

Infection control guidelines that did not work against Ebola in 2014

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Hosted by Bruce Gamage
Provincial Infection Control Network of British Columbia

www.webbertraining.com

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Infection control guidelines that did not work against Ebola in 2014

Objectives:

- To analyze the Ebola virus and risk of transmission
- To discuss the international Ebola- guidelines for the use of PPE -before and after September 2014
- To discuss controversial PPE information and assessment of the Ebola crisis
- To evaluate prevention-savy behaviour during serious outbreaks

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Overview Ebola infections

Year	Country	Ebolavirus species	Cases	Deaths	Case fatality
2012	Democratic Republic of Congo	Bundibugyo	57	29	51 %
2012	Uganda	Sudan	7	4	57 %
2012	Uganda	Sudan	24	17	71 %
2011	Uganda	Sudan	1	1	100 %
2008	Democratic Republic of Congo	Zaire	32	14	44 %
2007	Uganda	Bundibugyo	149	37	25 %
2007	Democratic Republic of Congo	Zaire	264	187	71 %
2005	Congo	Zaire	12	10	83 %
2004	Sudan	Sudan	17	7	41 %
2003 (Nov-Dec)	Congo	Zaire	35	29	83 %
2003 (Jan-Apr)	Congo	Zaire	143	128	90 %
2001-2002	Congo	Zaire	59	44	75 %
2001-2002	Gabon	Zaire	65	53	82 %
2000	Uganda	Sudan	425	224	53 %
1996	South Africa (ex-Gabon)	Zaire	1	1	100 %
1996 (Jul-Dec)	Gabon	Zaire	60	45	75 %
1996 (Jan-Apr)	Gabon	Zaire	31	21	68 %
1995	Democratic Republic of Congo	Zaire	315	254	81 %
1994	Cote d'Ivoire	Tai Forest	1	0	0 %
1994	Gabon	Zaire	52	31	60 %
1979	Sudan	Sudan	34	22	65 %
1977	Democratic Republic of Congo	Zaire	1	1	100 %
1976	Sudan	Sudan	284	151	53 %
1976	Democratic Republic of Congo	Zaire	318	280	88 %
Total- until 2013			2387	1590	66,6 %

Pandemics and serious outbreaks last 100 years

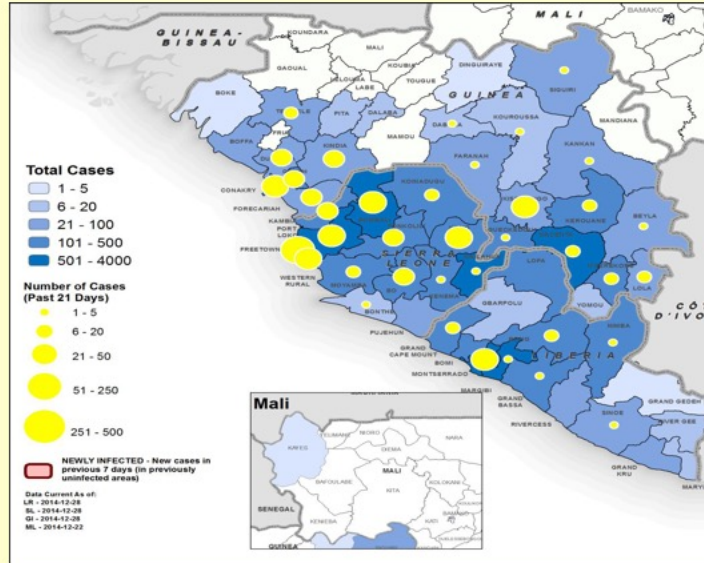
Type	Death rate
•1918-1977: Seven influenzae pandemics	< 3%
•2003 SARS: > 8000 cases (20% were HCW)	11%
•2005 Avian influenzae:	60%
•2009 Pandemic flu -AH1N1:	< 0.2%
•2013 –MERS(Middle East Resp Syndrome):	33-40%
 EBOLA – outbreaks:	
•1976-2013 (25), 2400 cases	67%(25-90)
•2014, West Africa	
• 28 616 cases and 11 310 deaths	40%
• HCW:> 880 cases and 509 deaths*	58%

Higher death rate among HCW?

- 103-fold higher than general population in Sierra Leone**

*WHO 17 July 2015, ** Kilmarx et al. CDC, MMWR 2014;63: 1168-71.

Figure 4: Geographical distribution of new and total confirmed and probable* cases in Guinea, Liberia, Mali and Sierra Leone. Dec 2014



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Ebola

- 1-3 week incubation
- Infective dose- not known
- Abrupt onset fever, headache, myalgia
- GI symptoms, chest pain, delirium
- 53-88% case-fatality
- ~ 45% hemorrhage
- Fatality higher when 10 mill virus/ml *
- Person-to-person transmission
- African rainforest- borders
- Unknown reservoir-fruitbats- gorilla's, shedding pigs**, "bushmeat" etc.



*Scheffelin NEJM Oct 29.2014**Kobinger et al. JID 2011,

Enveloped RNA-virus

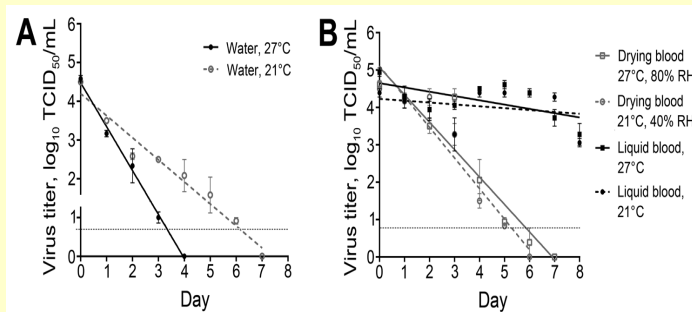
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Transmission?

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ViabE Ebola virus can persist in the environment for 4->15 days

blood (dried or liquid), water, and other surfaces - important for transmission Fisher et al. EID 2015;21: 1243-



Survives and may aerosolize in wastewater. Lin . 26.9.2016.

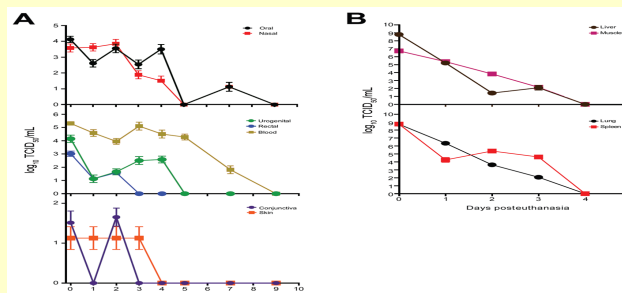
Survive at least 46 days in liquid media- room tp. Weber ICHE 2015;36:

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“Viable virus can persist for > 7 days on surfaces on bodies, confirming transmission, even after death”

Prescot et al. EID 2015;21: 856

- A high postmortem stability of Ebola virus;
 - Isolated (PCR) from oral, nasal, **skin**, blod, etc. swab for up to 10 weeks from macaques -monkeys
 - **Living virus** isolated 3-4 days to one week or more postmortem, from surface swab samples from **skin**, conjunctiva, nose, mouth etc Prescot et al. EID 2015;21: 856



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Transmission- by air?

- Five infected monkeys ” shed infectious virus in various bodily secretions.--- suggesting the potential for generating infectious aerosols. Thus, taking precautions against aerosol exposures to filovirus infected primates, including humans, seems prudent.” Jahrling et al. Arch Vir Suppl 1996;11:115-34
- Ebola-Kikwit 1995, person-to-person transmission was the main route of infection, ” but transmission by droplets and small aerosols among infected individuals is discussed.” Feldman ety al Arch Vir Suppl 1996;11:77-100.
- Domestic pigs may replicate ZEBOV to high titers (10^7) – mainly in respiratory tract- shedding and transmission to all naive pigs exposed. Kobinger et al. JID 2011;
- ”Piglets inoculated oro-nasally with ZEBOV were transferred to room housing macaques in an open, inaccessible cage system. All macaques became infected. ----*Our finding may influence prevention and control measures--.*” Weingartl et al. Sci Rep 2012

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Transmission of Ebola virus from pigs to non-human primates- monkeys

Hana M. Weingart^{1,2}, Carissa Embury-Hyatt¹, Charles Nfon¹, Anders Leung³, Greg Smith¹ & Gary Kobinger^{3,2}

¹National Centre for Foreign Animal Disease, Canadian Food Inspection Agency, 1015 Arlington St. Winnipeg, Manitoba, R3E 3M4, Canada, ²Department of Medical Microbiology, University of Manitoba, Winnipeg, Canada, ³National Microbiology Laboratory, Public Health Agency of Canada, 1015 Arlington St., Winnipeg, Manitoba, R3E 3R2, Canada.

ZEBOV transmission from pigs to cynomolgus macaques without direct contact.

Piglets inoculated oro-nasally with ZEBOV were transferred to the room housing macaques in an open inaccessible cage system. All macaques became infected.

Infectious virus was detected in oro-nasal swabs of piglets, and in blood, swabs, and tissues of macaques.

This is the first report of experimental interspecies virus transmission, with the macaques also used as a human surrogate.

Our finding may influence prevention and control measures during EBOV outbreaks.

Weingartl HM, et al. Scientific Rep 2. 2012; article number:811.

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Risk of transmission - to air and environment

- **"Skin contact transmission as well as airborne transmission are highly suspected" Congo.** Mwanatambwe et al. J Nippon Med Sci 2001; 68: 370-
- **Clinical specimens from 26 laboratory-confirmed human cases:**
 - "Virus was detected by culture and/or "(PCR)- "in 16 of 54 clinical specimens (including saliva, stool, semen, breast milk, tears, nasal blood, and a skin swab) and in 2 of 33 environmental specimens.
 - We conclude that EBOV is shed in a wide variety of bodily fluids during the acute period of illness"
 - Bausch J Inf dis 2007; 196:142-
- **Old knowledge - before the Europeans in Uganda:**
 - isolation of sick cases 100 meters from others ---
 - " local people have beliefs and practices in place-- useful to control rapid epidemics, such as EHF,
 - -- their knowledge may be useful to national and international teams in their efforts to control emerging diseases."
- Hewlett EID 2003;9: 1242-

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Ebola- Lessons learned

Ebun James-DeKam, General Secretary, Council of Churches in Sierra Leone (CCSL)
Promed 8 August 2014

- **”When the outbreak did occur, we were not prepared for it;**
- **The necessary PPE** (personal prevention equipment i.e. masks, goggles, gloves etc.) **were in short supply**; testing centers and laboratories were not set up to handle testing for EVD.
- **Medical staff were not trained in proper use of the PPE**; medical expertise with genuine knowledge and experience in dealing with EVD were in extremely short supply.
- Tracing units had to be organized and trained; burial teams had to be organized and trained.
- Ambulances refitted to accommodate only EVD victims.
- **The general population began to protest vigorously that regular patients and EVD patients had to go to the same facility for medical attention. This put the uninfected population at higher risk.**
- Little sensitivity in dealing with customs
- It will take time to slow progression of disease ”

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Guidelines before and after September 2014

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International guidelines used to protect HCW against Ebola, September 2014; WHO, UK and CDC

1. **WHO.** Interim infection prevention and control guidance for care of patients with suspected or confirmed filovirus haemorrhagic fever in health-care settings, with focus on Ebola. September 2014.
2. **UK,** Department of Health. Management of hazard group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequences. September 2014.
3. **CDC.** Infection prevention and control recommendations for hospitalized patients with known or suspected Ebola haemorrhagic fever in US hospitals. August 2014.
4. **CDC.** Guidance on personal protective equipment to be used by healthcare workers during management of patients with Ebola virus disease in U.S.hospitals, October 20, 2014.

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WHO, UK, CDC: "Contact and droplet 1m". Not airborne!				
Comparing the use of PPE - in Ebola virus guidelines from WHO, UK, and CDC (ref 1-4)				
	WHO 2014*	UK 2014**	CDC 2014***	CDC 2014****
	September	September	August	20 October
Spread of infection				
Direct contact	yes	yes	yes	yes
Indirect contact	?	yes	yes	yes
Airborne?	no	no	no	no
The use of PPE in:				
Suspected case				
Eye protection	yes	yes	yes	
Gown	yes	plastic apron	yes	
Gloves	yes	yes	yes	
Mask/surgical mask	yes	yes	yes	
Respirator/N95 etc	no	no	no	
Hair/head cover	no	no	no	
Specific shoes/shoe covers	yes	no	no	
Confirmed cases				
Eye protection	yes	yes	yes	yes
Gown	yes	yes	yes	yes
Gloves	yes	yes	yes	yes
Mask/surgical mask	yes	no	yes	no
Respirator/N95 etc	no	yes	no	yes
Hair/head cover	no	no	no	yes
Specific shoes/shoe covers	yes	no	no	yes
Aerosol-gener. Proc.				
Respirator/N95 etc	yes	yes	yes	yes
Hair/head cover	no	no	no	yes
Specific shoes/shoe covers	yes	no	yes	yes

PPE Sep.2014: Suspected and confirmed cases,

- No head/neck cover
- No respirator/N95 (ex. UK)
- Variable shoe covers
- Variable gown use (UK)

■ CDC: October 20- PPE for confirmed cases

- included putting on and removing PPE
- respirator/N95
- covering hair/head/neck
- shoe covers






■ Still not airborne!


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7.3 Steps to put on and remove essential required PPE

Steps to put on essential required PPE

- 1 Always put on essential required PPE when handling either a suspect, probable or confirmed case of VHF. Gather all the necessary items of the PPE beforehand.
- 2 The dressing and undressing of PPE should be supervised by another trained member of the team. These instructions should be displayed on the wall in the dressing and undressing room.
- 3 Put on the scrub suit in the changing room. 
- 4 Put on slip-on shoes with protective covers. If you will be working in wet settings with bodily fluids, water, detergent, waste, etc., use gum boots instead. 
- 5 Place the gown over the scrubs. 
- 6 Put on face protection:
 - 6a Put on a medical mask and goggles. OR 
 - 6b Put on a face shield (preferred). If the patient has respiratory symptoms or the design of the face shield does not stop you from touching your face (eyes, nose, and mouth), first put on a medical mask and then put the face shield over your face and the medical mask. 

7 If you have any abrasions on your scalp or you have concern for splashing fluids, also place a head cover at this time. 



8 Put on gloves (over cuff). 

9 If gown is permeable or if you expect strenuous activity with an exposed patient, place waterproof plastic apron over gown. 

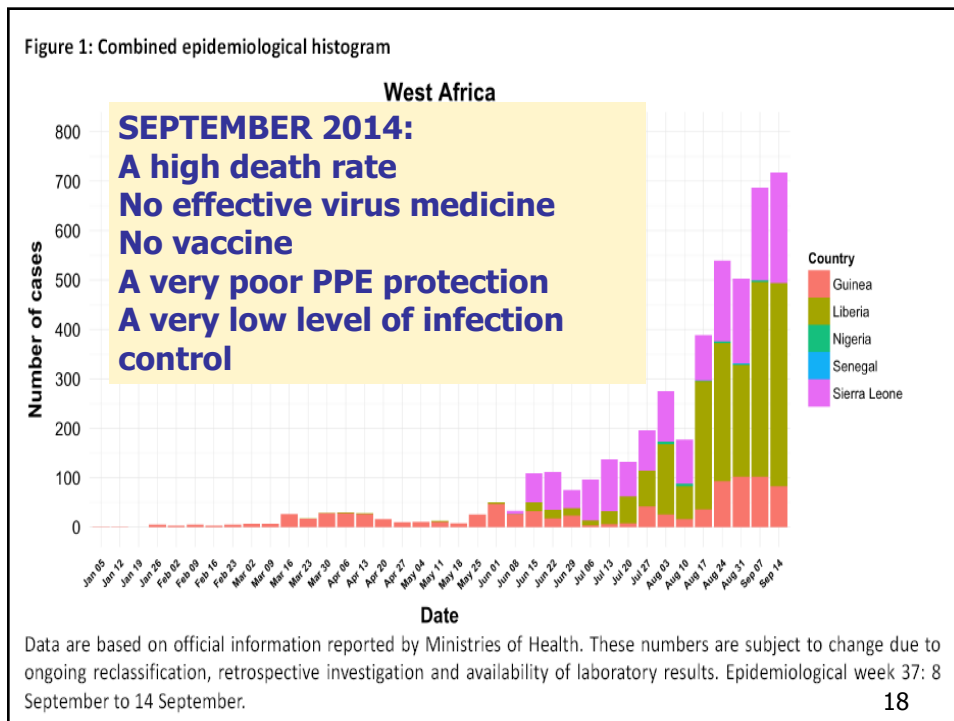
Whilst wearing PPE:

- Avoid touching or adjusting PPE
- Remove gloves if they become torn or damaged
- Change gloves between patients
- Perform hand hygiene before donning new gloves

Steps to remove PPE

- 1 Peel off plastic apron and dispose of safely, (if the apron is to be reused, place in a container with disinfectant) 
- 2 If wearing protective shoe covers, please remove them with your gloves still on. (If wearing gum boots, see step 5). 

WHO 2014 17



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Promed-mail

3] Infection control is not working

Date: 14 Sep 2014

From: Bjorg Marit Andersen <bomarand@hotmail.com> [edited]

- **Infection control concerning EVD is not working, especially when more than 240 [now 300] healthcare personnel have been infected, and more than 120 workers have died. Guidelines used to control SARS in 2003 should be used, not "contact and droplet protection of 1-2 meters," as is still recommended by WHO.**
- **Personal protective equipment (PPE) for contact and airborne infections should be used because of**
 - a) **respiratory symptoms,**
 - b) **a big distance -- up to 9 meters -- for droplets when coughing and sneezing** (Bourouiba et al. J Fluid Mechanics 2014;745:537-563.),
 - c) **re-aerolization from the environment, bed clothes etc.,**
 - d) **long survival of the virus outside the body, and**
 - e) **high lethality.**

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- “Healthcare workers (HCW) and helpers should be protected with PPE as they were during the SARS epidemic. The SARS epidemic was an infection control success by the healthcare system of some countries in Asia in 2003.
- **- WHO should not repeat the same failure as was done during the early phase of the SARS-epidemic by using "contact and droplet isolation."** Separate hospitals for EVD should be built, like in China (1000 beds in 8 days for SARS), and only patients with laboratory documented EVD should be cohorted. Suspected cases should be isolated separately.
- **HCW and helpers should be trained and especially observed concerning [putting] PPE on and taking [it] off. The observers should also use PPE. During the SARS epidemic, HCW were re-contaminated by not knowing how to take off PPE.**
- Exposed people and patients with other diseases should be treated in professional triages to reduce the population's fear of being EVD-infected during contact with healthcare. Exposed people should be taken care of by professional helpers.
- **There is a need for a lot of resources, especially concerning infection control work.”**
- Andersen BM, promed-mail 14 September 2014
- Promed-mail Archive Number: 20140914.2773490

[The above directions are perfectly correct. Unfortunately, investigators are concluding that health worker infections are occurring outside the hospitals. - Mod.JW]

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Aerosol controversy

September 2014; Promed-mail; an intensive discussion

- 14 Sept.: «Personal protective equipment (PPE) for contact and airborne infections should be used because of a) respiratory symptoms, b) a big distance -- up to 9 meters -- for droplets when coughing and sneezing, c) re-aerolization from the environment, bed clothes etc., d) long survival of the virus outside the body, and e) high lethality.» *Bjørg Marit Andersen*

Responses came very soon- among others:

- 17 Sept.: «Healthcare workers need optimal respiratory protection for Ebola»-for a risk group 4 organism like ebolavirus, the minimum level of protection should be an N95 filtering facepiece respirator» *Lisa M Brosseau and Rachel Jones.*
- 19 Sept.:»-it is feasible to make ebolavirus transmit through air» *Ben Neuman.*

Contra

- 19 Sept.:-- «we have never seen a human virus change the way it is transmitted» *Vincent Racaniello*
- 20 Sept.: «Suggesting airborne precautions for Ebola HCW is a really bad idea (!)-- Ebola is not airborne---Laboratory experiments --have clearly shown that Ebola and Marburg are highly aerosol infectious.-» *Heather Lander.*
- 21 Sept.: «--to my knowledge it (EDV) is not aerosol borne so I am at a loss to understand why there is so much emphasis on this route of transmission--» *Shahen Mehtar*

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 [cidrap.umn.edu](http://www.cidrap.umn.edu)
<http://www.cidrap.umn.edu/news-perspective/2014/09/commentary-health-workers-need-optimal-respiratory-protection-ebola>

COMMENTARY: Health workers need optimal respiratory protection for Ebola

Lisa M Brosseau, ScD, and Rachael Jones, PhD | Sep 17,

The precautionary principle—that any action designed to reduce risk should not await scientific certainty—compels the use of respiratory protection for a pathogen like Ebola virus that has:

Promed-mail 17 September 2014

- No proven pre- or post-exposure treatment modalities
- A high case-fatality rate
- Unclear modes of transmission

We believe there is scientific and epidemiologic evidence that Ebola virus has the potential to be transmitted via infectious aerosol particles both near and at a distance from infected patients, which means that healthcare workers should be wearing respirators, not facemasks.¹

Promed-mail: 08. Oct 2014: USA:

Experts worry Ebola may spread more easily than assumed-

Dr CJ Peters: «we just dont have the data to exclude it»-

Dr. M Osterholm: -» None of us know.»

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Ebola Virus Disease and the Need for New Personal Protective Equipment

Michael B. Edmond, Daniel J. Diekema, Eli N. Perencevich,
JAMA. 2014;312(23):2495-2496., online October 28, 2014

- --" The virus is found in body fluids that health care workers are likely to contact. These include blood, urine, vomitus, and stool.

- **Gastrointestinal fluid losses can be massive (5-10 L/day), and simulated vomiting studies have shown droplet dispersion greater than 10 ft.⁵**

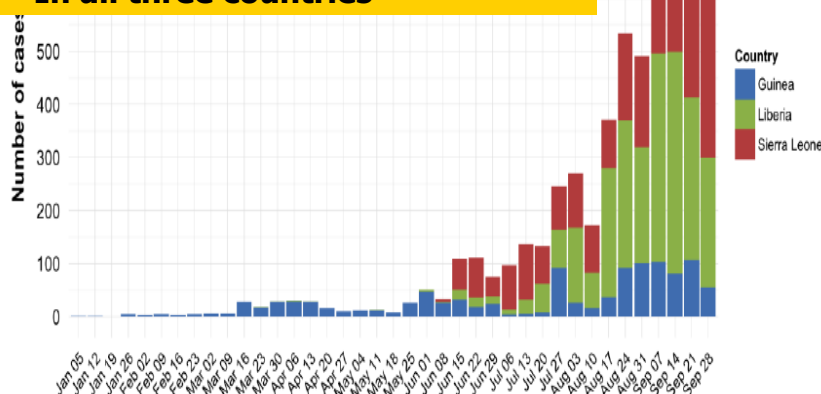
- **In patients dying of Ebola virus infection, serum viral loads can reach 10 billion copies/mL.⁶ ---**

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Figure 1: Confirmed and probable cases of Ebola virus disease in Guinea, Liberia, and Sierra Leone

September 28, 2014:

- **Rapid decline of new cases**
- **In all three countries**



Data are based on official information reported by Ministries of Health. These numbers are subject to change due to ongoing reclassification, retrospective investigation and availability of laboratory results.

TRIAGE outbreak with droplet protection in Sierra Leone Sept-Oct 2014

- The Bo Ebola Clinic **opened 19 September 2014** Medicines sans borders-
- Two weeks later, **2-4 October, 4 HCW got Ebola; 2 died.**
- One of them- a Norwegian case was transferred to a high-level (level 4) isolate in Norway and survived.
- All four Ebola cases worked together in the Bo triage area: 25-26 September
- Standard equipment in the triage area was gloves and surgical mask, because the HCW --should hold «2 meters distance»» to the patients, according to WHO.
 - «Then they could not be infected by droplets», said the Norwegian administrator
 - «Triage was an area to talk with the patients– «
 - «--little PPE's were used in order to create confidence in the local population !»

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Consultation on WHO rapid advice guideline

WHO Guideline Development Group meeting on Personal Protective Equipment
 in the Context of Filovirus Disease outbreak Response
6-7 October, Geneva, Switzerland 2014
 WHO headquarter

Participants

GDG members

Consultants

Emma Aarons, PHE, UK

Daniel Bausch, Peru (Tulane School of PHTM, USA)

Bryan Christensen, CDC, USA

An Caluwe

Cha

Alair

Mau

Shah

Robe

Babal

Didier

Bassir

Matthias F

WHO rapid meeting 6-7 October 2014:

Head and neck cover

Surgical mask only

Respirators only for aerosol- generating procedures

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WHO and CDC: respiratory and hood protection came in 2015- 2017- but only for confirmed cases--

Comparing the use of regular - PPE - in Ebola virus guidelines from WHO, and CDC in 2015		
	WHO 2015*	CDC 2015**
Spread of infection		
Direct contact	yes	yes
Indirect contact	?	yes
Airborne?	no	no
The use of PPE in:		
Suspected case-stable		
Eye protection	yes	yes
Gown	yes	yes
Gloves	yes	yes
Mask/surgical mask	yes	yes
Respirator/N95 etc	no	no
Hair/head cover	no	no
Specific shoes/shoe covers	no	no
Confirmed cases and unstable susp.		
Eye protection	yes	yes
Gown	yes	yes
Gloves	yes	yes
Mask/surgical mask	yes	no
Respirator/N95 etc	no	yes
Hair/head cover	yes	yes
Specific shoes/shoe covers	yes	yes
Aerosol-gener. Proc.		
Respirator/N95 etc	yes	yes
Hair/head cover	yes	yes
Specific shoes/shoe covers	yes	yes

- New PPE- guidelines from CDC and WHO Oct-Dec 2014-2017
 - Covering hair, head and skin.
 - "Donning and doffing"
- WHO: Still no respiratory protection
 - Still only use of mask "within one meter" in confirmed cases
- CDC: respirator/N95, but surgical mask to emergency service if the patient is not bleeding/vomiting----»stable»
 - * WHO fact sheet, April 2015--2017
 - ** CDC, April 2015-2017
 - *** CDC 2015 January: Emergency med serv: EMS are using mask if no complications

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WHO
6 October 2014

■ Hair, head and neck covered
 ■ No respirator/N95
 ■ Only use of surgical mask

2017 –PPE the same

Steps to put on personal protective equipment (PPE) including gown

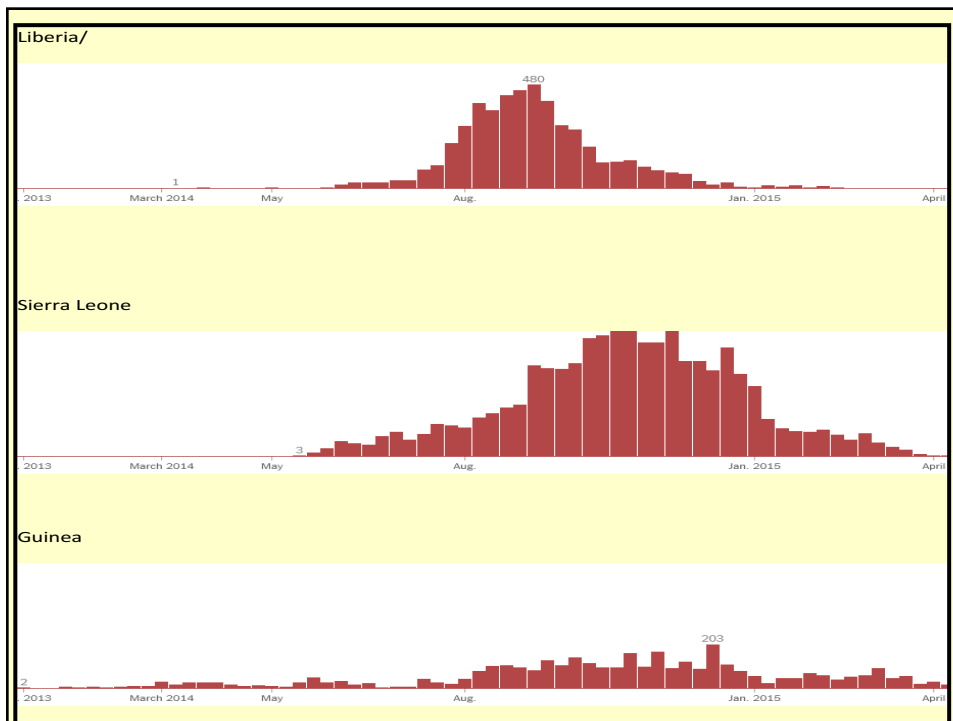
- 1 Remove all personal items (jewelry, watches, cell phones, pens, etc.)
- 2 Put on scrub suit and rubber boots* in the changing room.
- 3 Move to the clean area at the entrance of the isolation unit.
- 4 By visual inspection, ensure that all sizes of the PPE set are correct and the quality is appropriate.
- 5 Undertake the procedure of putting on PPE under the guidance and supervision of a trained observer (colleague).
- 6 Perform hand hygiene.
- 7 Put on gloves (examination, nitrile gloves).
- 8 Put on disposable gown made of fabric that is tested for resistance to penetration by blood or body fluids (OR to blood-borne pathogens).
- 9 Put on face mask.
- 10 Put on face shield OR goggles.
- 11 Put on head and neck covering surgical bonnet covering neck and sides of the head (preferable with face shield) (OR hood).
- 12 Put on disposable waterproof apron (if not available, use heavy duty, reusable waterproof apron).
- 13 Put on second pair of (preferably long cuff) gloves over the cuff.

* If boots are not available, use closed shoes (gloves without don/doff and fully covering the dorsum of the feet and ankles) and shoe covers (single and preferably disposable)

World Health Organization

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WHO July 20 2015

- All countries: 27 652 (11 264 deaths)
- Guinea: 3 770 (2509)
- Liberia:* 10 666 (4806)
- Sierra Leone: 13 209 (3947)

WHO:

- **More than 876 HCW with ebola; 509 deaths**
- **July 17 2015. " 3-4% of patients are HCW"**
- **Liberia lost ca 8% of nurses and doctors during Ebola 2014!**

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Controversial information and assessment

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Airborne or not? Controversial information!

WHO 2017

- "Ebola virus disease is not transmitted through the air"---
- "If a person sick with Ebola coughs or sneezes,-- and saliva or mucus touches another person's eyes, nose, mouth, or an open cut or wound, these fluids may spread Ebola."

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If a patient is sneezing, have hiccups, talking high, shouting – is that airborne or not?



-a big distance -- up to 9 meters -- for droplets when coughing and sneezing (Bourouiba et al. J Fluid Mechanics 2014;745:537-563).

Are Ebola-patients

- not talking,
- not coughing,
- not sneezing
- not vomiting
- no hiccups?

SMITTSOMT: I Norge har vi fått en ny farslett av albuhostende og nysende mennesker. Dette er en dårlig hygieneatferd under normale omstendigheter og en samfunnskritisk handling under epidemier, mener professor Bjørg Marit Andersen. Illustrasjonsfoto: Gorm Kallestad/Scanpix

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Shedding and re-aerolization from skin, textiles, equipment etc

- **Ebola:- living virus on body surfaces like skin and mucous membranes.**
- A living person is **shedding skin particles**-continuously;
- 30- 60 000 dead skin cells per minute; up to 500 mill/day as small particles in the air and like grey dust on surfaces.
- **Re-aerolization**, for instance, via bedmaking, cleaning, textiles, spraying, aerosol-generating procedures, etc. Shimori JHI 2002;50:30-35.

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Transmission of Ebola Viruses: What We Know and What We Do Not Know

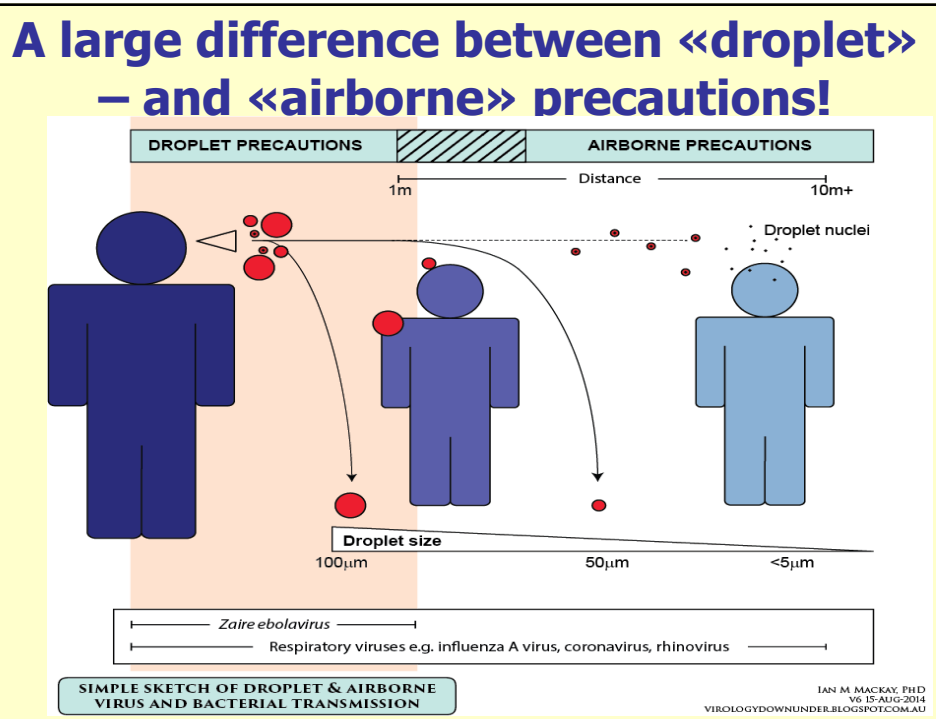
Michael T. Osterholm,^a Kristine A. Moore,^a Nicholas S. Kelley,^a Lisa M. Brosseau,^b Gary Wong,^c Frederick A. Murphy,^d Clarence J. Peters,^d James W. LeDuc,^d Phillip K. Russell,^e Michel Van Herp,^f Jimmy Kapetshi,^g Jean-Jacques T. Muyembe,^g Center for Infectious Disease Research and Policy, University of Minnesota, Minneapolis, Minnesota, USAa; Division of Environmental and Occupational Health Sciences, mbio.asm.org 2015;6: e00237-

15.march/april 2015

- **«Key areas requiring further study include**
 - the role of aerosol transmission (either via large droplets or small particles in the vicinity of source patients),
 - the role of environmental contamination and fomite transmission,
- **”We also hypothesize that Ebola viruses have the potential to be respiratory pathogens with primary respiratory spread.”**

Promed-mail 19 Feb 2015: Limited airborne transmission of Ebola is «very likely», a new analysis says.

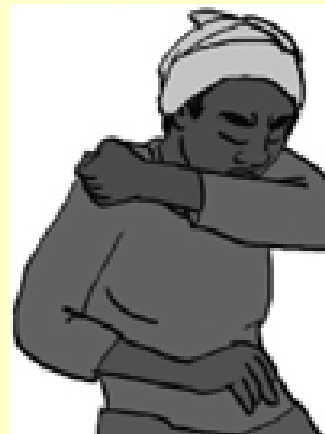
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The start of Ebola: WHO April 2014

«Cough or sneeze into your arm.
Use a tissue and then throw away.»

From the
CLINICAL MANAGEMENT OF EBOLA



The end of outbreak of Ebola: WHO Updated April 2015

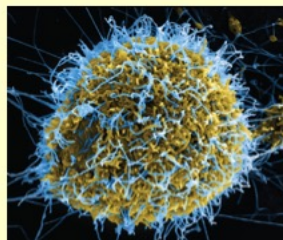
- Transmission: “Ebola then spreads through human-to-human transmission via direct contact-----”
- Controlling infection in healthcare-settings:---
 - “When in close contact (within 1 metre) of patients with EBV, health-care workers should wear face protection (a face shield OR a medical mask and goggles), ----a clean, non-sterile long-sleeved gown, and gloves (sterile gloves for some procedures).”

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“What You Need to Know about Ebola” CDC April 28 2015

---“Ebola is spread through direct contact with blood and body fluids”

--“Ebola is not spread through the air, water, or food”



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Fact sheet from CDC :

"Why Ebola is Not Likely to Become Airborne" CDC April 30 2015

- ***"Scientists have not seen any evidence to suggest that the Ebola Virus may be mutating to become more contagious or more easily spread."*** CDC
- **The "mutation problem"**

- **BUT:**
- **CDC/WHO have no evidence for that:**
 - **"Ebola is not airborne"**

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HCW during SARS epidemic in China, May 2003

However, WHO started with the
«droplet precautions» also in 2003----



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Infection Control Guidelines That Did Not Work Against Ebola in 2014
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www.hospitalhealthcare.com


April 2015

International infection control guidelines for Ebola

Ebola guidelines are not consistent and do not protect against airborne infection. Highly deadly infectious diseases should be treated at the highest infection control level

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Ebola is claiming an increasing number of victims in West Africa. Up to the end of October 2014, the number of confirmed, probable and suspected cases was 9291, including 4555 deaths (49%).² Healthcare workers (HCW) have also been seriously affected; as of 14 October, 423 HCWs have developed Ebola disease and 239 of them died (57%).¹ This development, with an increasing epidemic situation, may raise some questions about international and national infection control guidelines recommended by WHO, CDC and the UK:→ Why did the infection control not work for patients or for HCWs?



Importance of early and effective preventive behaviour during serious epidemics

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Why did WHO and CDC not act preventive?

- Ebola is a defined - level 4 high-risk disease that should be treated with high-risk isolation, from the start. Ebola is among the most dangerous diseases in the world.
- Why did WHO and CDC recommend to treat this level 4 disease as: "contact and droplet isolation within one meter"?
- Why did WHO and CDC not act preventive for
 - A remote disease, with small, but deadly outbreaks!
 - A disease with no evidence- based knowledge!
 - In a population in a tropical area, at a very high risk!
 - Where infections and death among HCW was known high, already from many years ago!
 - Why was Ebola handled in USA and Europe – as a level 4 disease?

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Report of the Ebola Interim Assessment Panel

Report of the Ebola Interim Assessment Panel, July 2015 to WHO

- - **The Ebola crisis not only exposed organizational failings in the functioning of WHO, but it also demonstrated shortcomings in the International Health Regulations (2005).**
- - If the world is to successfully manage the health threats, especially infectious diseases that can affect us all, then the Regulations need to be strengthened.--- -
- **Had the recommendations for revision made in 2011 by the Review Committee in relation to Pandemic (H1N1) 2009 been implemented, the global community would have been in a far better position to face the Ebola crisis.**
- **«The world simply cannot afford another period of inaction until the next health crisis. ---»**

Report of the Ebola Interim Assessment Panel, July 2015 to WHO

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Declaring a Public Health Emergency of International Concern (PHEIC)

Situation:

- <20. In the Ebola crisis, a PHEIC under the International Health Regulations (2005) was not declared by the Director-General until 8 August 2014.---
- 21. WHO does not have a culture of rapid decision-making and tends to adopt a reactive, rather than a proactive, approach to emergencies.---
- ---There seems to have been a hope that the crisis could be managed by good diplomacy rather than by scaling up emergency action.
- **At present, WHO does not have the capacity or organizational culture to deliver a full emergency public health response.»**

Report of the Ebola Interim Assessment Panel, May and July 2015 to WHO

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Cultural Contexts of Ebola in Northern Uganda

Barry S. Hewlett* and Richard P. Amola† 2003

- When an illness has been identified and categorized as a killer epidemic (*gemo*), the family is advised to do the following:
 - 1) Quarantine or isolate the patient in a house at least 100 m from all other houses, with no visitors allowed.
 - 2) A survivor of the epidemic should feed and care for the patient. If no survivors are available, an elderly woman or man should be the caregiver.
 - 3) Houses with ill patients should be identified with two long poles of elephant grass, one on each side of the door.
 - 4) Villages and households with ill patients should place two long poles with a pole across them to notify those approaching.
 - 5) Everyone should limit their movements, that is, stay within their household and not move between villages.
 - 6) No food from outsiders should be eaten.

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12) Once the patient no longer has symptoms, he or she should remain in isolation for one full lunar cycle before moving freely in the village.

13) If the person dies, a person who has survived *gemo* or has taken care of several sick persons and not become ill, should bury the persons; the burial should take place at the edge of the village.

- "From a biomedical perspective, this protocol constitutes a broad-spectrum approach to epidemic control.
- Isolation and identification of the patient's home and village were emphasized by all groups interviewed, but sexually transmitted and foodborne transmissions were also frequently listed.
- Elders were adamant that this protocol existed before the arrival of Europeans in the late 1800s."
- Barry S. Hewlett* and Richard P. Amola† 2003
- **Lessons to learn from earlier epidemics--**

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Updating Ebola transmission

- Virus shedding ---after intranasal inoculation in guineapigs. ---
"including those transported through air movement over short distances." Wong J Vir 2015;89:1314
- Persistence and recrudescence in some; CNS, eyes, semen (more than 2 years) Ed. JHI 2016;94:
- "Hiding in lungs of HCW". Persistence and local replication. Contribute to the transmission-- Biava et al. PLOS Path Jan 2017
- None of tested PPE combinations provided a complete solution for PPE. Canada .Herlihey TA et al. IJCHE 2016; 37:1022-



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Assessment of self-contamination during removal of PPE for Ebola—

Casanova LM et al. ICHE 2016;37:1156-

CONTAMINATION DURING EBOLA PPE REMOVAL 1159

TABLE 2. Detection of Non-enveloped Bacteriophage MS2 After PPE Doffing

Subject	Hands		Inner Gloves		Face	Shirt	Glove Sanitizer
	Non-dominant	Dominant	Non-dominant	Dominant			
1	ND	ND	ND	1.1×10^3	ND	ND	ABHR
2	ND	ND	ND	ND	ND	ND	ABHR
3	ND	ND	1.7×10^3	2.9×10^2	ND	ND	ABHR
4	ND	ND	ND	2.6×10^2	ND	ND	ABHR
5	ND	ND	9.2×10^4	5.5×10^4	ND	ND	ABHR
6	ND	ND	ND	ND	ND	ND	ABHR
7	ND	ND	8.5×10^1	1.2×10^3	ND	3.16×10^4	ABHR
8	ND	ND	2.8×10^4	3.6×10^4	ND	ND	ABHR
9	ND	ND	7.6×10^3	3.0×10^4	ND	ND	ABHR
10	ND	ND	5.2×10^2	1.8×10^1	ND	ND	ABHR
11	ND	ND	ND	ND	ND	ND	HOCl
12	ND	ND	ND	ND	ND	ND	HOCl
13	ND	ND	ND	ND	ND	ND	HOCl
14	6.4×10^1	1.0×10^2	ND	ND	ND	ND	HOCl
15	ND	ND	ND	ND	ND	6.16×10^3	HOCl

NOTE. ND, not detected; ABHR, alcohol-based hand rub; HOCl, hypochlorite glove sanitizer.

Skin, clothes contaminated after protective gear removed.

Thomas et al. JAMA Int med

2015;175:1904

- 435 gown and glove removals- fluorescent lotion tested and bacteriophage MS2.
- Contamination of skin or clothing: 46%
- More during gloves than gowns: 53% versus 38%
- Education and training significantly reduced the contamination rate.
- The hands and neck were the most frequent contaminated sites.

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Personal protective equipment solution for UK military medical personnel working in an Ebola virus disease treatment unit in Sierra Leone

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Donning and doffing methods – still with some problems---- with doffing--

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SUMMARY

The combination of personal protective equipment (PPE) together with donning and doffing protocols was designed to protect British and Canadian military medical personnel in the Kerry Town Ebola Treatment Unit (ETU) in Sierra Leone. The PPE solution was selected to protect medical staff from infectious risks, notably Ebola virus, and chemical (hypochlorite) exposure. PPE maximized dexterity, enabled personnel to work in hot temperatures for periods of up to 2h, protected mucosal membranes when doffing outer layers, and minimized potential contamination of the doffing area with infectious material by reducing the requirement to spray PPE with hypochlorite.

Complete PPE for occupational Ebola exposure **may work!**

- 77 occupational exposures to Ebola virus in 57 HCW (Guinea-2014-2015)
- **All were using complete PPE;**
 - **3.5 exposures/HCW/year and 18% high risk of transmission,**
 - **no infections.** Savini et al. CDC 2017;23:August

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Summary



- Ebola has caused a high number of victims, also among healthcare personnel (HCW) –in spite of PPE- recommendations for **contact and droplet isolation within one meter from the patient** (WHO,CDC,UK).
- The PPE- guidelines from WHO and CDC concerning suspected or confirmed Ebola cases were not evidence based and denied the possibility for airborne transmission.
- Before infection control was raised to level 4; strict isolation (airborne and contact infection), -more HCWs, helpers, families of cases and the general population were exposed unnecessary to a serious illness.
- New, updated guidelines from the WHO and CDC should protect HCW's, helpers and others working with Ebola and other serious infections in a more safe way, than today.
- A dangerous infection should always be met with the highest level of protection, not with the lowest.

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Thank you, for your attention!



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October 12, 2017	<p><i>(FREE Teleclass)</i> <u>STRENGTHENING IPAC STRUCTURES THROUGH EDUCATION IN LOW-INCOME OR MIDDLE-INCOME COUNTRIES</u> Speaker: Prof. Shaheen Mehtar, Infection Control Africa Network, and Stellenbosch University, Cape Town</p>
October 17, 2017	<p><i>(FREE South Pacific Teleclass - Broadcast live from the 2017 IPCNC conference)</i> <u>HAND HYGIENE PROGRAM SUCCESSES IN MEMBER COUNTRIES OF THE INICC</u> Speaker: Dr. Victor Rosenthal, Founder and Chairman, International Nosocomial Infection Control Consortium (INICC), Buenos Aires, Argentina Teleclass broadcast sponsored by Schülke (www.schuelke.com)</p>
October 26, 2017	<p><u>INFECTION CONTROL IN PARAMEDIC SERVICES</u> Speaker: Jennifer Amyotte, City of Greater Sudbury Paramedic Services, Canada</p>
October 31, 2017	<p><i>(FREE European Teleclass)</i> <u>INFECTION PREVENTION CHALLENGES AMONG HOSPITALIZED CHILDREN AND NEONATES IN AFRICA</u> Speaker: Prof. Dr Angela Dramowski, Stellenbosch University, Cape Town</p>
November 9, 2017	<p><u>CLEANING THE GREY ZONES OF HOSPITALS: LESSONS FROM A COMMUNITY-BASED TEACHING HOSPITAL</u></p>

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