Chapter X: The Anti-plague System of Uzbekistan

1. History of the Uzbek Anti-plague System

In Soviet times, the Uzbek AP system was comprised of four main facilities and four field stations reporting to various government agencies. Two regional AP stations (the first, "Uzbek," located in Tashkent and the second located at Karakalpak) reported to the Soviet MOH's Second Directorate.[187] The Uzbek and Karakalpak regional AP stations had two AP field stations each, in Bukhara and Zarafshan, and Takhtakupir and Turktul, respectively. One railroad AP station reported to the Ministry of Railways (Tashkent). The railroad station was created in 1950, and was responsible for monitoring the land within 5 meters of railroad tracks in Uzbekistan. Its laboratories, mounted on railroad cars, traveled across the country and took samples from land on both sides of the tracks. One AP station, at Uchkuduk, serviced the Nawoiy Mining and Metallurgical Combine (NMMC) and reported to the Soviet MOH's Third Directorate.[188] Among these facilities, only the Uzbek and Karakalpak AP stations were associated with the Almaty AP institute in Kazakhstan, which provided methodological guidance to the stations and reviewed their work plans.

As in Kazakhstan, most of the AP stations were set up in response to plague outbreaks in specific areas. For instance, the Karakalpak station was founded on November 9, 1949, in the aftermath of plague outbreaks in Nukus city during 1947-1948. Similarly, as a result of two human plague outbreaks in Uchkuduk and Tamdy settlements, the Zarafshan AP station was founded on August 11, 1982, as a field station subordinate to the Uzbek regional station.

Unlike Kazakhstan, which inherited a rather coherent AP system after the break-up of the Soviet Union, Uzbekistan acquired a rather disparate set of facilities. Whereas in Kazakhstan most AP facilities were already under the authority of the Almaty AP institute in Soviet times, the Uzbek AP facilities had no unifying component. To foster some cohesion in its national AP system, the Uzbek government decided to establish the Center for Prophylaxis of Quarantine and High-Risk Infections (CPQHRI) in 1999.[189] CPQHRI was put in charge of all AP stations located in Uzbekistan. The new organization was established at the former Uzbek AP station in Tashkent and became the de facto coordinating AP facility of Uzbekistan. The Karakalpak station was given the status of a CPQHRI branch, and the other stations were subordinate to them. In 2004, the Uzbek AP system was comprised of 12 facilities: the CPQHRI, the CPQHRI branch in Karakalpak, one regional AP station, six field stations, and three seasonal laboratories.

In 2002, CPQHRI employed 741 people (station staff included).[190] Today, it reports to the Chief State Sanitary Physician and the MOH Department of Sanitary-Epidemiological Monitoring. The CPQHRI and its Karakalpak branch receive funds from the MOH and then distribute them to the subordinate AP organizations.

As lead agency, the CPQHRI manages, coordinates, plans, and supervises the activities of all AP facilities in Uzbekistan. The only exception is the state-owned NMMC's AP station, which functions independently and is subordinated to the management of the NMMC.

In 2004, CPQHRI was comprised of 8 laboratories, including:

- Laboratory of the National Collection of Group I-II Pathogenic Bacteria;
- Plague Epidemiology and Bacteriology Laboratory; Cholera Epidemiology and Bacteriology Laboratory;
- High-Risk Viral Fevers Laboratory;
- Zooparasitology Laboratory;
- Department of Organization and Methodology;
- Department of Culture Media Production; and
- Laboratory Animal Vivarium.

CPQHRI also created a training center to train personnel from the Uzbek AP system who dealt with diseases from group I and II and the SES, who dealt with all group II diseases except plague (see Table 2). Training sessions lasted six weeks and there were 200 to 300 trainees per year.

The Karakalpak branch functioned, and still does today, as a regional AP station having as primary areas of responsibility disease surveillance and epizootic monitoring of natural plague foci in the territory of the Autonomous Republic of Karakalpakstan. The field AP stations, on the other hand, are responsible for disease surveillance and epizootic monitoring of smaller geographic areas.

2. Consequences of the Financial Crisis

Uzbekistan suffered severely from the post-Soviet economic downturn. The crisis was more serious in Uzbekistan than in Kazakhstan due to its higher poverty level. Unlike Kazakhstan with its sizeable deposits of petroleum and natural gas, Uzbekistan's economy is based on traditional agriculture, mainly cotton, vegetables, and fruit. As a result of Uzbekistan's penurious state, the AP system in Uzbekistan has been seriously underfunded and since 1992 has operated with a significant deficit.

Although some Uzbek AP facilities lost personnel after the break-up of the Soviet Union, the Uzbek AP system has not endured waves of massive departures as in Kazakhstan. One of the reasons for this is that in Soviet times, the Uzbek AP system employed very few ethnic Russians, who in other FSU republics were the first to depart starting in 1992. Some Uzbek facilities actually have more employees today than in 1992. This is an artificial increase, however. In order to obtain more funding from the government, facility directors inflate the number of employees they need. They then use these funds to increase the salaries of existing employees, who end up performing the work of two people.[191]

In 2004, one of the major problems experienced by the Uzbek AP system in general was an inability to retain qualified personnel and to hire new qualified employees. This situation arose largely due to the low level of the compensation offered for labor-intensive and dangerous work. In 2003, salaries ranged from the equivalent of \$25-\$35 a month for an AP scientist with experience.[192] As in other NIS, salary payments were often delayed.

Since the break-up of the Soviet Union, all Uzbek AP facilities have suffered a shortage of equipment and material to conduct research and disease surveillance work. Laboratory equipment was obsolete and facilities needed major renovations and upgrades. The Uzbek AP system also experienced an acute shortage of bacteriological diagnostic products, culture media, vaccines, reagents, instruments, special clothing, and laboratory equipment and ware. Research work with dangerous pathogens was conducted in laboratories deprived of adequate ventilation systems, so AP staff worked in laboratories with open widows, especially in the summer.

The field bases and laboratories located in desert plague foci that were used for field work also needed major renovations and equipment upgrades. In addition, expedition vehicles were often inoperable due to lack of repairs, spare parts, fuel, and lubricants.

After 1992, due to the lack of personnel, equipment, and funding, AP facilities have been unable to send their field teams to distant areas and in regions that are difficult to access, resulting in a decrease in monitoring activities by 70 to 80 percent.

During the Soviet era, difficult to reach natural foci could be accessed with all-terrain vehicles, including AL-3 bacteriology laboratory trucks, with which the Uzbek AP system was equipped.[193] In addition, funding was available to lease airplanes and helicopters for work in deserts and mountainous areas that were not accessible by land vehicles. This is no longer possible, so some inaccessible natural foci have not been surveyed for 12 years. For example, as of 2004, the natural foci in these mountainous regions were last monitored in 1989.

Due to the lack of funds, the AP system has cut field staff to a minimum, further disrupting epidemiological surveillance. Thus, only natural plague and cholera foci have been monitored since 1993. Further, in 2004, the Uzbek AP system monitored only 20 to 30 percent of the country's natural plague foci, primarily those located near borders with other countries.[194]

The situation was even more severe on the territory supervised by the Karakalpak Branch. The station's monitoring territory has increased by about 60,000 sq. km due to Aral Sea desiccation. The Amu Darya and the Syr Darya are the two main rivers that supply the Aral Sea, and they have been used since Soviet times to irrigate cotton fields. Over the years, the water lost due to being diverted from the rivers has led to much of the Aral Sea having dried up. One result has been that Vozrozhdeniye Island, once the site of the major Soviet biological weapons field test facility, connected to mainland in 2004, allowing rodents and insects endemic to the island to migrate to the mainland and, in the process, possibly bring with them new strains of pathogens. AP scientists fear that the island still harbors residues from the many BW-related field tests that were carried out during 1937-1991, which may increase the Aral region's population's exposure to dangerous disease agents. As disease surveillance data is confidential in Uzbekistan, it is not possible to determine whether this has occurred.

3. Monitoring of Natural Plague Foci and Other Diseases in Uzbekistan

The natural plague foci in Uzbekistan occupy almost 517,998 sq. km. This vast expanse is also endemic for such diseases as anthrax, tularemia, brucellosis, and cholera.

Natural Plague Foci

There are three main natural plague foci in Uzbekistan: one desert natural focus (400,000 sq. km), and two mountainous natural foci (100,000 sq. km collectively).[195] The desert natural focus borders Kazakhstan, Tajikistan, Afghanistan, and Turkmenistan. It includes two sub-foci; the Ustyurt (80,000 sq. km) and Kyzylkum (320,000 sq. km) autonomous foci. (Natural foci are called autonomous when no pathogen exchange occurs between them and other foci.) The Ustyurt and Kyzylkum foci are separated by the Amu-Darya River, which stops the circulation of plague hosts (great gerbils), and consequently the vectors. This natural barrier facilitates prophylaxis measures and makes them more effective.[196] The mountainous natural plague foci spread into Kyrgyzstan and Tajikistan. In both of these mountainous natural plague foci the main host is the marmot.

According to the director of CPQHRI, two new natural plague foci, at Aralkum and Khorezm, have been discovered since the break up of the Soviet Union. The new Aralkum natural focus—based on the presence of new strains—is located on the former Vozrozhdeniye Island and covers a territory of 42,000 sq. km. When the rodents from the mainland start inhabiting the former island's territory, it will be officially recognized as a new natural focus.

The Khorezm natural focus is located on the left bank of the Amu-Darya River and borders Turkmenistan. The Khorezm natural focus is considered to be new because it: (1) has a unique host (the meridional gerbil); and (2) is separated from other existing natural foci by a natural border (the Amu-Darya River). In the past the main host in this area was the great gerbil. However, several years ago floods killed large numbers of great gerbils, and as a result, the vectors switched to a new host—the meridional gerbil.

Other Natural Foci

In addition to plague, there are other natural disease foci in Uzbekistan, including diseases caused by bacteria (cholera; tularemia, anthrax, glanders, and melioidosis), viruses (yellow fever and several other types of highly dangerous viral fevers), and parasites (cutaneous acute necrotizing leishmaniosis).[197]

Monitoring of natural plague foci

As of 2004, monitoring campaigns were typically organized in the spring and fall, with each lasting six weeks. As a rule, epidemiological teams were sent to locations where pathogens had been isolated the previous year. Epidemiological teams usually comprised 7-8 people, including one physician, one biologist, one parasitologist/zoologist, and auxiliary personnel who delivered field samples to the regional or AP field station.

Once on site, members of the epidemiological teams, especially zoologists, studied the rodent population and took samples from rodents, such as blood and ectoparasites, for analysis. The team's physicians conducted a preliminary bacteriology and serology analysis of the samples at the seasonal laboratory. All samples were later transferred to the field/regional AP stations for further analysis.[198] This work was performed to detect plague epizootics among wild rodents, determine the intensity of epizootics, and assess their epidemic threat. Epidemiological teams also identified the major risk factors for human infection and the groups, places, and times associated with these risks.

The AP system and the veterinary network also collaborated in the surveillance of camel herds in epizootic areas. In theory, camels could not be slaughtered without a veterinary certificate and all camel carcasses had to be tested for plague bacteria.[199] In practice however, farmers and other people living in rural areas rarely call a veterinarian before slaughtering sick animals. This habit regularly generates cases of human plague.

In the event of epizootics near populated areas, “buffer zones” were established in the vicinity of the areas by exterminating wild rodents and their ectoparasites, killing rodents and insects inhabiting residential and commercial buildings, and providing plague vaccinations to exposed populations as needed. The AP system also conducted outreach work among residents of enzootic areas to provide information on the prevention and quarantine of high-risk infections.

4. Analysis of the Uzbek Anti-plague System’s Weaknesses and Proliferation Potential

After the September 11, 2001 terrorist attacks in the United States, CPQHRI’s director decided to move the Center’s collection of pathogens from the first floor to the second floor and have it guarded by facility employees at night. Containing over 1,000 strains of pathogens causing quarantine and high-risk infections, the facility housing the collection had an alarm system. However, the facility director did not consider it an adequate security measure.

Under the auspices of the CTR Program, additional security features were introduced in 2003. The laboratory housing the National Collection of Pathogens was equipped with special refrigerators with lockable doors. In addition, the entrance to the pathogen collection was secured with a new iron door equipped with a security eyehole, a combination lock, and an iron grid.[200]

To decrease the risks associated with the existence of multiple collections of pathogens, CPQHRI’s director initiated an effort to transfer pathogen cultures housed at other Uzbek sites to the CPQHRI. Now, pathogens may be stored on a permanent basis only at the National Collection of Pathogens, which is located at the CPQHRI. The rest of the AP facilities are permitted to store cultures of pathogens only temporarily.

Despite the consolidation of pathogen collections, the process of transferring pathogen from regional and field AP stations to the National Collection of Pathogens posed security concerns in 2004. According to internal regulations on pathogen transportation, newly isolated pathogens are to be sent to CPQHRI at the end of each monitoring campaign. In practice, however, due to personnel, fuel, and transportation shortages, the transfer of pathogens often was delayed and cultures were stored at field stations where they could not be adequately protected.

As in other NIS, the absence of an adequate communication system between the CPQHRI and the teams transporting the pathogens also represented an area of concern. In addition, due to temperatures that may exceed 100 degrees F in the summer, and to the absence of refrigeration equipment, transfers of pathogens usually were conducted at night, which provides concealment for anyone intent on stealing cultures.[201]

Apart from CPQHRI, none of the other Uzbek facilities had an alarm system; the doors and windows were not protected—except for decorative iron grids; most facilities have no trained guards or were guarded by pensioners. Perimeter walls, when they existed, were low enough to allow intruders to scale them. Pathogens were stored in small kitchen refrigerators protected only by a wax seal. Material accounting was accomplished on paper logs that often lay on laboratory tables, accessible to anyone. As a result of these shortcomings, Uzbek AP facilities were extremely vulnerable to intrusion and theft of pathogens by insiders.

In 2004, the biosafety situation at the Uzbek AP facilities was more than challenging. In addition to the fact that none of the facilities had adequate biosafety equipment to conduct laboratory work with dangerous diseases, specific infrastructure deficiencies created additional problems. One facility for instance had no system for collecting and treating liquid wastes. Some had incinerators to burn solid biohazard waste and dead animals, but they were not located in the laboratories. As a result laboratory staff had to carry infected material across the grounds of the facilities to the incinerators, thus creating a risk that accidentally released microorganisms would infect employees, and also a greater likelihood of infectious material being stolen. At facilities, which did not have incinerators, solid biohazard wastes and animal carcasses were buried in pits covered with wooden lids, with no provision for physical security.

The electrical and ventilation systems at AP facilities were and in some cases still are today obsolete and unreliable. The windows, which often do not have screens, were kept open most of the year in order to ventilate the laboratories. This not only allowed insects into the buildings, but also made it impossible to achieve the proper level of biosafety in the laboratories. Given that some facilities were and still are located in residential areas, this shortcoming creates additional risks for infecting local populations.

The AP system also faced a shortage of individual protective equipment. For instance, because of a lack of latex gloves, personnel used rubber gloves, which did not provide enough tactile sensitivity for handling hazardous materials in the laboratory, where precision and caution is essential. The AP suits were over 12 years old, which is far beyond their expected life. In addition, because of the lack of showers or showers in working order, laboratory personnel had no opportunity to shower after leaving infected rooms, thus creating another opportunity for contamination.

Based on the information that we have gathered, none of the Uzbek AP facilities were directly involved in the Soviet BW program. Although, some staff members worked closely with Soviet-era Russian AP scientists, the risks of brain drain are probably small; they, however, should not be overlooked.

The highest proliferation threat from Uzbek AP facilities in 2004 was the risk of pathogen diversion because of the absence or weakness of existing security systems. There were also concerns about the security of pathogens transfers. After they were isolated, pathogens were transported over long distances in remote and isolated areas, where an attack on the vehicle carrying live cultures could have remained unnoticed by law enforcement authorities for some time. In addition, AP employees responsible for pathogen transfers did not have appropriate communication equipment to inform the CPQHRI or law enforcement agencies in case of trouble.

The system of pathogen accounting in use in the Uzbek AP system as of 2004 further facilitated possible diversion. Accounting was based on paper logs that were subject to forgeries. Although the Soviet standard operating procedures that were still in use in Uzbekistan after 1992 imposed a two-man rule during laboratory work (usually a physician and a laboratory assistant), including in cases of pathogen destruction, it is not clear whether AP facilities actually verified the destruction of pathogens by performing periodic inventory of all pathogens.

Photo 1: Anti-plague Suit