The Ebola Epidemic in Africa: Where We've Been, Where We're At, and Where We're Going

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I know **less** about Ebola virus infection today than I did six months ago; please take the information provided here with that acknowledgement



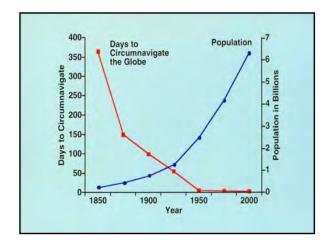
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"The greatest obstacle to discovering the shape of the earth, the continents, and the oceans was not ignorance but the illusion of knowledge."

-Daniel Boorstin

"For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled."

-Richard Feynman



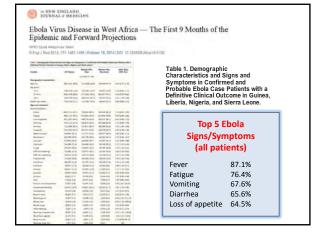
Ebola Virus and Human Infection

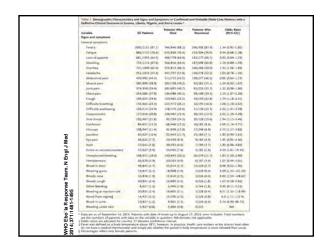
- Named after the Ebola River in the Democratic Republic of the Congo were it was first discovered in 1976.
- Twenty-four outbreaks or isolated case occurrences documented since 1976; 20 were community-wide outbreaks
- These outbreaks involved approximately 2,400 cases. The most number of transmission generations was five.
- Ebola had "hardly pinged the human species" before the current West Africa outbreak

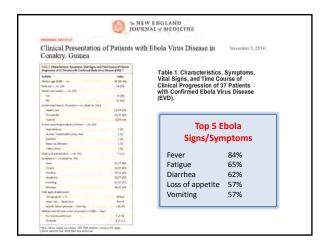


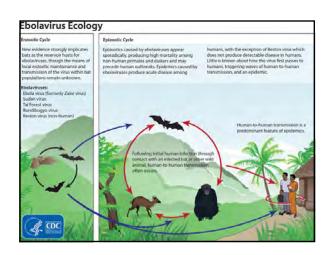
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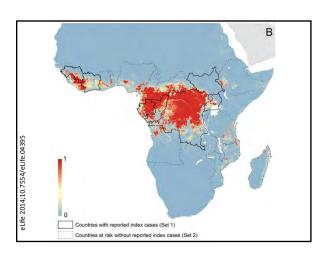
- Transmission of Ebola to and by humans has been documented by "direct contact" with an infected person/animal body fluids, including blood, vomit, feces and possibly perspiration
- The current outbreak has highlighted questions about transmission that remain unanswered;
 - fever
 - "airborne transmission"
 - worker safety
- Must not take our eye off the ball; its really about Africa

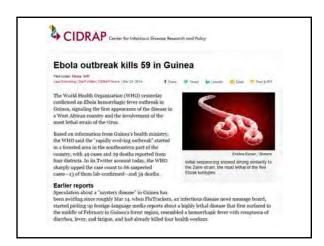






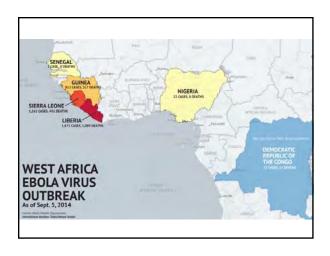




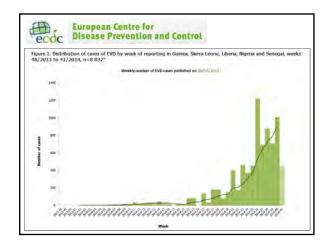




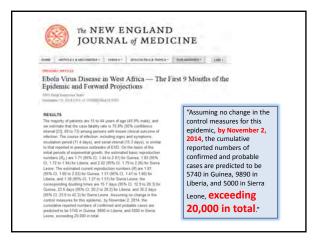


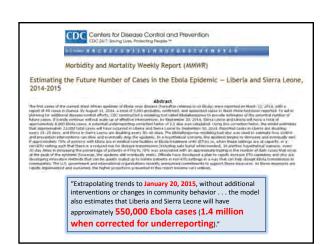


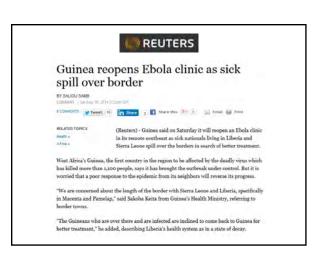




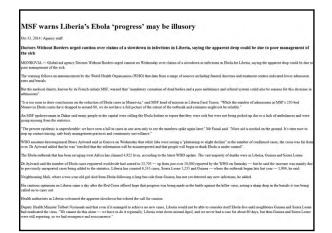
By Marine Ensures: 20 October 2014.5:30 ans 9 Consenents Every couple of days, the World Health Cirpanization (WHO) issues a sufficient published from the Ebbal epidemic, with new numbers of cases and dealths for such of the affected countries. These numbers—0216 and 4555 respectively, according to 6 Findley supdate—are instantly reported and healthed around the world. They're also quickly translated rich ayear more highlening peoples by to propley who believe they dependent closurely, such as virologed lain Mackey of the University of Coversionand in Brisbane, Austrialia, and Male Majamords; a Ph. D. student at the Measachurstis firetitus of Enrichmody or Combridge who visualizes the more data on her website and publishes projections on HealthMap, an online information system for outbrokes. But it's widely known that the real situation is much worse than the numbers show because many cases don't make a into the official









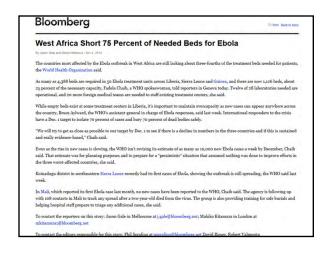


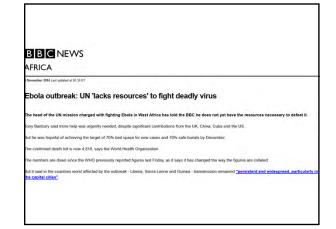














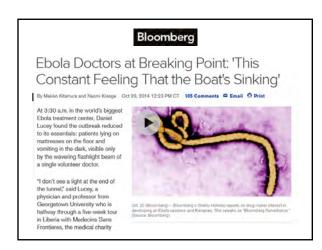








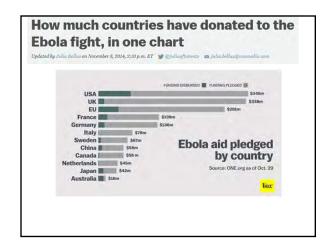














B B C NEWS

HEALTH

12 August 2014 Last updated at 09:46 ET

Ebola: Experimental drugs and vaccines

Vith hundreds of cases of Ebola in Africa, a panel of World Health Organization (WHO) experts has declared it is ethical to use experimental drugs in this current outbreak.

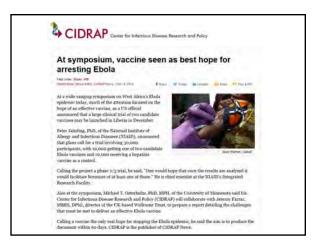
Vhat is the current treatment for Ebola? There is no licensed treatment or vaccine for the Ebola virus. Hospital treatment is based on giving patients ntravenous fluids to stop dehydration and antibiotics to fight infections. Strict medical infection control and apid burial are regarded as the best means of prevention

What about experimental treatments? Several experimental treatments for Ebola are being developed, which have shown promising results in nonkeys when given up to five days after infection. However, they have not been tested in more than a ndful of people and none has been licensed.

Ebola Vaccine and Treatment Studies

- •Non-human primate (NHP) are regarded as the best disease models
- Insufficient clinical disease data to assess comparability between NHP and human pathogenesis and immunity
- •Interventions targeting host functions and drug metabolism may be impacted by subtle species differences





Ebola Vaccines Under Study

ChAd3/NIAID/GSK

- Chimp adenovirus 3 with Ebola glycoproteins Phase 1
- Two dose

Vesicular Stomatitis Virus (VSV-EBOV)

- NewLink (Bioprotection)/PHAC
- VSV with Ebola Zaire GP
- Phase 1
- Single dose

Profestus: rVSV platform



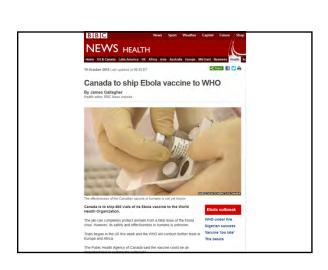
HHS advances third Ebola vaccine development

"We are pushing hard to advance the development of mallipse products as quickly as possible since a evaluation and future use in preventing or trinstrup this design designer." said Rober for the director of the appropria "Our goal is in cleare the global gap in vacciness and the operation needed to protect the public health from Ebola as highlighted by the epidemic in West Africa."

Health and Human Services awarded \$6 8 million to Protectus BioSciences Inc., a company, for one year to continue developing the vaccine candidate. If successful Drug Administration will need to approve the vaccine candidate before it begins the

We may need a vaccine to actually be an expiritant part of the curricle of the epidemic itself, an apposed to what the original purpose of it, which was protect healthcare workers alone," he said

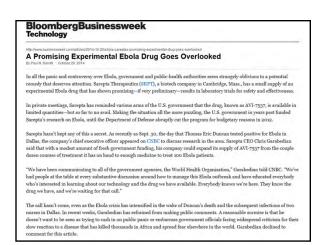




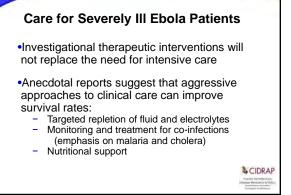


Ebola Treatment Under Study •Therapeutics - Compounds with antiviral activity - Other (supportive care/complications) •ZMapp[™] - Triple monoclonal antibody cocktail - Produced in tobacco plants •Antibody infusion •Viral polymerase inhibitor

& CIDRAP





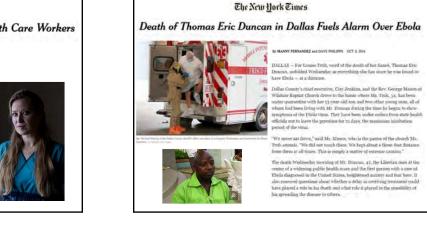












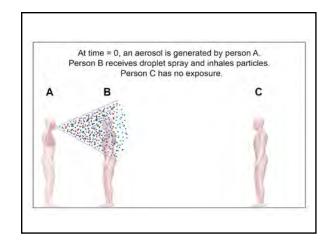


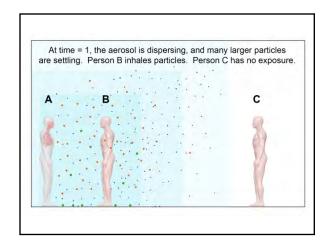


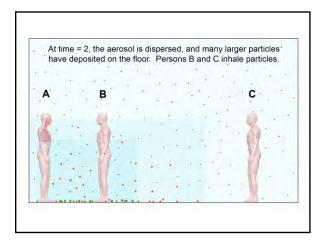






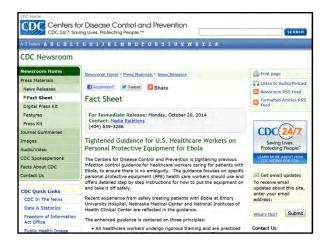












CDC Healthcare Worker Guidance October 20, 2014

• CDC is recommending all of the same PPE included in the August 1, 2014 guidance, with the addition of coveralls and single-use, disposable hoods. Goggles are no longer recommended as they may not provide complete skin coverage in comparison to a single use disposable full face shield. Additionally, goggles are not disposable, may fog after extended use, and healthcare workers may be tempted to manipulate them with contaminated gloved hands.

CDC Healthcare Worker Guidance October 20, 2014

- The enhanced CDC guidance is centered on three principles:
 - All healthcare workers undergo rigorous training and are practiced and competent with PPE, including taking it on and off in a systemic manner
 - No skin exposure when PPE is worn
 - All workers are supervised by a trained monitor who watches each worker taking PPE on and off.

CDC Healthcare Worker Guidance October 20, 2014

- PPE recommended for U.S. healthcare workers caring for patients with Ebola includes:
 - Double gloves
 - Boot covers that are waterproof and go to at least mid-calf or leg covers
 - Single use fluid resistant or imperable gown that extends to at least mid-calf or coverall without intergraded hood.
 - Respirators, including either N95 respirators or powered air purifying respirator (PAPR)

CDC Healthcare Worker Guidance October 20, 2014

- PPE recommendations continued:
 - Single-use, full-face shield that is disposable
 - Surgical hoods to ensure complete coverage of the head and neck
 - Apron that is waterproof and covers the torso to the level of the mid-calf should be used if Ebola patients have vomiting or diarrhea



REUTERS

U.S. Ebola fears fuel new demand for protective gear



manufacturers to little-known beamesses that produce harmat units used in West Africa and now V.S. hospitals.

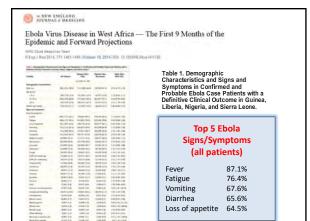
of the demand has come from governmental and international agencies since the outbreak began in March.

After Laberian national Thomas Eric Duncan was diagnosed with Ebols in Dallas, and later died, U.S. hospitals rapidly increased anders for presenter segarpment. A norse's side in Spain also become infected after caring for a potient there.

Los Angeles Times Ebola research: Fever not a surefire sign of infection

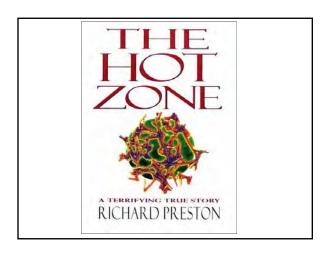
or public health workers acreening more than 1,000 air travelers who arrive each week in the United States from Ebola-stricken West Africa. one symptom above all others is supposed to signal danger: fever,

So long as an individual's temperature does not exceed 101.5 degrees and there are no visible symptoms of Ebola, health authorities say if should be assumed the person is not





Ebola Hemorrhagic Fever, Kikwit, Democratic Republic of the Congo, 1995: Risk Factors for Patients without a Reported Exposure T. H. Roels, A. S. Bloom, J. Buffington, G. L. Muhungu, W. R. Mac Kenzle, A. S. Khan, R. Ndambl, D. L. Noah, H. R. Rolka, C. J. Peters, and T. G. Ksiazek Epidemic Intelligence Service, Division of Applied Public Health, Training, Division of Prevention Research and Analytic Methods, Epidemiology Program Office, Division of Reproductive Health, Epidemiology Program Office, Division of Reproductive Health, Division of Viral and Relectatian Diseases, Navional Center for Diseases, Center for Diseases, Vanional Center for Diseases, Center for Diseases, Control and Pueda Brainta Superiora Intelligence Control for Diseases, Navional Center for the Kirchit, Diseases, Center for Diseases, Control and Pueda da Kirchit, Klovite, Diseases, Republic of the Congo da Kirchit, Klovite, Diseases, Carlos Republic of the Congo In 1995, 316 people became ill with Ebola hemorrhagic fever (EHF) in Kikwit, Democratic Republic of the Congo. The exposure source was not reported for SF patients (17%) at the start fix investigation, and it remained unknown for 12 patients after extensive deplemiologic evaluation. Both admission to a hospital and visiting a person with fever and bleeding were risk factors associated with infection. Ninetteen patients appeared to have been exposed while visiting someone with suspected EHF, although they did not provide care. Fourteen of the 19 reported touching the potential suspected EHF, afthough they did not provide care. Fourteen of the 19 reported touching the potential suspected EHF. afthough the contact while carries for an infected person was probably the major route of transmission in this and previous EHF outbreach, the virus any have been transmitted by touch, droplet, advisoring particle, or fomite, thus, expansion of the use of burrier techniques to include casual contacts might prevent or mitigate future epidemics.





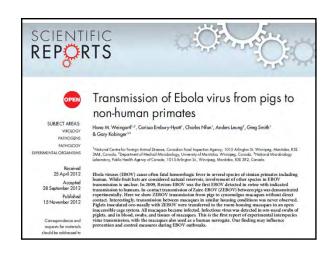
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Transmission of Ebola virus (Zaire strain) to uninfected control monkeys in a biocontainment laboratory

N Jaax, P Jahrling, T Geisbert, J Geisbert, K Steele, K McKee, D Nagley, E Johnson, G Jaax, C Peters

Secondary transmission of Ebola virus infection in humans is known to be caused by direct contact with infected patients or body fluids. We report transmission of Ebola virus (Zaire strain) to two of three control rhesus monkeys (Macaca mulatta) that did not have direct contact with experimentally inoculated monkeys held in the same room. The two control monkeys died from Ebola virus infections at 10 and 11 days after the last experimentally inoculated monkey had died. The most likely route of infection of the control monkeys was aerosol, oral, or conjunctival exposure to virus-laden droplets secreted or excreted from the experimentally inoculated monkeys. These observations suggest approaches to the study of routes of transmission to and among humans.

Lancet 1995; 346: 1669-71

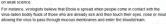


U.S. scientists say uncertainties loom about Ebola's transmission, other key facts

Mon, Nov 3 20

(Reuters) - Even as government officials express confidence that researchers know the key facts about Ebola, many questions crucial to preventing an outbreak in the United States remain unanswered, scientists told a workshop at the National Academy's Institute of Medicine in Washington on Monday.

Virtually all the unknowns have practical consequences, participants emphasized, makin it foolish and perhaps dangerous to base polici



But penetration through intact skin has not been definitively ruled out, said hemorrhagic-fever expert Thomas Ksiarek of the University of Texas Medical Branch (UTMB), who co-led a session of Ebola's transmission routes.

"Does bleach or hand sanifizer," which people in West Africa are using to protect themselves from Ebola, "make the skin more susceptible" to being penetrated by the virus?, Peters wondered. "It's question that has to be asked."

For months public health officials in the United States and elsewhere have insisted it cannot. But the possibility of such "subclinical transmission" remains very much open, said Dr. Andrew Pavia, chief of pediatric infectious diseases at the University of Utah. Nor do experts know whether the infectious dose of virus depends on how it enters the body. Pavia

Also unknown is whether the time between exposure to Ebola and the appearance of symptoms depends on which bodily fluids someone contacted. If it does, then someone exposed through, say, saliva rather than blood might incubate the virus for longer than the 21 days officials have

