





Norovirus Sweeps Through Britain

LONDON (Reuters Life!) Jan 03 --Hundreds of thousands of Britons... struck down by a highly infectious stomach virus... swept the country during the holiday period, doctors said... "stay at home, take paracetamol and drink plenty of fluids."



Indonesia... 2 new cases of human H5N1 avian influenza infection... a 29year-old female from Banten Province... developed symptoms on 22 January... hospitalized on 28 January... died on 2 February...

PATHOGENSPARASITESPLAGUESPANDEMICS

- How many kinds of pathogens are there, and what kinds of diseases do they cause? What are we and why do we suffer?
- How do pathogens spread and persist? How does epidemiology explain parasite lifestyles?
- What epidemics will we face in future? What are "the coming plagues"?



1. Pathogens and people



Non-living pathogens Viruses Prions Parasitic DNA



Viruses -- genes in a protective protein shell --Ebola, measles, polio, cancers



Prions -- infectious protein particles -transmissible spongiform encephalopathies (TSEs) -- Creutzfeld-Jakob disease (kuru, vCJD), bovine spongiform encephalopathy (BSE or *mad cow disease*)

Parasitic DNA -- transposons -- mobile genetic elements -- heritable disorders -- hemophilia, severe combined immunodeficiency, porphyria, cancer

People are mostly bacteria Humans + bacteria = "super-organisms"

Humans

Functional cells (other than blood, neurons) 10¹² Bacteria (*Bacterioides, Clostridium, Escherichia...*)

On skin	
In mouth	
In gut	
502	

Clostridium, Escherichia
10 ¹²
10 ¹⁰
1014
>1kg
>1000 species
>1000 × as many genes

From the power of partnership...







1415 organisms patho to humans (exc. arthro	ogenic opods)	
 Viruses & prions 	217	
 Bacteria & rickettsia 	538	
• Fungi	307	
 Protozoa 	66	001
 Helminths (worms) 	287	aylor et al 2
 Zoonotic (from animals) 	868	rce: Ta
 "Emerging" 	175	Sou





2. How pathogens spread, and why they stick around

Concepts and models

- "All that is simple is false and all that is complex is useless" P Valéry
- "Everything should be made as simple as possible, but not simpler" A Einstein
- Why replace a world you don't understand with a model of the world you don't understand? P Richardson & R Boyd























London, Thames, summer 1858 "The Great Stench"

"The sewage of three millions of people has been brought... to seethe and ferment... in one vast open cloaca... Parliamentary committee rooms rendered barely tolerable..."

Winslow 1943



Notes on Nursing What It Is, and What It Is Not by *F Nightingale, 1860*

"of the fatal effects of the effluvia from excreta it would seem unnecessary to speak were they not so constantly neglected"

F Nightingale

The Great Stink of Paris and the Nineteenth-Century Struggle Against Filth and Germs by David S. Barnes, 2006



Clearing the air: Dr. André-Justin Martin led the municipal disinfection service in 1890s Paris



3. Plagues – current and emerging





















Apocalypse soon?

- Unavoidable transmission route
- Highly infectious
- High proportion of people exposed
- Transmission rapid compared with response time (everyone gets infected before knowing)
- Fatal

INFECTION TRANSMITTED VIA THE GLOBAL AVIATION NETWORK?















From natural history to public health

- Parasitism adopted as a "lifestyle" by many kinds of living and non-living agents what is self and non-self?
- Despite huge parasite diversity, very few cause most human deaths

most are preventable or curable

• Pandemics most likely to be a lethal virus with transmission rapid compared with reaction time

influenza (weeks), HIV/AIDS (years)