

Pneumonic Plague Epidemic in Madagascar

A View from the Ground 2017 and Update from 2018

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Madagascar: A Beautiful Island Nation in East Africa

The Capital City: “Tana” Antananarivo



Jacaranda Trees in Peak Bloom



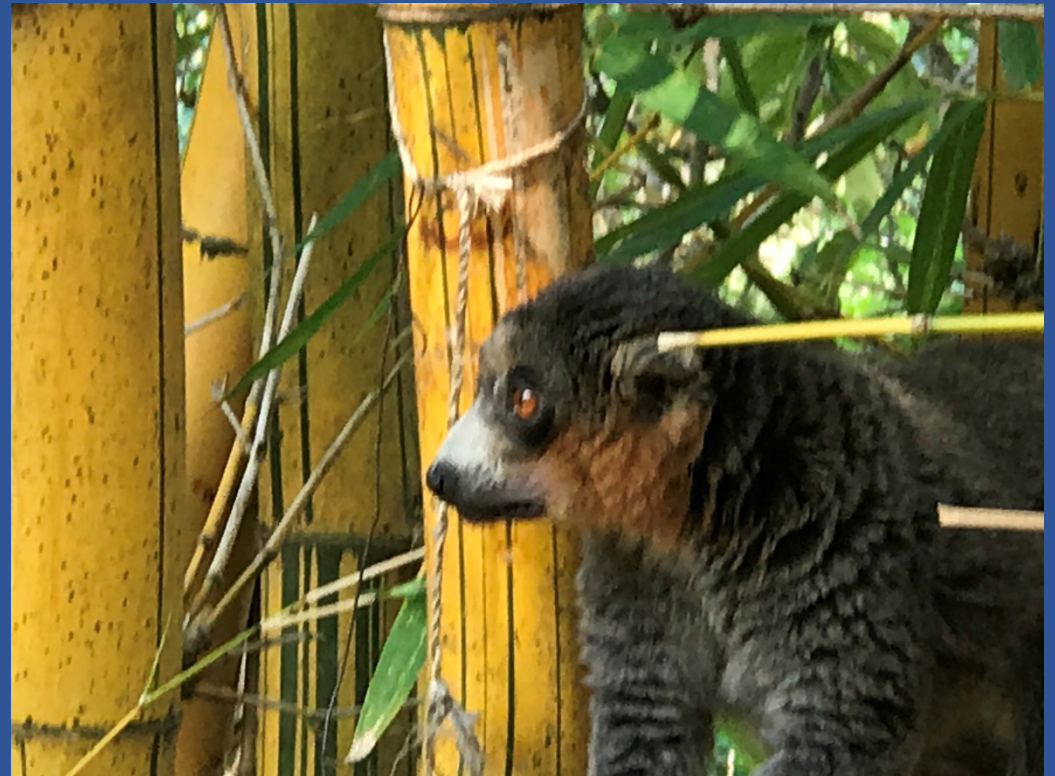


Lemurs: Unique to Madagascar

Ringtail Lemurs with newborns



~ 8 More Species of Lemurs



Madagascar: A Land of Natural Beauty

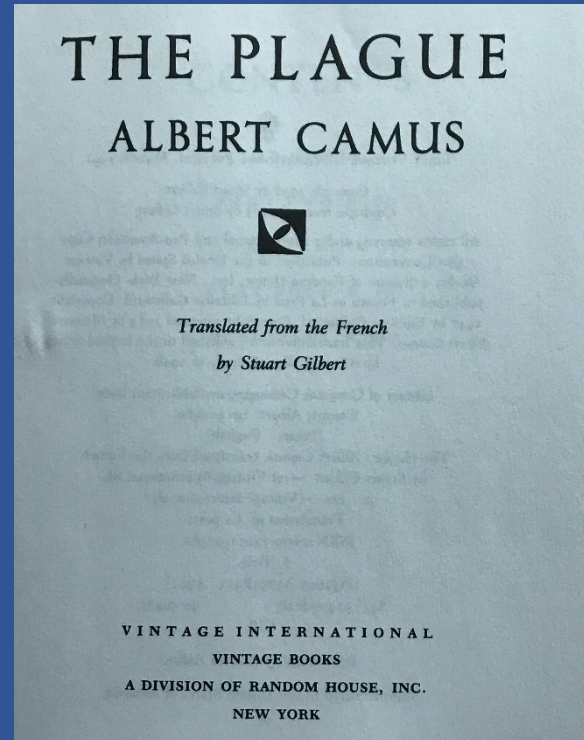


And Plague: Endemic in Central Highlands due to Infected Rat Fleas, Poverty, and Weak Health Infrastructure

Rat Fleas are vectors of *Yersinia Pestis* that cause (Bubonic) Plague



Camus' Book on Urban Plague, Fear, & Society in 1940's Algeria



Traveling to the Plague-Endemic Central Highlands:

Searching for Patient with Culture-Positive Plague Pneumonia

**When the Road Ends, “Shoe Leather”
Epidemiologists Start Walking**



“ZEBU” Crossing the Dirt Road



Madagascar Epidemic Detectives: Ministry of Health

Epidemiologic Surveillance Office

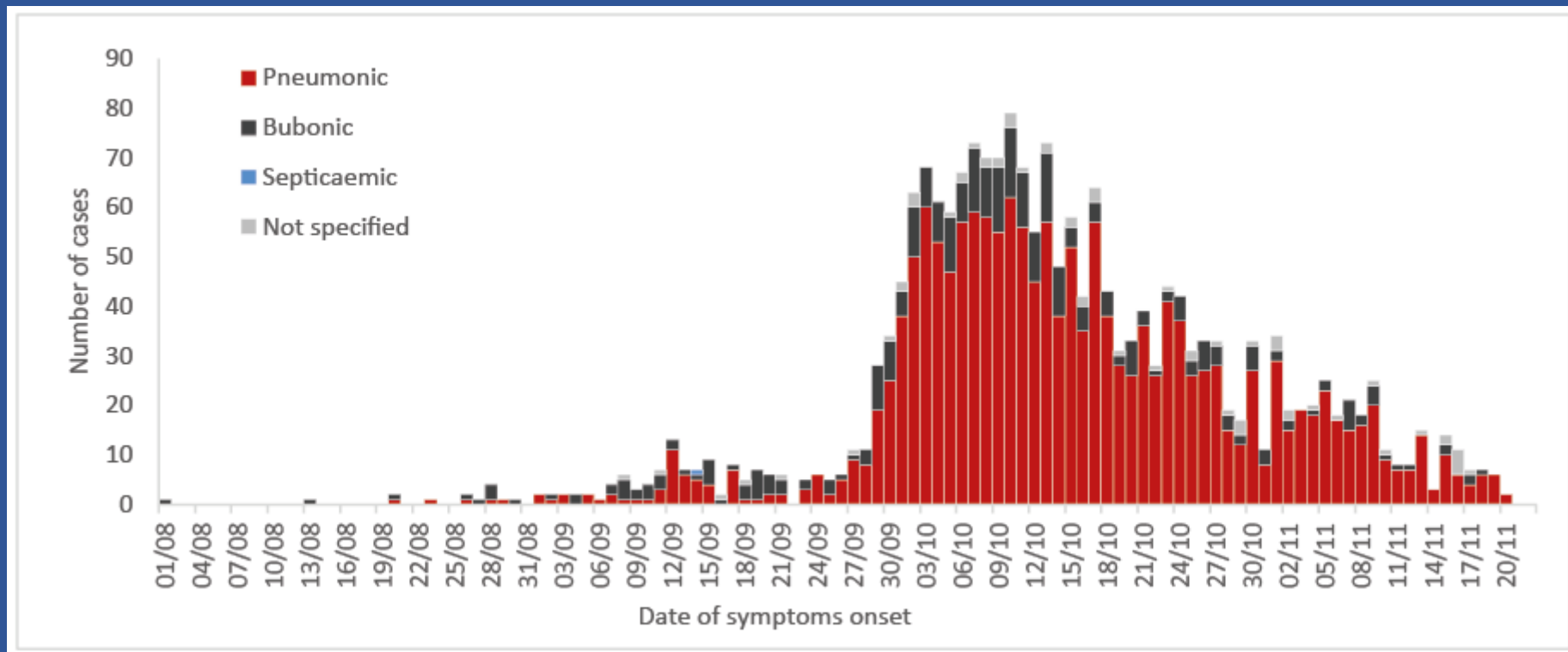


Ministry of Public Health



2017 Madagascar (Pneumonic) Plague Epicurve:

Confirmed < Probable < Suspect with onset 1 Aug-22 Nov (WHO AFRO 27 Nov)



Pneumonic Plague: Short Incubation Period and Rapid Death if Untreated.
Thus, Immediate Treatment Before Diagnostic Lab Results

- Incubation Period: 1-4 days
- Fever, headache, fatigue
- Cough, Chest Pain, Dyspnea
- Bloody Sputum is a Key Finding
- Dx: Rapid test, PCR, Culture, Serology
- Chest X-ray: Bilateral infiltrates
- Rx: *Streptomycin* in Madagascar
- In USA: Rx with Gentamicin
(or ? Levofloxacin or Ciprofloxacin)

Pneumonic Plague:

Primary: Spread Person-to-Person by Respiratory Droplets

Secondary: Spread from Lymph Nodes (bubo) to Blood to Lungs

Pneumonic Plague: A Medical Emergency



Streptomycin 36 or more IM 500mg Injections

2. PESTE PULMONAIRE

Médicaments : streptomycine SMY uniquement
Durée : 8 jours à 10 jours

Schéma

Chez l'adulte : 1^{er} et 2^{ème} jour : 4g en doses fractionnées de 0,5 g toutes les 3 heures
3^{ème} et 4^{ème} jour : 3g en doses fractionnées de 0,5 g toutes les 4 heures
5^{ème} au 8^{ème} jour : 2g à raison de 1 g le matin et 1 g le soir

Chez l'adolescent et l'enfant, on préconise une dose de :
Pendant les 4 premiers jours : 7,5 mg/kg/injection toutes les 3 heures pendant 4 premiers jours
Puis 15 mg/kg/injection matin et soir du 5^{ème} au 8^{ème} jour.

Age	Médicaments	1 ^{er} jour	2 ^{ème} jour	3 ^{ème} jour	4 ^{ème} jour	5 ^{ème} jour	6 ^{ème} jour	7 ^{ème} jour	8 ^{ème} jour
Adulte	SMY injectable (1g – 1 flc) Dose selon les poids	0,5 g toutes les 3 heures U U U U U U U U	0,5 g toutes les 3 heures U U U U U U U U	0,5 g toutes les 3 heures U U U U U U U U	0,5 g toutes les 3 heures U U U U U U U U	1 flc matin 1 flc soir U U U U	1 flc matin 1 flc soir U U U U	1 flc matin 1 flc soir U U U U	1 flc matin 1 flc soir U U U U
Moins de 15 ans	SMY injectable (1 g – 1 flc) Doses selon les poids	7,5 mg/kg A chaque injection U U U U U U U U	7,5 mg/kg A chaque injection U U U U U U U U	7,5 mg/kg A chaque injection U U U U U U U U	7,5 mg/kg A chaque injection U U U U U U U U	15 mg à chaque injection U U	15 mg à chaque injection U U	15 mg à chaque injection U U	15 mg à chaque injection U U

U : nombre d'injection

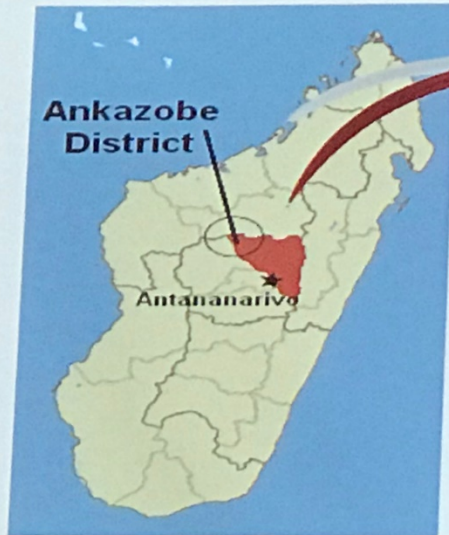
Traitement en cas d'allergie à la SMY : CHLORAMPHENICOL
Le CHLORAMPHENICOL est aussi, très actif sur *Yersinia pestis*, habituellement réservé aux méningites pesteuses. Une dose de charge de 25 mg/kg suivi par un traitement intraveineux de dix jours à la dose de 50 à 75 mg/kg/jour est recommandée par l'OMS. La dose étant de 20 à 25 g.

Updated Data Presented by WHO Plague Expert Dr. Eric Bertherat

- The following WHO Slides (5) Presented 9 November, 2018 at the International Meeting on Emerging Diseases (IMED) in Vienna, Austria
- Dr. Bertherat and I worked together in Madagascar in October-November 2017, and met in Austria 9 November 2018 at IMED

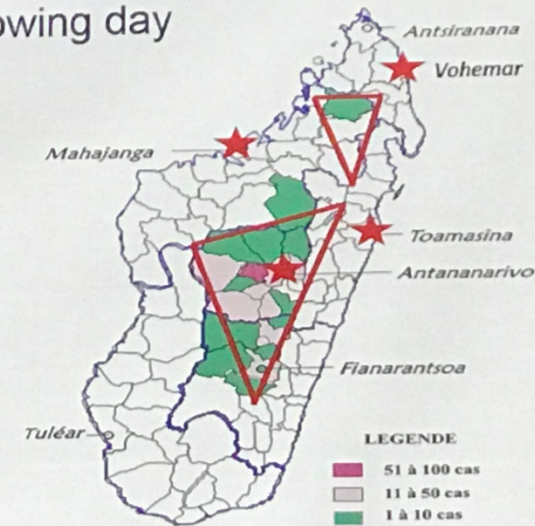
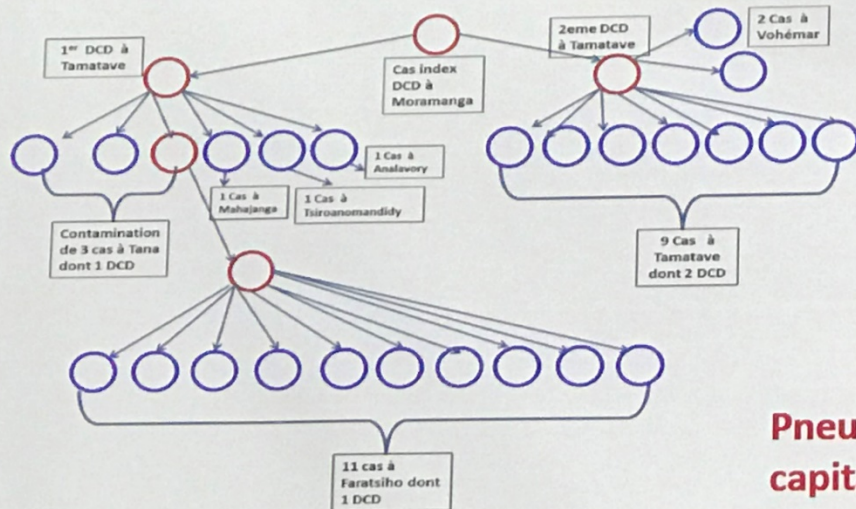
11 Sept. 2017: Antananarivo hospital A 47yrs old woman dies of pneumonia

- 3rd death in the same family. Pneumonic plague suspected, secondarily confirmed
- **Index case** : 31 yrs old man getting sick and dying on 27 Aug. during a journey in collective taxi between Ankazobe (endemic district) and Toamasina



Index case dying on 27 Aug ...

- His neighbor in the taxi gets sick on 1st Sept and dies the following day
- A 2nd passenger gets sick on 2nd Sept and dies on the 3rd



Pneumonic plague outbreak affecting several cities, the capital included. Notification to WHO on 13 Sept. according to the IHR

Aug- Nov 2017: 2 414 reported cases

Suspect: clinical presentation + epid. context

Probable: RDT + or PCR +

Confirmed: (RDT + and PCR +) or (culture +)

597 confirmed/probable

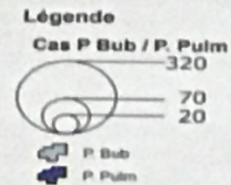
418

Pneumonic
(32 confirmed)

139 Bubonic
(66 confirmed)

39
unknown

- 41 affected districts / 114
- 84 % of PP in Antananarivo and Toamasina

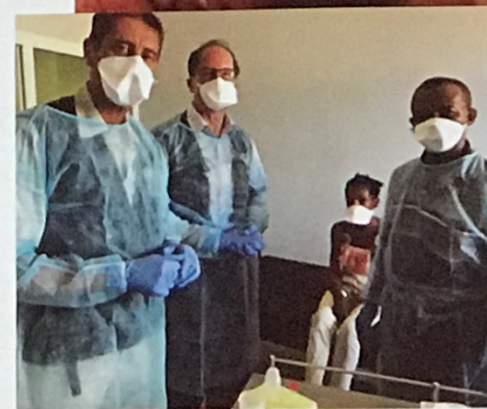


Source DVSSE

Unusual clinical presentation of PP ?

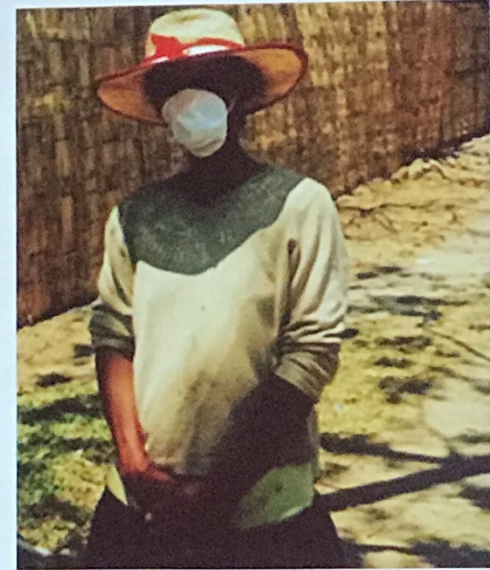
Lack of clinical experience in new affected areas + misuse of RDTs + lack of means

- Suspect case = evocative symptoms + context, whatever the lab results
 - PP vs BP
 - < 5yrs: Rhino, Adeno, Coronavirus (Influenza surveillance)
 - PP vs TB
- Confirmed PP:
 - Median age 26 yrs
 - Cough (81%), Chest pain (50%), haemoptysis (48%)
- Initial event, characteristic of a PP outbreak



Interpretation (1)

- The most important PP outbreak in urban context for at least 25 years
- No tangible arguments supporting a modification of the circulating strain, of the clinical presentation, nor a change in ecological or anthropological factors
- Rather the result of a conjunction of unfavorable factors occurring over an intense endemicity. The scenario was predictable
- New areas affected, lack of clinical experience + misuse of RDT : over notification and confusion



Rapid Diagnostic Test for *Yersinia pestis* at Point of Care:

Developed by Institute Pasteur Madagascar

On Pus from Bubo (?or Sputum?)



Bloody Sputum

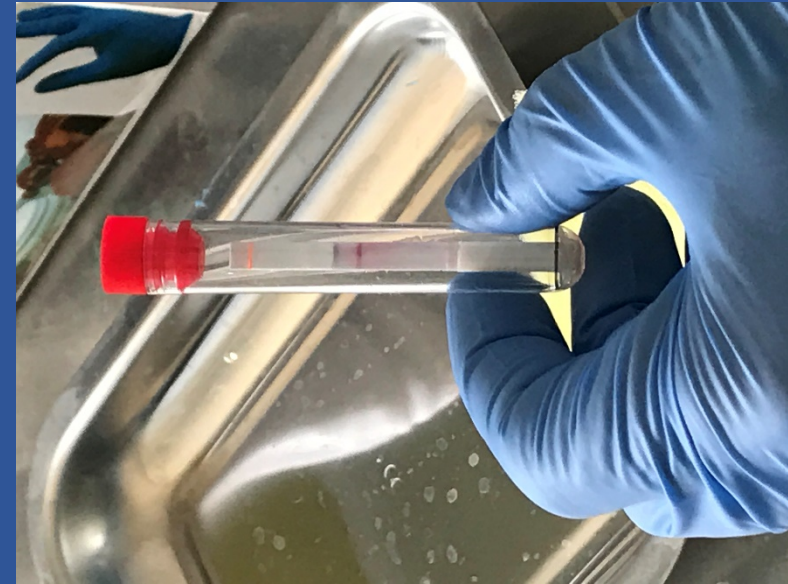


Performing the Rapid Diagnostic Test at the Bedside

Bedside Test with Madagascar & WHO Doctors



Dipstick Result in 25 minutes: The Answer is...



Institute Pasteur Madagascar (IPM) Laboratory in the Capital

Dedicated Plague Laboratory Unit



With WHO and Pasteur Team



Personal Protective Equipment 2017 Plague

With Madagascar Colleagues



Treated, Recovering Patients in Tents



Examples of Measures to Help Stop the Epidemic

Public Health

- Community Education
- Risk Communication
- Closing Schools & Social Gatherings
- Safe and Dignified Burials
- Coordination by Government, WHO, NGOs

Medical

- Identify Patients Quickly
- Give Patients Antibiotics Quickly
- Giving Preventive Antibiotics to Close Contacts
- Specimen collection & reporting back results
- New Treatment, Diagnostic, & Triage Protocols

Identify Pivotal Questions during Epidemics e.g., What is Preventing International Spread?

Airport Exit Screening Questions

- Do you know signs & symptoms of Plague?
- Do you know that if you have the signs and symptoms of plague, you can transmit the disease to others?
- Do you know you must consult your doctor quickly if signs and symptoms of plague begin within 10 days of your return and notify of your stay in Madagascar?

Airport Exit Screening Form Oct 16, 2017

QUESTIONNAIRE - QUESTIONNAIRE - FANOTANIANA

Connaissez-vous les signes de la peste ?
Do you know the signs and symptoms of plague?
Fantatrao veireofitrangan'ny aretinapesta?

Oui - Yes - Eny <input type="radio"/>	Non - No - Tsia <input type="radio"/>
--	--

Saviez-vous que si vous présentez ces signes, vous pourriez transmettre cette maladie aux autres ?
Do you know that if you have the signs and symptoms of plague, you can transmit the disease to others?
Fantatrao ve fa
rahamisy ireo fambara aretinamombany Pesta ireo ianao, diametyha

Oui - Yes - Eny <input type="radio"/>	Non - No - Tsia <input type="radio"/>
--	--

Saviez-vous qu'il faut consulter immédiatement votre médecin dès l'apparition de ces signes dans les dix jours suivant votre retour, tout en signalant la notion de séjour à Madagascar ?
Do you know that you must consult quickly your doctor if signs and symptoms of plague begin within 10 days of your return and notify of your stay in Madagascar?
Fantatrao ve fa
tokony hanatona Mpitsabo haingana ianao raha misy ireo fambara aretinamombany Pesta ireo ianao, diametyha

Oui - Yes - Eny <input type="radio"/>	Non - No - Tsia <input type="radio"/>
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Traveling to Airports and Seaports to Establish Exit Screening Operations

From Capital City to other Cities



2nd Half of October 2017

Flying to Seaports Cities of:

- Mahjunga
- Tomatave (Toamasina)

Seaport city of Tomatave (“Toamasina”)

Entry Screening to Seaport



2nd Largest City: Also, Pneumonic Plague



2018 Proposed Changes for Plague Pneumonia

Dx

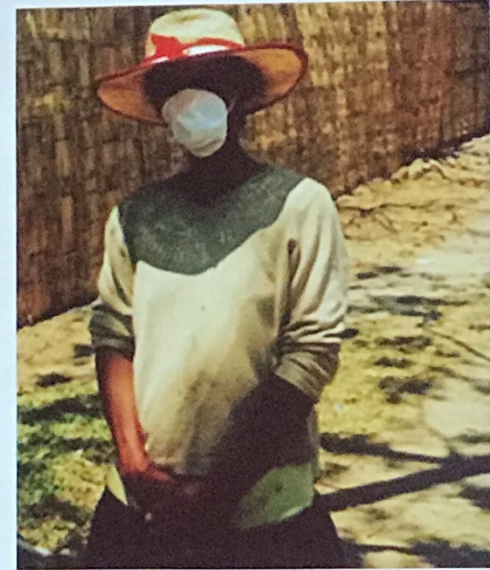
- Do not use Rapid Test for Dx Suspected Plague Pneumonia
- Use higher-specificity PCR
- Obtain blood for cultures
- If feasible, obtain CXR

Rx

- Avoid 36 IM injections of STM
- If another suspected urban pneumonia epidemic occurs, then avoid 36-40 IM shots of Streptomycin.
- Rx with Gentamicin IV/IM for Plague and Levofloxacin (po/IV) for non-plague bacterial pneumonia

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Thank you!

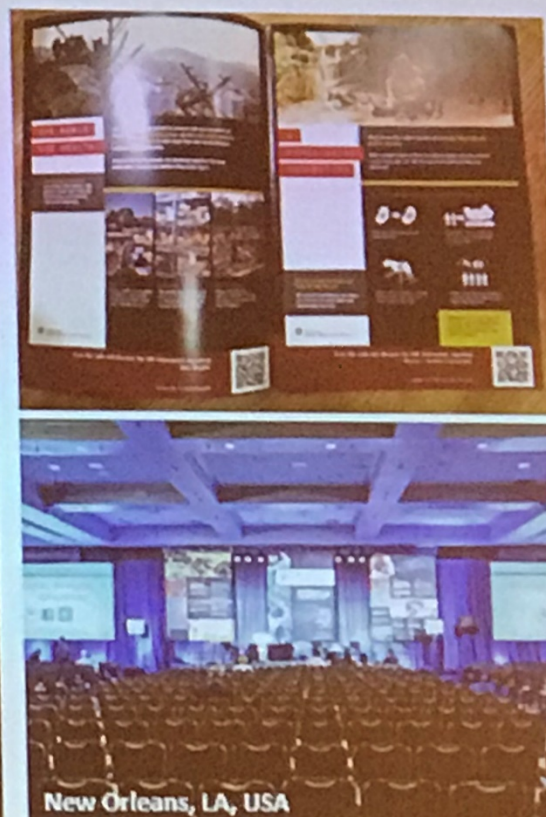
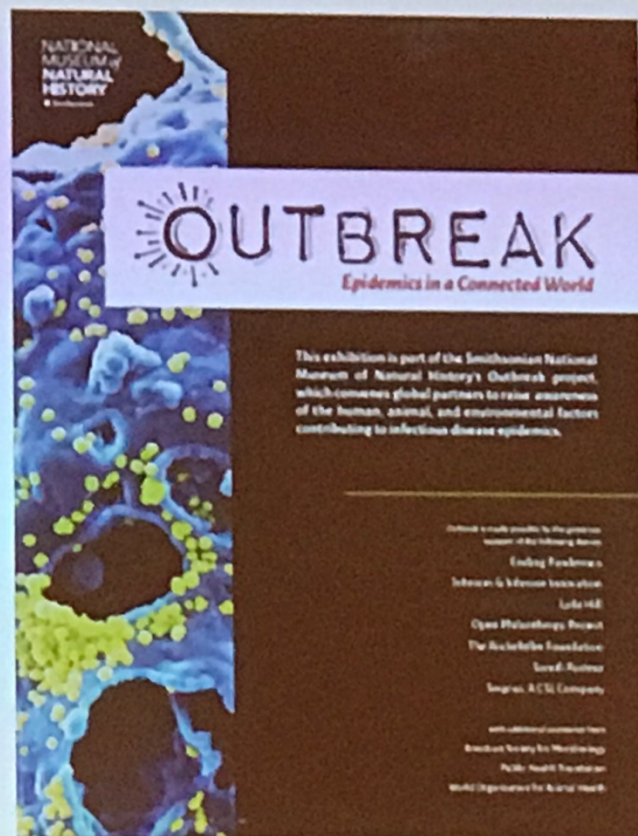
Questions and Comments

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- Email: DRL23@Georgetown.edu
- Daniel.Lucey8@gmail.com



Outbreak DIY: a **new** tool

- **Free**
 - No costs or obligations to NMNH/SH
 - Production costs determined by hosts
- **Flexible**
 - Optional use of all assets except one
 - Designed for scalability
- **Translatable**
- **Customizable**



Outbreak DIY assets

- **16 pre-designed panels**
 - monolingual text in English
 - bilingual text in English and French, Spanish, Modern Standard Arabic, Simplified Chinese or Traditional Chinese
- **2 template panels**
 - monolingual or bilingual format
- **6 multimedia pieces** (videos, games)
 - audio in English
 - text/subtitles in English, French, Spanish, Modern Standard Arabic, Simplified Chinese or Traditional Chinese
- **Community Resource Guide**
- **Style Guide**
- **Volunteering training and public program tools**
- **Promotional and evaluation materials**
- **Contact: NMNH-ExhibitsDIY@si.edu**

