

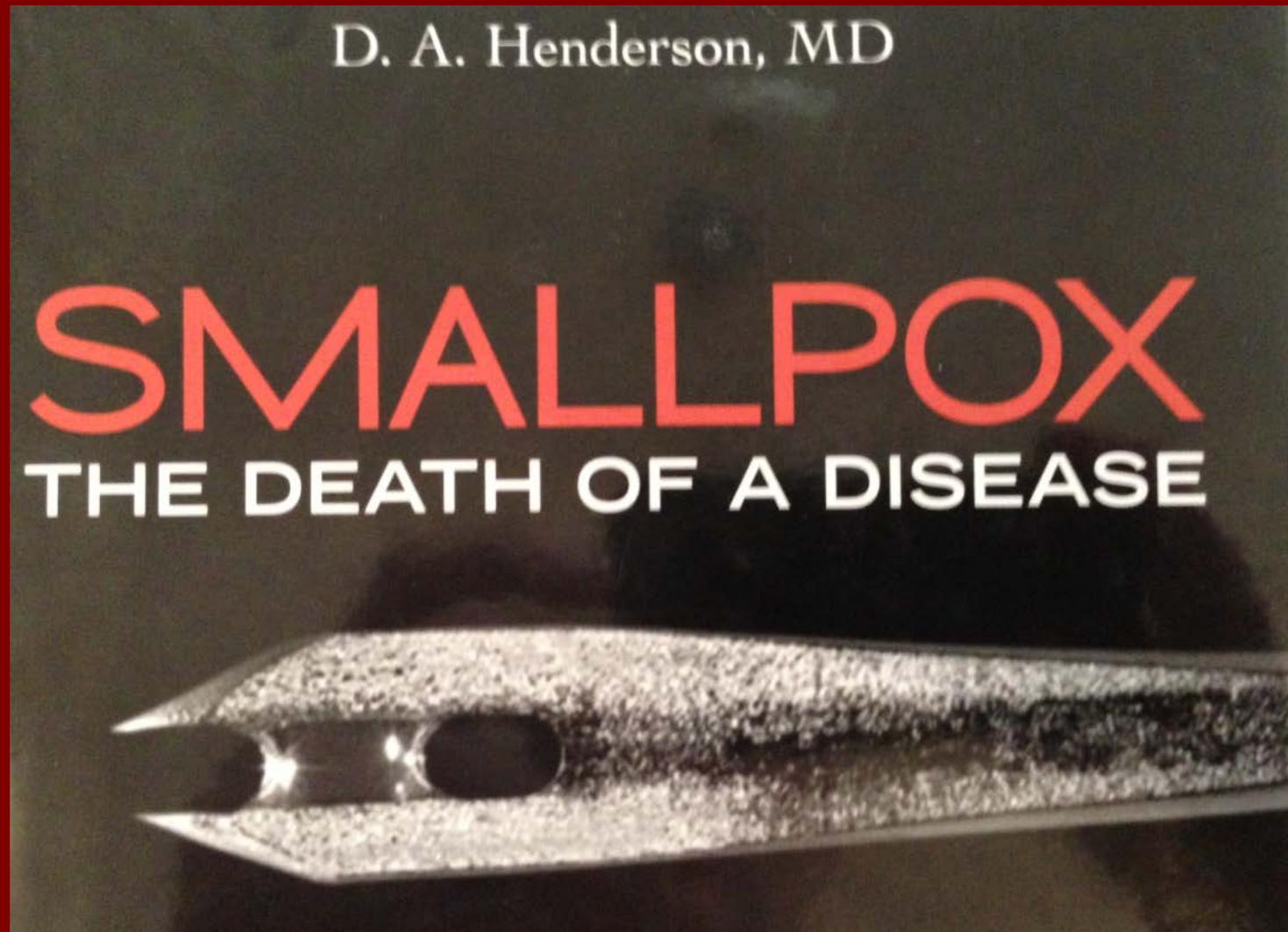
Smallpox Recognition and Vaccination

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5 Key Points: Smallpox and the Vaccine

- Smallpox is caused by variola orthopoxvirus.
- Last natural case was in 1977. No animal reservoir.
- The virus exists in one lab in the US & one in Russia
- Thus, even ONE case today is a PUBLIC HEALTH EMERGENCY (due to either lab error or bioterror).
- The smallpox vaccine uses a different virus "vaccinia".
Thus, the VACCINE can NEVER CAUSE SMALLPOX.

Bifurcated Needle with a Drop of Smallpox Vaccine
(Bookcover by DA Henderson 1928-2016)



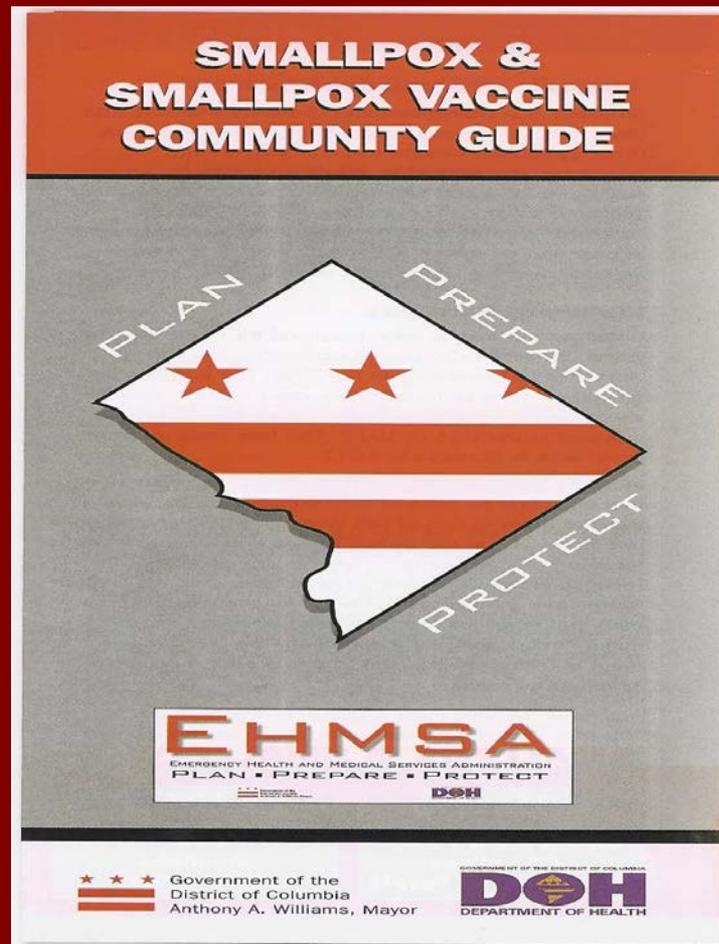
Dr. D.A. Henderson: “Smallpox Vaccination” Washington Hospital Center: Jan 22, 2003



2002-2003: Smallpox Vaccine Trainings by Washington DC Department of Health



Smallpox & Smallpox Vaccine Educational Community Guide for Washington DC Area



The DAY ONE Scenario For Planning and Preparedness

- Pre-Event (1st case) Planning and
- Post-Event (after 1st case) Planning

- What to do given a single patient with smallpox anywhere in the world?

- A reasonable test for ‘Are We Prepared?’

**First DC volunteer vaccinated by
DC Department of Health: 3 March 2003**



Vaccinating initial 40 Health Care Workers: Washington DC Department of Health 20 March 2003



Smallpox Vaccination Training 2002-2003

Washington DC-Virginia-Maryland Region

- Departments of Health
- Hospital Association
- Medical Society of DC.

- Media interviews & discussion.

- Use of bifurcated needle & risks/benefits of vaccination. Certification card given (see photo).

DISTRICT OF COLUMBIA

Daniel Lucey, M.D.

Is Designated by the Department of Health as

SMALLPOX IMMUNIZATION TECHNICIAN

Date: November 2002

Expires: November 2004

Tracking No.: 0185



[Signature]
Chief Medical Officer

Smallpox: Clinical Recognition

- Key references (see photos & timeline following):
- WHO smallpox website:
<http://www.who.int/csr/disease/smallpox/en/>
- US CDC smallpox website:
<https://www.cdc.gov/smallpox/>

4 Key Points for Clinicians

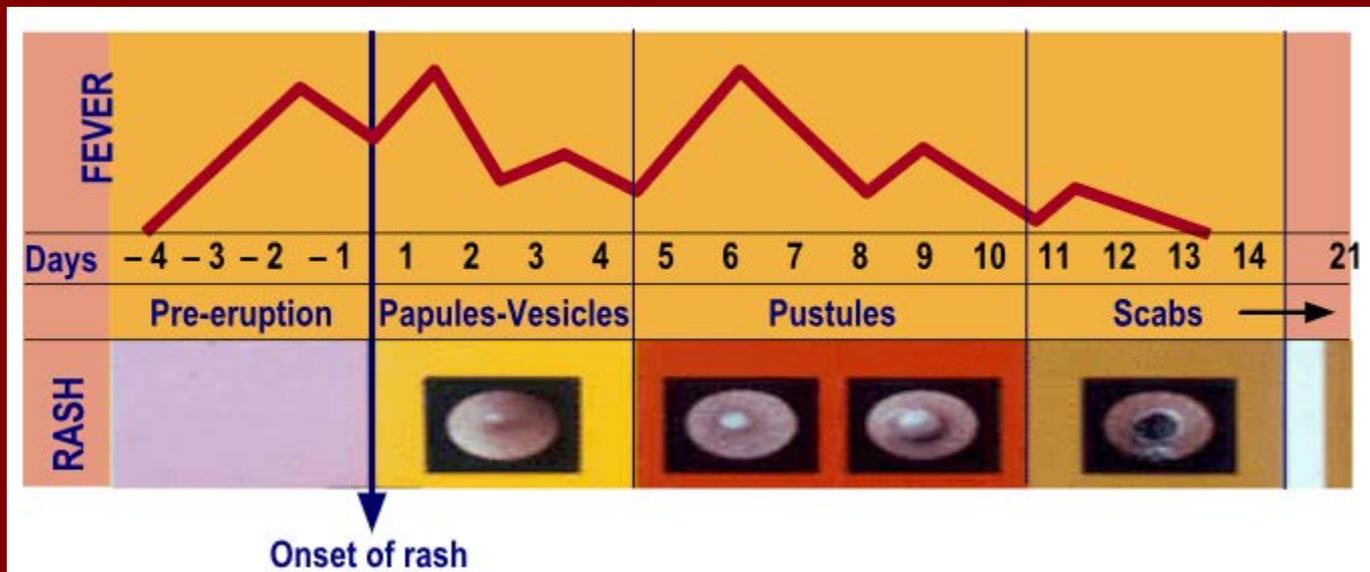
- Incubation period: 7-17 days.
(except shorter for rare hemorrhagic form).
- Diagnosis: Clinical criteria e.g., WHO or US CDC algorithm, then lab tests.
- Therapy: No antiviral drugs FDA-licensed
- Prevention: Vaccination. Avoid Exposure.

WHO IHR (2005) Definition of Confirmed Case of Smallpox Must Be Reported to WHO

- **“Confirmed case of smallpox**
- An individual of any age presenting with acute onset of fever ($\geq 38.3^{\circ}\text{C}/101^{\circ}\text{F}$), malaise, and severe prostration with headache and backache occurring 2 to 4 days before rash onset; **and**
- Subsequent development of a maculopapular rash starting on the face and forearms, then spreading to the trunk and legs, and evolving within 48 hours to deep-seated, firm/hard and round well-circumscribed vesicles and later pustules, which may become umbilicated or confluent; **and**
- Lesions that appear in the same stage of development (i.e. all are vesicles or all are pustules) on any given part of the body (e.g. the face or arm); **and**
- No alternative diagnosis explaining the illness; **and**
- Laboratory confirmation”. (Source: WHO smallpox website Feb. 2017).

Smallpox: Clinical Recognition

- WHO Smallpox Website: Febrile prodrome then evolving rash with lesions in same stage:



Day 5 of Smallpox (top) Rash -vs- Chickenpox (bottom) Rash (WHO)



Smallpox Lesions: Palms and Soles (WHO)

Pocks are usually present on the palms of the hands and on the soles of the feet.



Ordinary Smallpox (*Variola major*): US CDC website for clinicians

Ordinary Smallpox



Male smallpox patient with lesions on upper body, arms, face, and neck. Source: CDC's Barbara Rice.

Transmission of Smallpox (Variola Virus): Begins with onset of Fever (before Rash)

- “Human-to-human transmission of variola virus occurs by inhalation of large, virus-containing airborne droplets of saliva from an infected person.
- Infectious virus particles are released from the sloughing off of oropharyngeal lesions.
- Smallpox patients are considered infectious from the time the first oropharyngeal lesions appear, throughout the course of the disease, until the last scab falls off the body.” (Source: US CDC smallpox website).

If Widespread Smallpox Aerosol Attack, Remember: Short Incubation of Hemorrhagic Form & Risk in Pregnancy

- Hemorrhagic smallpox 240 cases: Rao AR. J Indian Med Assoc 1964 (Sept 1); 43:225-229. Mean of 6 days from onset of febrile prodrome to death...
- Current US (CDC) protocol to identify smallpox is NOT designed to identify hemorrhagic smallpox..a rare form sometimes see during pregnancy.
- Photo here from US CDC website:----



Tissue Culture Derived Vaccine Licensed by Food and Drug Administration (FDA) in 2007

- The same Vaccinia virus is used in this “ACAM 2000” vaccine as in the traditional “DryVax” vaccine (Note: the DryVax vaccine no longer available in USA as of 2009).
- No foreign (animal) proteins due to use of tissue culture.
- Can “surge” vaccine production faster using cell culture in the event of emergency need to produce vaccine quickly.

Smallpox Vaccine Use in Postevent: 2015 US CDC 34-Page Guidance

- Peterson, B and Damon I. et al. Clinical Guidance for Smallpox Vaccine Use in a Postevent Vaccination Program. MMWR Recommendations Reports 2015 (Feb 20); /64 (RR02): 1-26. (3 Vaccines in US Stockpile).
- 1) ACAM2000: tissue culture derived (Vero cells).
- 2) Imvamune: Requires 2 doses at 0 and 4 weeks for persons never vaccinated (1 dose if prior vaccination). Indications notably for persons with atopic dermatitis and HIV/AIDS CD4 < 200.
- 3) APSV (Aventis Pasteur Smallpox Vaccine): Liquid calf-lymph vaccine frozen since 1956-57.

Smallpox Vaccine Use in Postevent: 2015 US CDC 34-Page Guidance

- Detailed Guidance on:
- 1) Which vaccine to use when, and
- 2) Contraindications (e.g., atopic dermatitis, immunodeficiency, age < 1, pregnancy), and
- 3) Potential adverse events (incl. myopericarditis seen in 2002-2003, and multiple others well-documented reactions progressive vaccinia, postvaccinial encephalitis, eczema vaccinatum, ocular vaccinia, generalized vaccinia, others.

ACAM2000 Vaccine:

Only FDA-Licensed Smallpox Vaccine in the USA

- Administered as 1 dose by percutaneous route using 15 jabs with bifurcated needle (see needle & demonstration)
- Must see at least one drop of blood to have confidence vaccine will be effective and produce a “take” i.e., a vesicle or pustule 6-8 days after vaccination.
- Sometimes Severe and Life-threatening Adverse Events estimating to be similar to traditional “DryVax” vaccine.

Thank you!

- Questions and Comments.
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