An Epidemiological Analysis of the 1971 Smallpox Outbreak in Aralsk, Kazakhstan

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During the summer of 1971, a previously unreported outbreak of smallpox occurred in Aralsk, a city of approximately 50,000 people on the northern shore of the Aral Sea in the Soviet republic of Kazakhstan. It is now clear that senior Soviet leaders, starting with KGB chief Yuri Andropov, suppressed the reporting of this outbreak, possibly to protect the top-secret Soviet biological warfare (BW) program. In so doing, they put the population of Central Asia at risk of a potentially catastrophic epidemic.1

Professor Bakyt B. Atshabar, Director of the Mosgut Aikimbaev Kazakh Scientific Center of Quarantine and Zoonotic Infections in Almaty, Kazakhstan, generously made available to the Center for Nonproliferation Studies of the Monterey Institute of International Studies a previously secret Soviet medical report describing the 1971 smallpox outbreak, which is published here in English translation. The document was addressed to Dr. M. A. Aikimbaev, then the director of the Central Asian Anti-Plague Research Institute, the forerunner of the institute that Dr. Atshabar now heads. The outbreak report includes descriptions of clinical illness, pathology data, and a detailed review of quarantine and prophylaxis measures taken during and after the outbreak, including primary vaccination and the disinfection of homes of smallpox victims.

In addition to the initial (index) case of smallpox in Aralsk, nine more people contracted the disease, and three of them died. Evidence presented in this analysis suggests that the outbreak was probably not of “natural” origin. Although endemic smallpox was still present in Afghanistan in 1971, smallpox had not been reported anywhere in the Soviet Union since 1961. No smallpox cases of any kind on Soviet soil were reported after that year to the World Health Organization (WHO), as required by international agreement. In and of itself, the failure of the Soviet Union to notify the WHO of the 1971 outbreak suggests a sinister source for the epidemic. This paper reviews the data in the official report, evaluates the purported mechanism of introduction of smallpox into Aralsk, and offers an alternative hypothesis for the source of the outbreak.

SUMMARY OF OFFICIAL REPORT

The facts of the outbreak as stated in the official report are as follows. On or about July 15, 1971, a biological research vessel called the Lev Berg (named after a famous Russian biologist and geologist) set sail from

1 The views presented here are the author’s own personal opinions, and do not necessarily reflect those of Sandia National Laboratories or the U.S. Government.
Aralsk on an extended voyage. The ship was scheduled to stop at two dozen research stations scattered around the Aral Sea, and planned to return to its homeport on August 8, 1971.

The course of the ship took it to Uyaly on the eastern shore of the Aral Sea on July 29, then some 200 kilometers west across the southern expanse of the sea to the city of Komsomolsk-on-Ustyurt (now in Uzbekistan) on July 31 (see Map 1). The ship berthed for a day before heading to the southeast city of Muynak (also now in Uzbekistan) on August 4. The final portion of its journey took the ship and crew back to Aralsk on August 11, having traveled some 450 kilometers in roughly a week.

On board the *Lev Berg* was a young fisheries expert, Patient 1, who was responsible for, among other things, casting nets and collecting various species of fish and plants for archiving. The Aral Sea, then the fourth largest freshwater lake in the world, was in the early throes of its slow death as a result of a Soviet government decision to divert its feeder rivers into massive irrigation projects, with the goal of making the Soviet Union self-sufficient in the production of cotton, a water-intensive crop. After two decades of cotton farming, the shoreline had begun to recede, threatening vast numbers of birds, fish, and small mammals with extinction. Accelerating the shrinkage and deterioration of the sea was the evaporation from its surface in the hot, desert-like environment, and the use of huge quantities of organophosphate pesticides, which turned the sea into a drainage pool of salts and toxic chemicals.

The main purpose of the *Lev Berg* expedition was to assess the ecological damage to the sea, which was already apparent in 1971. Today, the Aral Sea has shrunk in surface area more than 60%, and the seaside towns that hosted the *Lev Berg* are now located tens to hundreds of kilometers from the shoreline.

The official report states that on August 6, as the research vessel headed back to Aralsk at the northern end of the Aral Sea, Patient 1 became ill with fever, headache, and muscle aches. For the last five days of the voyage, she stayed in her bunk on the ship and, on reaching Aralsk, headed immediately to her family home. There, she was nursed by her mother and visited by the local general practitioner, who noted that she had a fever of 39 degrees Centigrade (102.2 degrees Fahrenheit) and a cough. The doctor prescribed antibiotics and aspirin but did not make a definitive diagnosis. Shortly thereafter, a rash appeared on her back, face, and scalp—more or less at the same time—and her fever broke. She recovered quickly, feeling well enough to leave for the Kazakhstani capital of Alma-Ata on or about August 15, to be married.4

Patient 1 had been vaccinated against smallpox, as had the other members of her family. Doubtless because of this fact, her skin rash—which the official report describes as rather mild (but which she recalls as being fairly extensive)—disappeared without much permanent scarring. On August 27, however, Patient 1’s 9-year-old brother, Patient 2, came down with a fever and a skin rash. A pediatrician (not the same physician who had treated his older sister) made a house

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2 The name of the index case, her current city of residence, and other patient-specific information for the index case and other victims of the Aralsk smallpox outbreak have been intentionally obscured in the interest of protecting their privacy.

3 In Soviet times, the capital of Kazakhstan was called Alma-Ata. The city is now named Almaty and is no longer the capital of Kazakhstan.

4 Patient 1, telephone interview with author, May 25, 2002 (not part of the official report). Patient 1 disputes some of the important details of the official report (see below).
call to see the boy on August 30. He diagnosed “urticaria” (hives), a skin eruption often considered to be an allergic reaction, although in approximately 70 percent of cases no specific cause can be identified. Patient 2 was treated with tetracycline and aspirin, and recovered completely over the next two weeks.5

The pediatrician did not see Patient 2 again, and the boy returned to school on or about September 13. He was later quarantined after the medical authorities realized that they were dealing with a smallpox outbreak. In late August and early September, however, the medical records suggest that no consideration was given to a diagnosis of smallpox. This oversight is hardly unreason-

able, given that the Soviet Union had been free of the disease for a decade and that the nearest country with endemic smallpox was Afghanistan, hundreds of kilometers away.

Over the next 3 weeks, physicians in Aralsk saw eight additional cases of fever and skin rash. Six adults (ages 24 to 60, median age 34.5 years) and two children (ages 4 and 9 months) were diagnosed with smallpox, based on clinical appearance and the confirmatory growth of viral plaques on the chorioallantoic membrane of a fertilized egg, resulting in characteristic glossy white “pocks.” A rise in the level of antibodies to variola virus—the causative agent of smallpox—was also reported in the medical records. The antibody assays were done at

5 The administration of aspirin is an odd choice, as aspirin can exacerbate urticaria.
an unnamed facility in Moscow. (Although the name of the laboratory is not mentioned in the report, it was probably the Institute for Viral Preparations in Moscow, the leading center for smallpox research in the Soviet Union in 1971.)

The clinical manifestations of smallpox in the 10 patients varied across the known spectrum of the disease. The two children, both of whom were reportedly unvaccinated, developed the rare and highly lethal hemorrhagic form of smallpox and died. Patient 2 survived a case of classical “discrete” smallpox, meaning that he had diffuse lesions separated by areas of normal skin (in contrast to the more severe “confluent” form of smallpox, in which the lesions coalesced and frequently became secondarily infected with bacteria). One adult, 23 years old and unvaccinated according to her medical records, also died from the hemorrhagic variant of the disease. The other four infected adults (ages 24, 36, 38, and 60) contracted smallpox despite having been vaccinated. Three were described as having “varioloid smallpox” with only a few scattered lesions evident on physical examination, and one with a classic “discrete” rash. In short, three people, all unvaccinated, developed the hemorrhagic form of the disease and died. Six others also contracted smallpox in either a modified or typical discrete form. The epidemic curve for this outbreak is shown in Figure 1. Table 1 lists the ten cases with patients numbered in the order of the date of onset of their illness.

The official report also describes the massive effort made by public health officials to contain the outbreak. Nearly 50,000 residents of Aralsk were vaccinated in less than 2 weeks, and many hundreds were placed in isolation in a makeshift facility on the outskirts of town. Transportation into and out of Aralsk was almost completely halted, and more than 5,000 square meters (54,000 square feet) of living space in the homes of local residents were disinfected, along with 18 metric tons of household goods.
Table 1: Summary of Smallpox Cases, Aralsk, 1971

| Patient | Age (years) | Sex | Date of Onset of Illness | Type of Rash | Previously Vaccinated | Outcome (Dead vs. Recovered) |
|---------|-------------|-----|--------------------------|--------------|-----------------------|-----------------------------|
| 1       | 24          | F   | 8/12/71                  | Discrete/classical | Y                     | R                           |
| 2       | 9           | M   | 8/27/71                  | Discrete/classical | Y                     | R                           |
| 3       | 23          | F   | 9/10/71                  | Hemorrhagic    | N                      | D                           |
| 4       | 36          | F   | 9/10/71                  | Discrete/classical | Y                     | R                           |
| 5       | 5.5         | M   | 9/18/91                  | Discrete/classical | Y                     | R                           |
| 6       | 38          | M   | 9/24/71                  | Varioloid/mild  | Y                      | R                           |
| 7       | 0.8         | M   | 9/26/71                  | Hemorrhagic    | N                      | D                           |
| 8       | 60          | F   | 9/26/71                  | Varioloid/mild  | Y                      | R                           |
| 9       | 33          | M   | 9/28/71                  | Varioloid/mild  | Y (x3)                 | R                           |
| 10      | 0.33        | F   | 10/2/71                  | Hemorrhagic    | N                      | D                           |

EPIDEMIOLOGICAL ANALYSIS OF THE ARALSK OUTBREAK

Although the number of cases in the Aralsk smallpox outbreak was small, it is instructive to compare it with another “imported” epidemic for which clinical and environmental parallels exist. In Yugoslavia in 1972, a Muslim from Kosovo province went on pilgrimage to Mecca, Saudi Arabia, and returned through Baghdad, Iraq, where he was infected with smallpox. He then “imported” the disease into Kosovo, resulting in the first smallpox outbreak in Yugoslavia since 1930.6 Only about 65 to 70 percent of the adult population of Kosovo province had received a primary vaccination, and children were not being vaccinated at that time.7 The official report suggests that the extent of vaccination among adults in Aralsk was similarly poor. In both outbreaks, smallpox remained undiagnosed until approximately six weeks into the epidemic. Thus, in most key epidemiological aspects, including the importation of the virus into a previously smallpox-free environment and the limited “herd immunity” of the affected population, the two outbreaks were quite similar.

Taking only the Kosovo cases from the published epidemiological curve for the Yugoslav outbreak and ignoring later cases that resulted from the movement of infected individuals to other parts of the country, it is possible to perform a survival curve analysis to characterize the two outbreaks (see Figure 2).8 The limited number of cases makes it difficult to perform a robust statistical analysis because small changes in the Aralsk data could change the results. Nevertheless, using three different statistical tests (Log-Rank, Wilcoxon, and Weibull proportional hazards modeling), the Aralsk and Kosovo smallpox outbreaks are indistinguishable in their time course (p>0.34, 0.43, and 0.24, respectively). Because these statistical tests apply different weightings to early versus late cases and use different regression techniques, the uniformly high p-values suggest very similar dynamics.

6 S. Litvinjenko, B. Arsic, and S. Borjanovic, Epidemiological Aspects of Smallpox in Yugoslavia in 1972, Document WHO/SE/73.57 (Geneva: World Health Organization, 1973).
7 F. Fenner, D. A. Henderson, I. Arita, Z. Jezek, and I.D. Ladnyi, Smallpox and Its Eradication (Geneva: World Health Organization, 1988), p. 1019.
8 Ibid., p. 1020.
in the two outbreaks. This finding probably reflects the strong correlation between the respective incubation periods, the delays in recognition and intervention, and the consequent epidemic peaks.

Although the overall mortality in the two outbreaks was similar (three out of ten cases in Aralsk, 35 out of 175 cases in Kosovo, \(p>0.43\) by Fisher’s exact test), critical differences between the two outbreaks are also evident. There were three patients with hemorrhagic smallpox (all fatal) in Aralsk, but five such cases in Kosovo, where the total number of smallpox cases was much larger (\(p<0.005\) by Fisher’s exact test). This observation suggests that the clinical manifestations were somewhat more severe in the Aralsk epidemic.9

Hemorrhagic smallpox was rare in most outbreaks and was almost universally fatal. Its manifestations were believed to be related mainly to host factors rather than to the specific strain of variola virus involved.10 In Rao’s large series of over 10,857 smallpox patients in Madras, India, there were only 240 cases of hemorrhagic smallpox, an incidence of about 2.2% (confidence interval 2.0–2.5%).11 The most striking aspect of Rao’s data is the almost complete absence of hemorrhagic smallpox in infants; only three cases were reported in children under one year of age (fewer than 0.03% of cases). Yet in the Aralsk outbreak, two of the three cases of hemorrhagic disease occurred in infants.

Although the Aralsk outbreak data are insufficient to support a firm conclusion, the seemingly high percentage of hemorrhagic cases and the skewing of the distribution to very young children suggest that either unusual “host factors” (e.g., nutritional status, genetic resistance) or an unusual strain of the virus were responsible for this distinct-

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9 Binomial 95% confidence intervals are as follows: 30% of the cases in Aralsk were fatal (6.7%—65.2%) and 2.8% in Kosovo (0.9%—6.5%).

10 A. R. Rao, A Study of 240 Cases of Haemorrhagic Smallpox, Document No. Smallpox/WP/22 (Geneva: World Health Organization, January 6, 1964).

11 There are no confidence intervals published in Rao’s study. This interval was calculated based on a binomial assumption.
tive feature of the Aralsk outbreak. It seems unlikely, however, that the host factors were somehow more adverse in Aralsk than in Madras.

Further, of the six adults with confirmed smallpox in Aralsk, five had been vaccinated. Because it is not known how many of the later-quarantined “contacts” of Patients 1, 2, and 3 were vaccinated, nor how many years had passed since their last vaccination, it is impossible to calculate vaccine effectiveness in the Aralsk outbreak. However, the efficacy of the smallpox vaccine (sometimes also called “rate of protection”) is usually described as being in excess of 90%. The official report states that there were approximately 30 direct contacts of Patients 3 and 4 (including Patients 7–9); those contacts that developed clinical disease had all been vaccinated. In addition, the index case (Patient 1) had been vaccinated, but not Patient 3. These data suggest that the variola virus strain involved in the epidemic may have been somewhat vaccine-resistant. This hypothesis is strengthened by a statistical comparison of the transmissivity of smallpox in the Aralsk outbreak with that in other well-documented outbreaks.

Data from Pakistan suggest that if the index case is unvaccinated but household contacts are vaccinated, the frequency of smallpox transmission is approximately 5.5%.12 If the index case is vaccinated, then vaccinated family members contract smallpox at a rate of approximately 2.1%. In the Aralsk outbreak (allowing for a wide confidence interval), one would expect that in the households of Patients 3 and 4, consisting in total of roughly 30 people, all of whom were presumably vaccinated, two household contacts (or less) should have become ill. In fact, at least four household contacts became ill.

Patient 3 (who died of hemorrhagic smallpox) had two household contacts before being admitted to the hospital and diagnosed with smallpox, but neither of her contacts became ill. Patient 4 had at most 25 contacts, three of whom became ill. Table 2 compares smallpox transmissibility during the Pakistan and Aralsk outbreaks. Chi-square analysis shows a moderate statistical likelihood that smallpox transmission was more likely in vaccinated household contacts in Aralsk than in Pakistan (p=.11 by Fisher’s exact test).

These observations suggest, but do not prove, that either vaccine efficacy in the Soviet Union was less than in Pakistan, or that the viral strain in Aralsk was somehow more infectious than traditional strains. When one considers that hemorrhagic index cases have a lower efficiency of virus transmission (probably because they are completely bedridden and die quickly), the possibility that an unusual strain of smallpox was involved in the Aralsk outbreak cannot be dismissed. Although the outbreak was successfully contained, doing so required heroic efforts. Moreover, the non-vaccine component of the response—household quarantining, the halting of all transportation into and out of the city, and the isolation of infected or exposed individuals in a separate observation hospital for as long as three to four weeks—may have been as important as mass vaccination in preventing the further spread of the disease.

CONCLUSIONS OF OFFICIAL REPORT

How did the index case in the 1971 Aralsk outbreak become infected with smallpox? The official report does not offer a

12 G.G. Heiner, N. Fatima, and F. R. McCrumb, “A Study of Intrafamilial Transmission of Smallpox,” American Journal of Epidemiology 94 (1971), pp. 252-268.
conclusive explanation but presents three hypotheses. According to the first of these:

Members of the crew and of the research team went ashore on July 29 in the town of Uyaly in the Kzyl-Orda region, on July 31 in the town of Komsomolsk-on-Ustyurt, and on August 4 in the town of Muynak in the Karakalpak Autonomous Soviet Socialist Republic. Patient 1 was in all three towns, and in Muynak she bought a towel, some fabric, and a dress. Patient 1 became ill on August 6, while on her way from Muynak to Aralsk. She first had a headache and a fever. On August 11 upon her arrival in Aralsk, where her family resided at No. 7 Shkolnaya Street, M. B. Buyraev, the physician responsible for that district, was called to the house, and he noted that the patient complained of the following: headache, cough, and a fever up to 39°C [Centigrade].

The reader is again referred to Map 1, illustrating the approximate geographic location of the ports of call made by the *Lev Berg*. The authors of the official report conclude:

According to this scenario, Patient 1 was the source of the disease’s outbreak in the city of Aralsk. She contracted smallpox at the end of July, 1971, either in Uyaly or in Komsomolsk-on-Ustyurt. This is confirmed by the absence of the illness among the other crew members of the vessel and among the researchers.

This interpretation of the epidemiological data is problematic, however. The median incubation time for smallpox is approximately 13 days, with a range of 11 to 15 days encompassing the 95% confidence interval. Thus, if Patient 1 became ill on August 6, she would have likely been exposed to smallpox between July 23 and July 27. Although exposure during the port visit in Uyaly on July 29 is possible, it seems unlikely. More important, Patient 1 stated in an interview (see below) that at no time was she permitted to leave the ship throughout the voyage.

The second hypothesis put forward in the official report 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. The last previous cases of smallpox in the Soviet Union had resulted from an importation of the disease from Afghanistan in 1961,13 and such an importation certainly could have happened again. According to World Health Organization reports, there were 1,030 cases of smallpox in Afghanistan in 1970, and 482 cases during the first eight months of 1971. The disease could have reached the territory of the Tajik and Uzbek Soviet Socialist Republics, which were economically linked to the city of Aralsk. Large quantities of cotton, melons, and other agricultural products from the Uzbek and Tajik republics were shipped north to Aralsk via the Amu-Darya River and the Aral Sea, whereas grain, coal, and other items were shipped south.

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13 Fenner, et al., *Smallpox and Its Eradication*, pp. 1073-1074.
The Uch-Say transshipping facility was serviced by workers from Aralsk and other cities and towns in the region. Periodically, teams from the Aralsk shipping company were sent to the port of Termez, where they transferred cargo from Afghanistan from ships to trains. Such a team arrived in Aralsk from Termez on August 29-30. Nevertheless, its members could not have been the source of infection for Patient 1 because of the time discrepancy. According to the third hypothesis presented in the official report:

A scenario of infection via the open-air market has also been thoroughly checked. As a matter of fact, individuals bring to the city of Aralsk large quantities of produce from the Uzbek and Tajik republics. However, no evidence was established that people with smallpox arrived from those regions and visited the home of [the father of Patients 1 and 2] or the market’s director, or that goods such as rugs and other wool artifacts were bought or sold there.

INTERVIEW WITH PATIENT 1 AND COMPARISON TO OFFICIAL REPORT

On May 25, 2002, the author (Zelicoff) contacted the index case, Patient 1, by telephone and conducted an extensive interview of about two hours (approximately half of this time was taken up by Russian-English interpretation). Patient 1 is currently living in Kazakhstan, is married, and consistent with the official report, is now 54 years of age. She is currently disabled by a neurological disease that makes it difficult for her to engage in strenuous physical activity. But her mind remains clear, and she spends most of her time reading, including biology journals, her scientific specialty.

Patient 1 confirms that, as a recent graduate of the Fisheries Institute in Aralsk, she sailed on the *Lev Berg* in 1971. She disputes, however, several key aspects of the official report. Most significantly:

- **Patient 1 insists that she did not disembark from the *Lev Berg* at any of the ports of call along its route, though she does remember that the ship stopped at Muynak (Muynoq) near the delta of the Amu Darya at the southern end of the Aral Sea. In particular, she did not, as officially stated, visit the market in Muynak (now located in Uzbekistan), nor did she purchase any items of any kind from vendors. Patient 1 noted that official policy allowed only the male members of the crew to leave the ship, and that this rule was strictly enforced.**

- **The official report states that Patient 1 became ill en route to Aralsk. Yet Patient 1 recalls feeling well on the ship and only becoming ill shortly after arriving home in Aralsk, on August 11 or 12, 1971.**

- **Patient 1 describes a diffuse rash that “covered [her] entire body,” and contends that a similar rash occurred in her brother, Patient 2, about two weeks later.**

- **She states that no one on board the *Lev Berg* developed illness or fever through August 11, when the ship returned to Aralsk.**

Patient 1 does not remember the precise dates of the *Lev Berg*’s voyage on the Aral Sea. She noted in the interview that, as the youngest member of the crew, she was the one working most frequently on deck. She spent most of her time casting nets to catch fish, which she then took to the small laboratory below deck to archive samples, perform simple analyses, and make notations in the laboratory journal. Unfortunately, she did not retain ownership of the journal, which might confirm the dates and locations of the ship.

Patient 1 recalls that when she became ill after her return to Aralsk, she was visited by a physician. She was living with her mother, father, and three brothers at the time. As noted in the official report, the doctor did not provide her or her family with a specific diagnosis, nor
did he show particular concern about the nature of Patient 1’s rash or illness. The rash was sparse and did not leave permanent scars on her body. Nevertheless, it appears to have been more severe than the “mild variety” of smallpox ascribed to her case in the official report.

If Patient 1’s recollections are accurate, it is unlikely that she was exposed to smallpox at any of the ship’s ports of call on the Aral Sea. It is also unlikely that she was secondarily infected by any of the male crew members who went ashore, because no one on board became feverish or otherwise sick during the voyage.

**INTERVIEW WITH PATIENT 2, THE BROTHER OF PATIENT 1**

On May 26, 2002, the author spoke with Patient 2, the younger brother of Patient 1.14 (The two did not communicate between my interviews.) Patient 2 is now 40 years old, consistent with the official report. He works as a manual laborer, but attended university for some time. He is in good health, married, and has several children. Patient 2 stated that he became ill in late August 1971, shortly before school began (September 1 was the traditional first day of school in the Soviet Union), again consistent with the official report. He recalled his illness vividly, describing it in his own words as follows:

About 2 weeks after my sister came home, I became ill. It was in late August, maybe the 27th or 28th. At first I had a very high temperature for 3 days, and then the rash appeared. My whole body was covered with lesions about 2 to 3 millimeters in diameter. The rash lasted 2 weeks, and then the lesions crusted over. After the rash disappeared, I had white spots on my skin that disappeared about 1 to 2 years.

This description leaves little doubt that the disease was classical (discrete) smallpox. Patient 2’s recollection is also consistent with the official report, which places the date of onset of his illness as August 28, 1971. He also recalls that his schoolteacher came to visit, and that she later died. She was probably the third case of smallpox, one of two cases with onset of illness on September 10. The official report lists this individual as a teacher at School No. 13, and the date of her death as September 29. Patient 2 specifically recalled that he was a student at School No. 13.

**AN ALTERNATIVE HYPOTHESIS**

It is clear that Patient 2 became ill as a result of contact with his sister, Patient 1, the index case. Because it is certain that Patient 2’s illness began during the last week of August 1971, it is most likely that his sister, Patient 1, became ill on or about August 11, roughly 13 days earlier. This is precisely in line with her oral history and at variance with the official report, where the date of onset of her illness is given as August 6. It is extremely unusual for patients with smallpox to transmit the disease after the first week of clinical illness, further discrediting the official report. It is therefore most likely that she became infected with smallpox during the last days of July 1971.

Until at least 1990, the Soviet Ministry of Defense maintained an offensive BW program in violation of the 1972 Biological and Toxin Weapons Convention, which entered into force in 1975. It is now known that beginning in 1936, the Soviet Ministry of Defense used Vozrozhdeniye Island in the Aral Sea as a site for BW field testing.15

14 Patient 2, telephone interview with author, May 26, 2002.

15 See Kenneth Alibek with Stephen Handelman, *Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World—Told From Inside by the Man Who Ran It* (New York: Random House, 1999); G. Bozheyeva, Y. Kunakbayev, and D. Yeleukov, *Former Soviet Biological Weapons Facilities in Kazakhstan: Past, Present and Future*, Occasional Paper 1 (Monterey, CA: Monterey Institute of International Studies, 1999).
island offered a number of advantages: it was isolated and surrounded by water, making security relatively easy. The wind blew predictably from north to south, providing an upwind “safe haven” on the northern end of the island that was used for housing troops, their families, and even a children’s playground. Finally, the blistering hot temperatures and intense solar radiation insured that microbial pathogens tested in the open environment would die quickly and hence would not inadvertently escape from the island.

No definitive documentation has been released from the Soviet archives describing the activities at the Vozrozhdeniye Island test site. Reportedly, it was used for the offensive and defensive testing of aerosols of various biological agents, including the pathogens that cause anthrax, tularemia, and Q-fever. Some sources have also claimed that smallpox virus strains were stored and tested on the island. In the early 1970s, it was well known among those living in the region that Vozrozhdeniye Island was a “biological laboratory testing military equipment and weapons.” Thus, the local inhabitants knew enough to avoid it.

Referring to the map, the Lev Berg was probably south of Vozrozhdeniye Island on or about July 30. Could an open-air test or a laboratory accident involving a virulent strain of variola virus have resulted in the inadvertent contamination of the research vessel? Dr. Pyotr Burgasov, a former chief sanitary physician of the Soviet Union who is notorious for his now-discredited claim that the Sverdlovsk anthrax outbreak of 1979 resulted from “contaminated meat.”19 was interviewed in the Russian press in November 2001. He is quoted as having said:

On Vozrozhdeniye Island in the Aral Sea, the strongest formulations of smallpox were tested. Suddenly I was informed that there were mysterious cases of disease in Aralsk. A research ship of the Aral fleet came 15 kilometers away from the island (it was forbidden to come any closer than 40 kilometers). The laboratory technician of this ship took samples of plankton twice a day from the top deck. The smallpox formulation—400 grams of which was exploded on the island—“got her” and she became infected. After returning home to Aralsk, she infected several people, including children. All of them died. I suspected the reason for this and called the Chief of the General Staff of the Ministry of Defense and requested that the train from Alma-Ata to Moscow be forbidden to stop at Aralsk. As a result, an epidemic around the country was prevented. I called Andropov, who at that time was chief of the KGB, and informed him of the exclusive recipe of smallpox in use on Vozrozhdeniye Island. He ordered that not another word be said about it. This is a real biological weapon! The minimum radius of contamination was 15 kilometers. One could imagine what would have happened if instead of one laboratory technician, there had been 100 to 200 people.20

Burgasov’s statement is unclear on some points and inaccurate on others. For example, the claim that “all of them died” is certainly not correct. Nevertheless, Burgasov, who was highly placed in the Soviet government at that time, must have known which pathogens were tested on Vozrozhdeniye Island and if major mishaps had occurred. Thus,

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16 E.E. Small, F. Giorgi, L.C. Sloan, and S. Hostetler, “The Effects of Desiccation and Climatic Change on the Hydrology of the Aral Sea,” *Journal of Climate* 14 (2001), pp. 300-322.
17 Ken Alibek, Testimony before the Committee on International Relations, U.S. House of Representatives, 107th Congress, First Session, December 21, 2001.
18 Patient 1, telephone interview with author, May 25, 2002.
19 V. Israelyan, “Fighting Anthrax: A Cold Warrior’s Confession,” *Washington Quarterly* 25 (Spring 2002), pp. 17-19.
20 Evgeniya Kvitko, “Smallpox: As Bad a Weapon — An Interview with General Pyotr Burgasov” (in Russian), *Moskovskie Novosti*, November 13, 2001.
although some of the details of his admission are false, the general thrust seems credible: Patient 1 was exposed to smallpox virus released as part of a BW field test on Vozrozhdeniy Island on or about July 30. An infection contracted on that date would have resulted in the onset of fever approximately 13 days later—on August 11, 1971, precisely when Patient 1 states her illness began. The localized epidemic then followed her arrival in Aralsk.

UNANSWERED QUESTIONS

This preliminary and admittedly incomplete analysis of the Aralsk smallpox epidemic raises a number of unanswered questions. For the first time, there is clear circumstantial evidence that the Soviets not only “weaponized” smallpox but succeeded in aerosolizing it and, it appears, “hardening” the virus so that it maintained its infectivity as it traveled downwind over a distance of at least 15 kilometers. What strain of variola virus was tested on Vozrozhdeniy Island? Does the apparently high prevalence in the Aralsk smallpox outbreak of hemorrhagic manifestations and, perhaps, of vaccineline resistance indicate that Soviet military scientists chose an especially virulent strain of variola as a candidate biological weapon? A few scientific papers suggest, but do not necessarily prove, that “hemorrhagic” strains of smallpox exist.\(^{21}\) Are clinical or laboratory samples of the weaponized strain still stored in one or more Russian laboratories? Were there other incidents in which civilians were accidentally exposed to Soviet BW agents from the Vozrozhdeniy test site?

The answers to these and many other questions will almost certainly have a profound effect on civilian and military biodefense efforts in the United States and elsewhere. In the immediate term, our complete reliance on a single vaccine (unmodified vaccinia) represents a serious potential vulnerability. Only a detailed analysis of the Aralsk strain with the most modern tools of molecular biology can guide public health officials and defense planners in formulating appropriate policies and prophylaxis, which may include a concerted effort to produce new vaccines based on entirely novel approaches, along with testing of anti-viral drugs in animal models.

With the Cold War over and Russia eager to be accepted by the West as a newly emerging democracy and a member of major international organizations, such as the North Atlantic Treaty Organization and the World Trade Organization, it is long past time for Moscow to reveal the detailed history of the Soviet BW program. Helping to resolve the numerous uncertainties about the 1971 smallpox outbreak in Aralsk would be an important first step in that direction. That smallpox is still with us is obvious, perhaps in forms we never encountered throughout its long history as a natural disease. The problem is, we do not know where it is and when it will emerge—yet again.

\(^{21}\) J.K. Sakar and A.C. Mitra, “Virulence of Variola Virus Isolated from Smallpox Cases of Varying Severity,” *Indian Journal of Medical Research* 55 (1967), pp. 13-20; R. Shafikova and S. Marennikova, “Comparative Studies on the Properties of Variola Virus Strains. II. Pathogenicity for Suckling Mice and Gamma-Irradiated White Mice,” *Acta Viroligica* 15 (1971), pp. 321-323.