

New lessons from an old infectious disease outbreak:

How bad could bioterrorism be?

Alan P. Zelicoff, MD

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ARES Corporation
Albuquerque, NM

E-mail: azelicoff@arescorporation.com

Phone: 505-272-7102 or
zalan8587@qwest.net

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Smallpox -- Favorite Soviet (and Russian?) Biological Weapon

- Spreads VERY easily from person to person
- Mortality rate up to 40%; morbidity rate about 100%
 - But, mortality depends on the host
- Not hard to make
- Prophylaxis available (maybe)
- Concept of use:
 - Post- nuclear scenario?
 - ICBM warhead

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Usual smallpox



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Bad, bad smallpox



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Clinical Smallpox

- ✦ Smallpox was eradicated in 1977 (in Somalia).
- ✦ Declared officially eradicated in 1980
- ✦ World wide eradication campaign carried out by the WHO
 - ✦ Proposed by the Soviet Union
 - ✦ Vaccine provided by the Soviet Union
- ✦ Human only disease
- ✦ Classical appearance
- ✦ Classical clinical progression

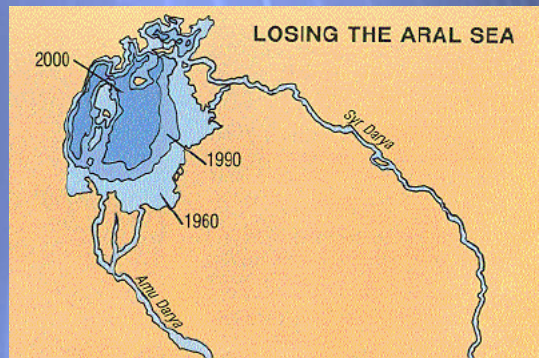
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Aral Sea Region

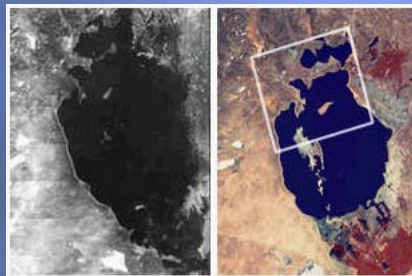


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Aral Sea Geography



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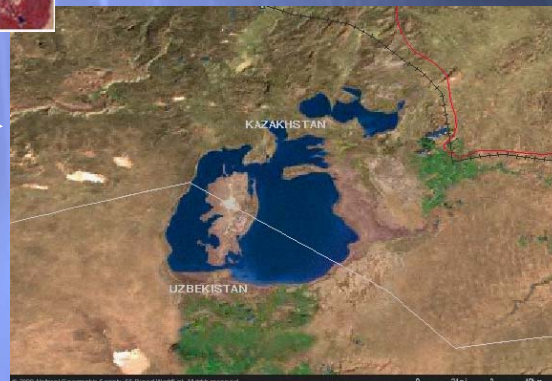


1960's and 1987

2000

Views of the
Aral Sea

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Summary: Official Report

- ✦ Index case - 24 y.o. F, ichthyologist
- ✦ One of 12 crew on vessel "Lev Berg"
- ✦ 6 August 1971: Illness began with fever
 - ✦ 4th or 5th day of illness, rash began (rash not described)
- ✦ 11 August: Returned to Aral'sk, and visited by physician
- ✦ Felt well by 20 August

- ✦ 15 August: brother becomes ill
- ✦ 30 August: pediatrician visits
 - ✦ Dx: "urticaria" (rash not otherwise described)
- ✦ 12 September -- returns to school

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Summary: Official Report

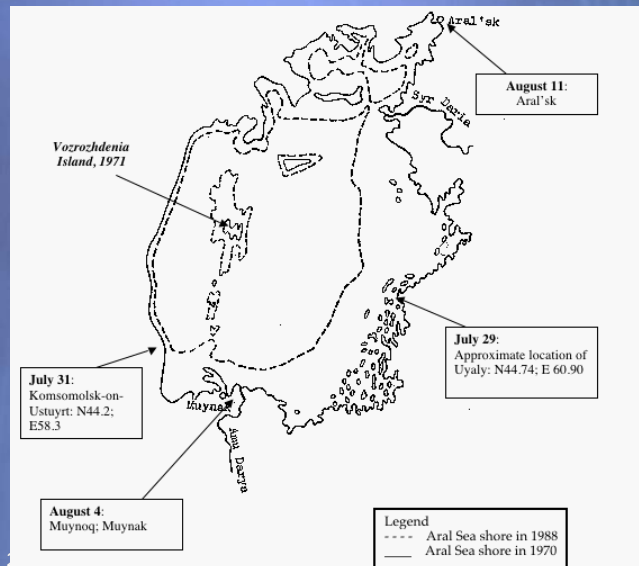
3rd Patient

- 9/10: high fever and headache
- 9/17: “rash over whole body” --> hospitalized
 - Working dx: “Dermatitis herpetiformis”
- 9/22: Dx. Smallpox (by ID expert)

4th Patient - schoolteacher of Pt. #2

- 9/10: ill with fever
 - 9/20: rash appeared (initial dx. = measles)
 - 9/20: rash started on face, then trunk and extremities
 - dx. Smallpox made
 - Quarantine and house-to-house search begun
 - > 200 people quarantined
- Sept 2003, 13,000 vaccinated over about 2 weeks

The course of the Lev Berg



Conclusions of Official Report

- ✦ "She went ashore July 29 and 31, 1971, and on August 4, 1971. She became ill on August 6. It can be presumed that she became infected with smallpox in one of these two (sic) locations. Judging by the incubation period, these locations were Uyaly and Komsomolskiy".
 - ✦ Incubation period = 2, 6, or 8 days (?)
 - ✦ No outbreak identified in any of the towns where the ship berthed
- ✦ "Less probable, but still possible, is that the infection was introduced directly into the city of Aralsk from the southern borders of the Soviet Union via land or water transportation."

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Interviews: May 25 and 26, 2002

Patient #1 (Bayan Bisenova)

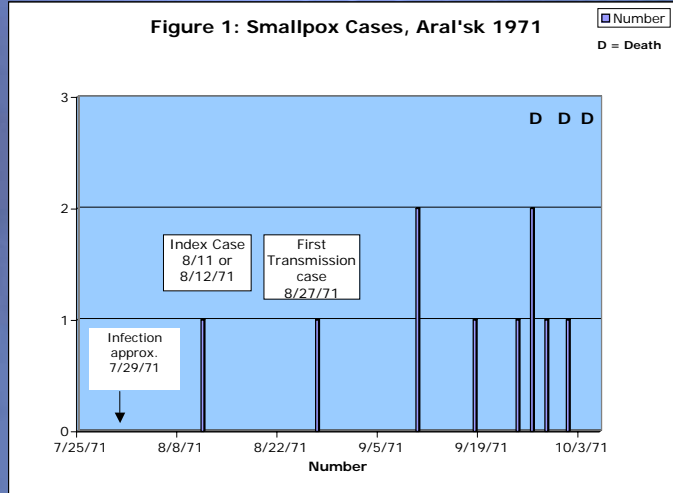
- ✦ Had been vaccinated
- ✦ 54 y.o. biologist
- ✦ Spent much time on the deck of the ship
- ✦ *Did not get off ship nor go shopping*
- ✦ *Became ill on or about August 11 or 12*

✦ Patient #2 (Sakijan Bisenov)

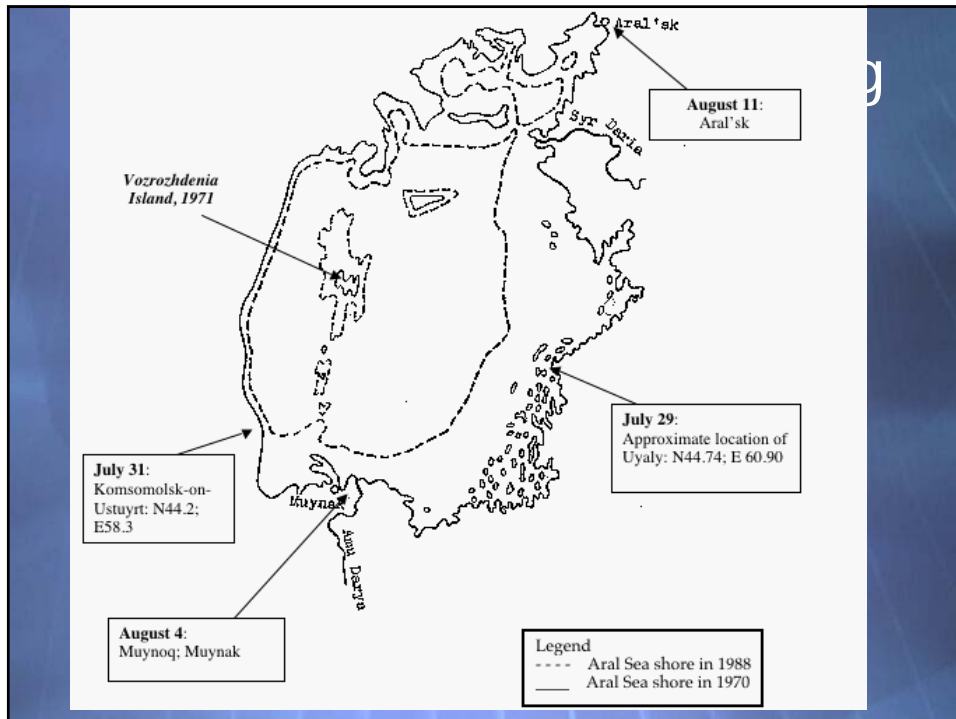
- ✦ Had been vaccinated
- ✦ Became ill 13 - 14 days after his sister
- ✦ Diffuse rash when he saw his teacher
(#4)

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Summary of Cases



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Alternative synthesis

- 12 - 14 days before Patient #1 became ill:
 - The *Lev Berg* was likely south of Vozrozhdenia island
 - Wind blows uniformly from North or Northwest
 - Vozrozhdenia island was a biological weapons testing site
 - Smallpox drifted down-wind from the island?
- What kind of smallpox strains were involved?

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Interview with Pyotr Burgasov, Moscow News, Nov. 13, 2001

“A powerful form of smallpox was tested on the island Vozrozhdenie in the Aral Sea. ...Suddenly, I received a report that there was a mysterious death. It turned out that a research vessel in the Aral Sea approached the island at 15 kilometers distance. (It was forbidden to be closer than 40 kilometers). A laboratory assistant went out on to the deck twice a day and took plankton samples. Smallpox agents “reached” her—at the time there were a total of 400 grams of the formula on the island. She was infected, and upon returning home to Aralsk, ...

Guessing the reasons, I called the head of Genshtab and requested that the train from Alma-Ata to Moscow be forbidden to stop in Aralsk. ... I called Andropov, then the head of the KGB, and reported that a rare form of smallpox had been contracted on Vozrozhdenie. He ordered that not another word be said about it.”

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Does smallpox come in flavors?

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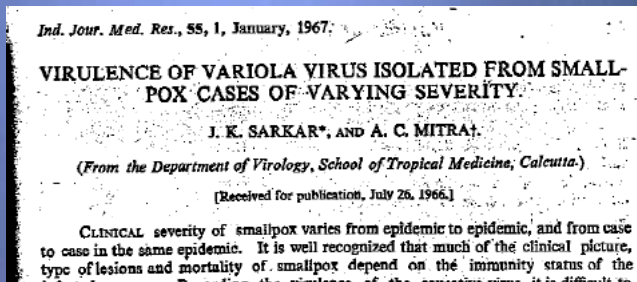


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Sarka JK and Mitra AC. Indian Journal of Medical Research, 55(1) January 1967

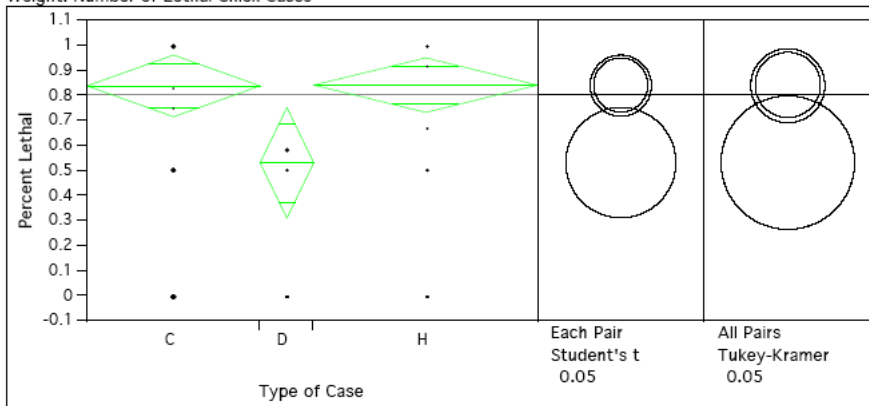
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Isolates' Clinical Type (in Humans)	Percent Lethality in Chicks	Percent Lethality in Mice	Histopath Score (ordinal)	PFU Colonies/g chick liver
Hemorrhagic	100.0%	100.00%	3	3500
Hemorrhagic	100.0%	100.00%	2	3000
Hemorrhagic	91.7%	62.50%	3	1500
Hemorrhagic	0.0%	0.00%	1	350
Confluent	75.0%	50.00%	2	3000
Confluent	83.3%	62.50%	3	1500
Confluent	100.0%	50.00%	3	4000
Confluent	0.0%	0.00%	1	400
Confluent	0.0%	0.00%	1	100
Confluent	0.0%	0.00%	1	200
Discreet	58.3%	100.00%	1	825
Discreet	0.0%	62.50%	1	1000
Discreet	0.0%	0.00%	1	350
Discreet	0.0%	0.00%	1	400
Discreet	0.0%	0.00%	2	500
Discreet	0.0%	0.00%	1	300

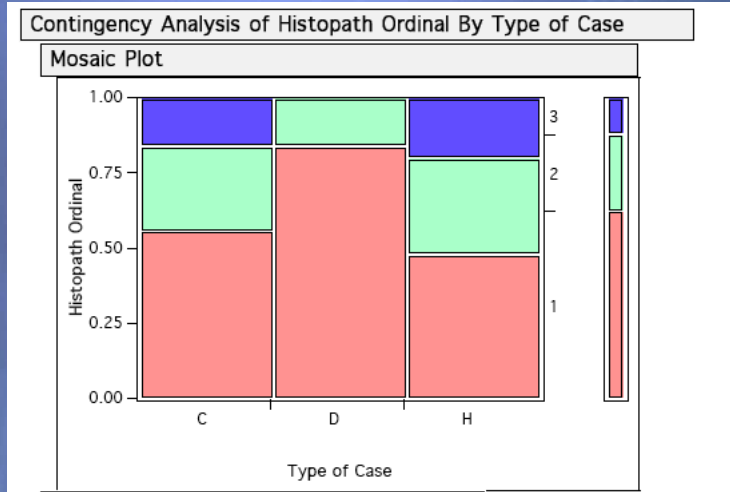
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Oneway Analysis of Percent Lethal By Type of Case

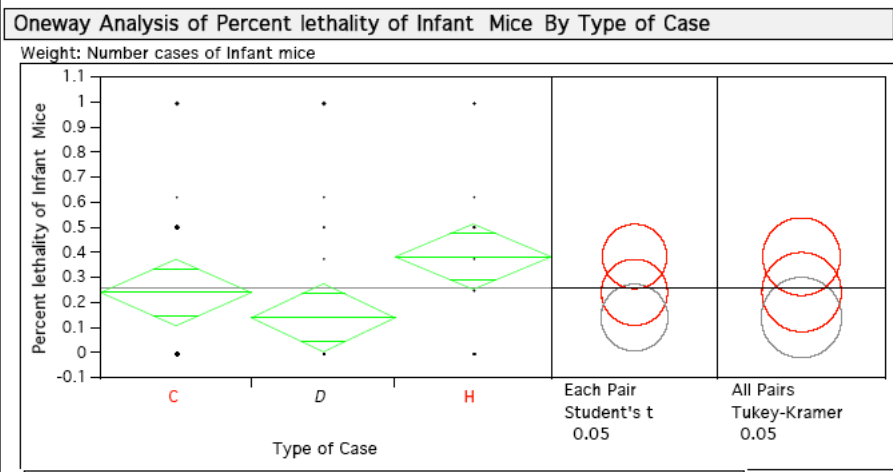
Weight: Number of Lethal Chick Cases



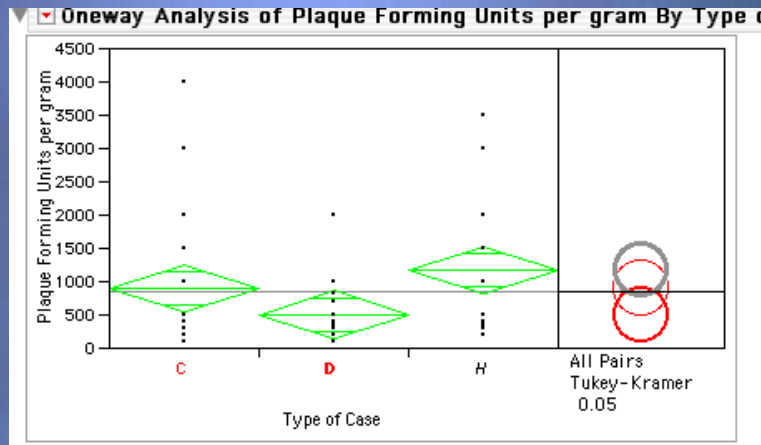
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Some unanswered Questions

- Do clinical isolates still exist?
 - Russians should be pressed to provide additional information
- Is the isolate somehow unique?
 - Alternative vaccines should be investigated
 - Anti-viral drug identification and development
- Smallpox can be *aerosolized*. *Can anyone else do it?*
- If smallpox can be dispersed as an aerosol, pre-event vaccination may be paramount
- It is likely that syndrome a syndrome surveillance system would detect classical bioterrorism diseases like smallpox.

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Questions or Comments?

"The hardest part about gaining any new idea is sweeping out the false idea occupying that niche. As long as that niche is occupied, evidence and proof and logical demonstration get nowhere. But once the niche is emptied of the wrong idea that has been filling it - once you can honestly say, 'I don't know', then it becomes possible to get at the truth."

--Robert A. Heinlein

Alan P. Zelicoff, MD

505-255-6908

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E-mail: zalan8587@qwest.net