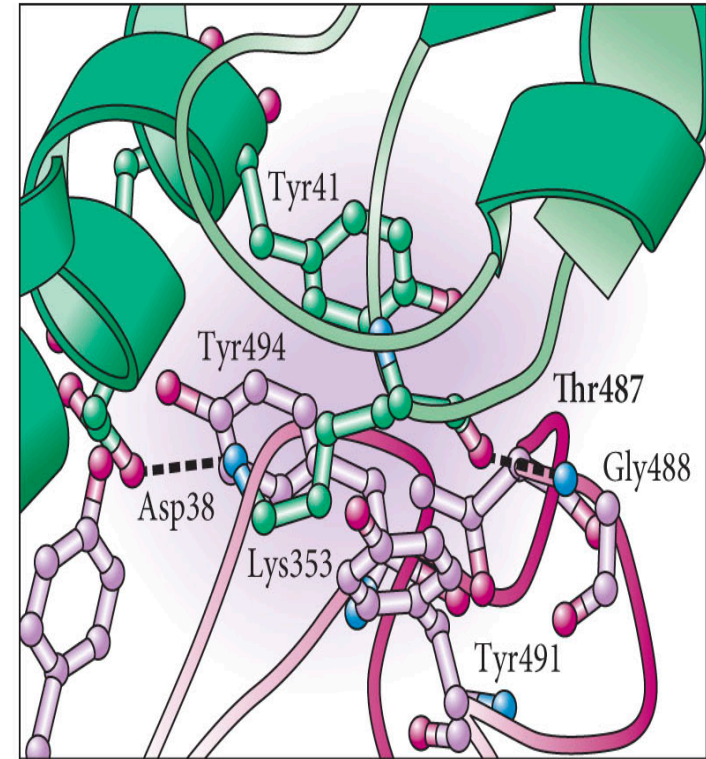
A

From civet to human: K479N



B

From human to human: S487T



C

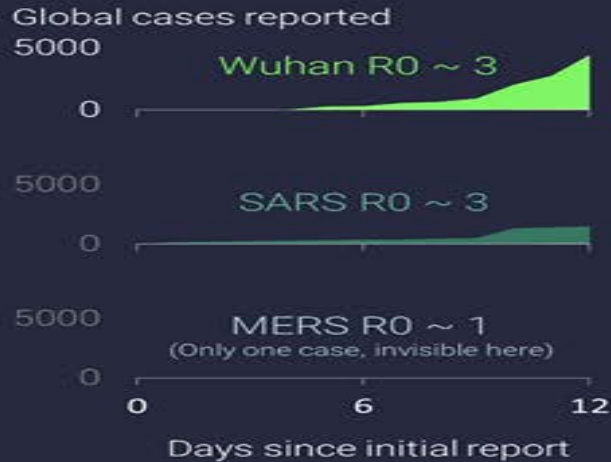
May change avidity for viral receptors

Adapted from F. Li et al., *Science* 309:1864–1868, 2005, with permission.

How fast is the Wuhan Virus spreading?

Estimates place the **reproduction number** of the Wuhan Virus at **about 3**, similar to the SARS outbreak in 2003 and the common flu.

With all the media attention, it seems pretty fast.



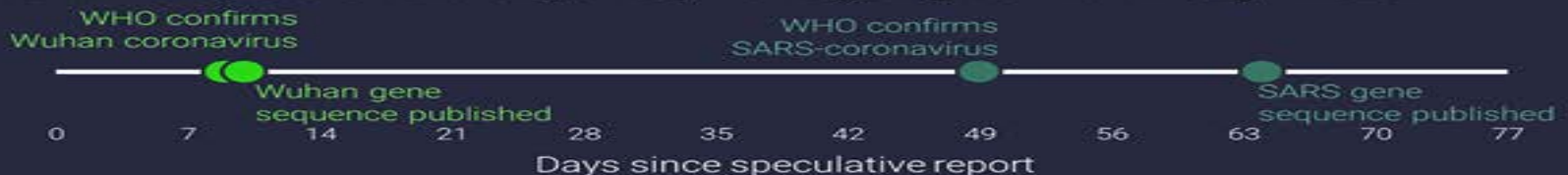
The **reproduction number (R_0)** represents the average number of people that a contagious person can infect in a non-vaccinated community.



But looking at the long-term outlook of previous cases...



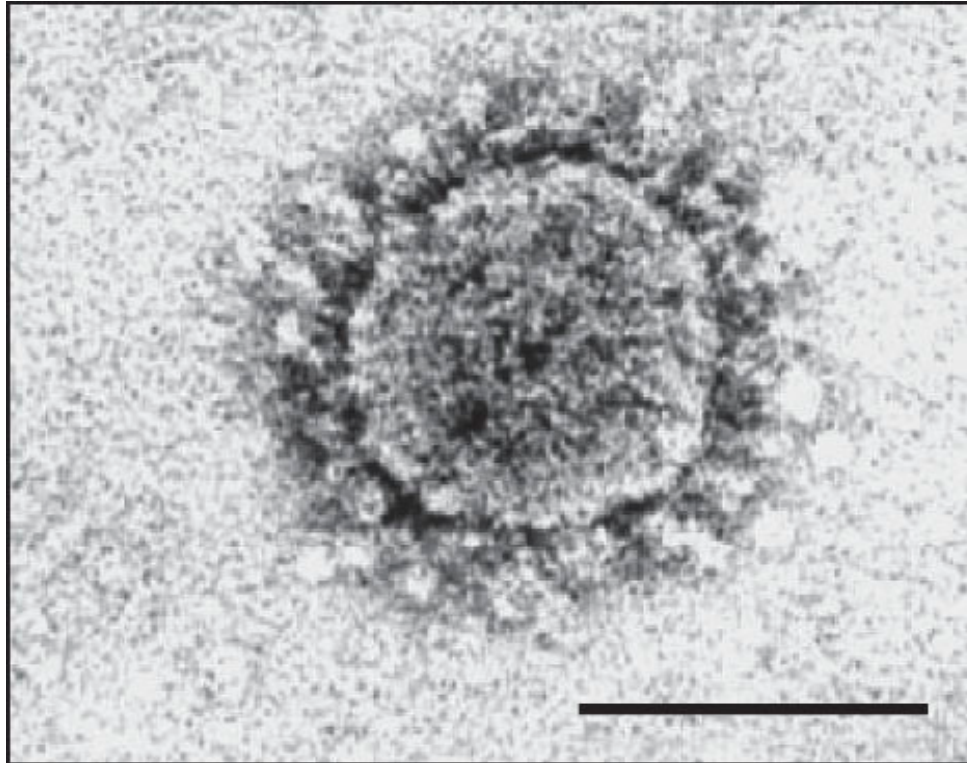
and the speed of the response, we're going to live through 2020.



Remember to **wash your hands properly and don't touch your face.**
Sources: WHO, CDC, ECDC, Anderson & May (1991), Althaus (2014).
This does not act as a substitute for official reports and scientific publications.

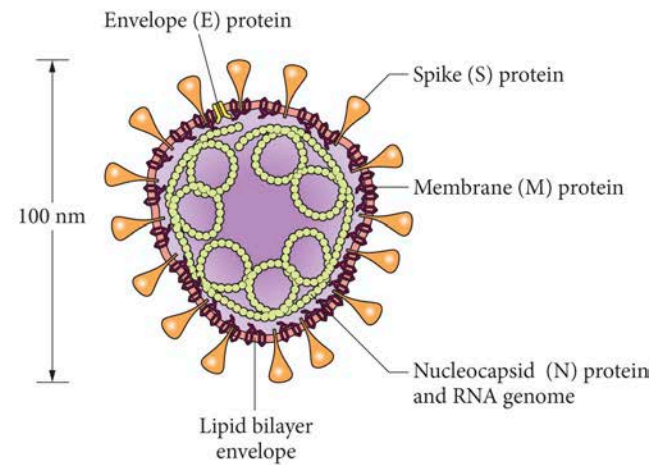
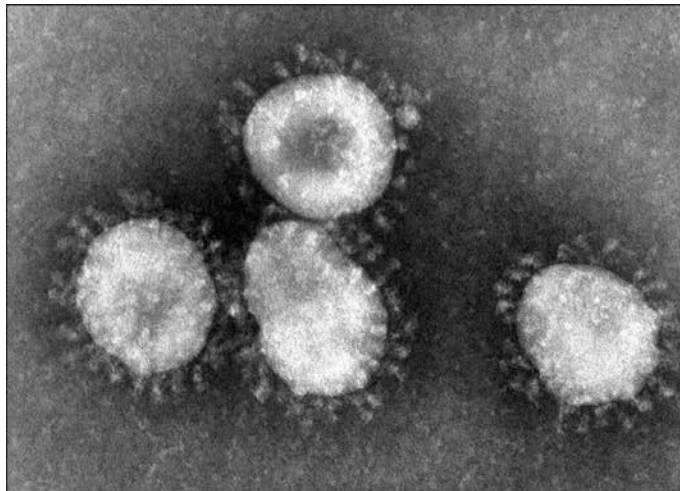
Why is Sequencing important? and how are these sequences used?

- Testing for infection
 - Early detection
 - What tests are available
 - How fast
 - How important
 - Development of **Potential Vaccines** (synthetic biology)



From T. J. Ksiazek et al., *N. Engl. J. Med.*
348:1953–1966, with permission.

Coronaviruses

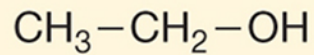


Schematic adapted from P. S. Masters, p. 193–292, in K. Maramorosch and A. J. Shatkin (ed.), *Advances in Virus Research*, vol. 66 (Academic Press, San Diego, CA, 2006), with permission.

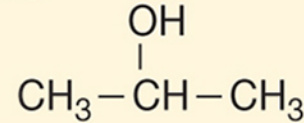
Alcohols

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

Alcohols



Ethanol



Isopropanol

- Among the most widely used disinfectants and antiseptics (**70% is best, however about 60% fine**)
- Two most common are ethanol and isopropanol
- **Bactericidal, fungicidal, but not sporicidal**
- Inactivate **enveloped viruses**
- **Denature proteins and dissolve membrane lipids**

Conditions Influencing the Effectiveness of Antimicrobial Agent Activity

- Pathogen Population size
 - larger microbial populations take longer to kill than smaller populations-how many virions are present in an average sneeze???? (e.g. 10,000/droplet, or 100,000/droplet)
- Population composition on fomites
 - microorganisms differ markedly in their sensitivity to antimicrobial agents
 - **HOW DOES AERIAL AND GROUND SPRAYING HELP?**
 - Wouldn't focused disinfection work better? Use alcohol to wipe surfaces that people actually touch, rather than spraying the air???????

More Conditions...

- **Concentration** of an antimicrobial agent
 - usually higher concentrations kill more rapidly
- **Duration** of exposure
 - longer exposure \Rightarrow more organisms killed or eliminated by hand-washing**
- **Temperature**
 - higher temperatures usually increase killing
- **Physicochemical Conditions-WASH YOUR HANDS!!!!!!**
 - **pH, viscosity, concentration of organic matter, etc. can profoundly impact effectiveness WASH YOUR HANDS!!!**

Viral Stability in the Environment

- Enveloped viruses lose their infectivity rather quickly in the environment, especially at high temperatures
 - Organic material helps in survival
 - SARS---- how long???? Hours depending on type of matrix
 - SARS CoV2 can be spread by aerosols....., well, no kidding.....
 - May survive up to 3 hours in aerosols (of course this was done in the lab, but **gives us an idea of the survival rates**)
 - **Use masks if you are infected to protect others, but, do gloves protect? Does virus remain infective on glove surfaces?**

NYTimes: [Home](#) - [Site Index](#) - [Archive](#) - [Help](#)Welcome, [robletoe](#) - [Member Center](#)

Go to a Section

Go

Site Search:

Who has time for dial up?

Activate your high-speed Internet access and get a **free** modem*.

*offer does not apply to Cablevision customers

[click for details](#)[NYTimes.com](#) > [Science](#)

If SARS Hits U.S., Quarantine Could Too

By **DAVID TULLER**

Published: December 9, 2003

SAN FRANCISCO, Dec. 8 — As the health officer of Alameda County, Dr. Anthony Iton is prepared to make tough choices if SARS re-emerges this winter or spring, as many infectious disease experts fear.

The county, just across the bay from here, has identified two large buildings where, if voluntary steps to quell an epidemic were to fail, the authorities could sequester not just people who were sick but also people who might have been exposed to the SARS virus, Dr. Iton said.

The buildings, he said, could house up to 100 people and could be guarded to keep anyone from leaving.

[Enlarge This Image](#)

Associated Press

Patients with the infectious respiratory disease SARS were quarantined in April at a hospital in Beijing as a masked security detail stood guard.

Advertiser

Who has
for dialActivate
high-speed
access and
free mod[click for de](#)

“The Triumph of Death” by Pieter Breughel, the Elder

Yersenia pestis - a story of dogs, cats and mice



Figure 1-4 Microbiology, 6/e
© 2005 John Wiley & Sons

Analytical Philosopher: British, Nobel in Literature. “Solo sé que no sé nada” (Socrates)



El problema con el mundo es que los estúpidos están seguros de todo y los inteligentes están llenos de dudas.

Bertrand Russell.

MEASLES OUTBREAK (Sarampion, Rubeola)

- Texas state representative Bill Zedler says a resurgence of measles across the U.S. isn't worrying him.
- Zedler, R-Arlington, is promoting legislation that would **allow Texans to opt out of childhood vaccinations.**
- **“They want to say people are dying of measles. Yeah, in Third World countries they’re dying of measles,” Zedler said, the [Texas Observer reports](#). “Today, with antibiotics and that kind of stuff, they’re not dying in America.”**

TREATMENT

- Lots of different antivirals/antimicrobials are being tested-**Largest trial just started (SOLIDARITY)**
- **Base analogs** amongst the most promising
- RNA-dep.RNA polymerase (**Remdesivir**)
- **Interferon** α , β
- **Chloroquine** (antimalarial)/azithromycin
 - **Cannot be given** to pregnant women, heart disease, terminal liver and renal disease, etc, etc.
 - Can be fatal at 2X recommended dose (deaths in China and Nigeria, **1,000mg versus 2,000mg**)
- Chloroquine cannot be given to patients on Azithromycin (increases the QT interval)

Science and Coronaviruses

- Over 800 scientific papers have been published on SARS CoV2 to date
- Most are very rigorous, some suffer from being too short on “n”
 - Need to get information out, but need to be very **careful with drawing large conclusions from limited studies**
- All studies are progressing and we are in the middle of a **very large scientific (and social) experiment**. Need to be proactive in Public Health and **THERE IS NO MORE IMPERATIVE THAN PUTTING INTO PRACTICE THE “ONE-HEALTH” APPROACH** from now on

What else can we do?

- **REMEMBER FOOD INDUSTRY AND ITS IMPORTANCE IN THE POSSIBLE SPREAD OF PATHOGENS-anybody seen a chef with a mask?**
- **Manufactura de Puerto Rico-ahora mismo esta lista para producir barbijos, batas QUE PUEDEN SER ESTERILIZADAS Y REUTILIZADAS: EN LOS HOGARES SE PUEDEN PONER EN AGUA HIRVIENDO O CLOROX AL 1% Y REUTILIZARLAS- la tela es absorbente!!!!!!!**
- **SOMOS TAN PLASTICO-CENTRICOS?**