

Nuclear tests leave Kazakhstan still searching for answers

Between 1949 and 1989 the Soviet Union detonated 456 nuclear bombs at the Semipalatinsk test ground in eastern Kazakhstan, sending plumes of toxic fallout over nearby villages. More than 20 years on, the health effects are still being felt. Tom Parfitt reports.

Chupatka the cow stands alone in a small enclosure in the middle of the central Asian steppe. She seems untroubled as she munches grass; and well she might, for she feels no effect from what she is eating. Between 1949 and 1989, the Soviet military detonated more than 450 nuclear bombs here at Semipalatinsk testing ground, an 18 500 km² sweep of eastern Kazakhstan better known as the Polygon. The Red Army was blithe about the human effect as unpredictable winds blew plumes of fallout over nearby villages.

Today, the extent of contamination caused by the blasts and the consequences for the health of local people remain a topic of intense study. Chupatka is part of an experiment to determine levels of radionuclides in plants on the test ground, and in livestock that eat them. Scientists from Kazakhstan's Institute of Radiation Safety and Ecology (IRSE) are feeding her with contaminated grass in an attempt to determine whether cattle grazed on the site can be slaughtered for meat. "I take my respirator and go out with my scythe to those craters over there," explains Sergei Keller, an employee of the institute, pointing to vegetation where dosimeter readings show up to 30 microsieverts per hour—about 300 times the background level.

According to Kazakh authorities, up to 1.5 million people were affected by fallout from the blasts at Semipalatinsk. Local—and some scientific—wisdom says that almost 40 years after the most dangerous tests ended the people who live on the edge of the test ground are still paying a high price. "This is an ongoing tragedy", says Zhanna Zhibrayeva, coordinator for UN

projects in Semey, the nearest city to the test ground.

In Semey, doctors at the regional oncological dispensary claim the prevalence of solid tumour cancers in the east of the country is 50% higher than the national average. "We think the Polygon is to blame", says Adylzhan Masadykov, deputy director for medical treatment.

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"Breast and lung cancers are especially pronounced", says Masadykov, whose dispensary will soon open a nuclear medicine department. Kazakh specialists say there are also high rates of infectious and non-infectious diseases, and haematological disorders in the region. Russian, American, Japanese, and British researchers have produced

scores of reports attempting to link the rates with radiation.

Yet, despite the scrutiny, the true effect on health has proved extremely tricky to pin down. In Nagasaki and Hiroshima, tens of thousands of people died from the force of the initial blasts, from burns and from acute radiation sickness. The consequences of the 1986 Chernobyl nuclear reactor disaster are disputed but researchers attribute a spurt of thyroid cancers to the presence of large quantities of radioactive iodine in the fallout. In Semipalatinsk, the answers are more elusive. "We need much more thorough epidemiological studies before we can make conclusions about cause and effect", says Shunichi Yamashita, chair of the Atomic Bomb Disease Institute at Nagasaki University, Japan, who has been visiting Semipalatinsk for 15 years.

What is certain is that the tests were done with little concern for people living on the steppe around the site.



Oleg Nemytov of the Institute of Radiation Safety and Ecology takes a dosimeter reading next to plants being grown as part of an experiment on the Semipalatinsk nuclear testing ground, Kazakhstan

The most dramatic—and dangerous—explosions were seen between 1949 and 1963, when the bombs were either detonated on a platform or dropped from aircraft. After that, the bombs were detonated underground. Proskovya Koloskova, who is 85 years old, lives in a state-funded old people's home in Semey, where several of the residents witnessed Soviet testing. Koloskova, then a farm worker, lived in a village about 65 km from the epicentre when she saw an explosion in 1954.

"They gave a warning on the radio that we should stay in the yard enclosed by our apartment blocks", she remembers. "But no one enforced it and curiosity got the better of us, so we went outside and I saw it from the street in front of my house. There was a flash like white lightning, then a great cup of fire rising into the sky with black smoke spilling out from the sides and tongues of red flame." Koloskova has had pain in her legs ever since, and her youngest son died at the age of 44 years after severe kidney problems. "Maybe the tests were to blame", she says.

The Red Army went to great lengths to establish the effect of their blasts on buildings, bridges, vehicles and even livestock. Fanning out from the epicentre where the nuclear bombs were detonated, the military built single-storey houses, low-rise apartment blocks, and even an underground metro station. They also positioned cars and aircraft, and tethered groups of sheep, pigs, and other animals. As for the human legacy, it seems the military did not care about—or at least underestimated—the effect of erratic winds, which sent streamers of fallout into populated areas beyond the perimeter of the Polygon. More than 67000 people are estimated to have received a radiation dose of higher than one sievert.

In 1957, however, the Soviet ministry of health did set up a top-secret research institute to study

the effect of the nuclear tests. Like many such bodies during the Cold War, it was given a misleading name to distract from its real purpose: Antibrucellosis Clinic No 4, after a bacterial disease spread by farm animals. The clinic was based in Kurchatov, the town situated on the edge of the Polygon, which is named after the Russian nuclear physicist Igor Kurchatov. For several decades, researchers there studied a group of 20000 people from three districts in Semipalatinsk region, comparing their data with control groups. The emphasis was on collecting information rather than providing treatment. The scientists concluded only a small group of inhabitants exposed to high doses had suffered "disturbances of natural immunity, cytogenetic effects, accelerated ageing processes, and excess cancer mortality".

After the break-up of the Soviet Union, employees at the clinic—now called the Institute of Radiation Medicine and Ecology—were able to speak openly about their findings. Boris Gusev, the head of the institute, claims he and colleagues have now established a direct link between radiation exposure and gene defects in families living in villages near the Polygon, such as Sarzhal, Mostik, and Dolon. That conclusion seems to be supported by the work of a group of researchers led by geneticist Yuri Dubrova of the University of Leicester, UK. In 2002 they reported that people exposed to high doses of radiation near Semipalatinsk had an 80% higher rate of DNA mutation and their children a 50% higher rate, than did control groups.

Whether such genomic instability causes predisposition to disease is a point of debate. Many locals believe they have unwittingly handed on health problems to their children and grandchildren. "I've heard the impact increases with each generation", says Koloskova. Other specialists, however, remain sceptical that health effects

are transgenerational. Nicholas Priest, a British toxicologist who has worked on NATO projects to study contamination at Semipalatinsk, says the higher doses received by villagers at the time of the tests could have produced a 10% increase in cancers.

"The Kazakhs tend to exaggerate the figures because a lot of organisations get funding coming in on the back of investigating these issues", he says. As for the risk from residual radiation now, Priest says it is "very low", although there are potentially dangerous hotspots on the Polygon—an area slightly smaller than Wales. Some have been concreted over, but others lie exposed.

"My concern is that there are no fences around the testing ground, or signs telling you where not to go", says Kathleen Purvis-Roberts, an environmental chemist from Keck Science Centre at Claremont Colleges in California, USA. "There are farmers grazing their animals there and scavengers have been pulling up copper wire for scrap. The control is very lax." Priest says one reason for the absence of warning signs is that they could aid terrorists seeking sources of plutonium and other radioactive material to make a dirty bomb.

In Kurchatov, scientists tend to downplay the extent of contamination. Yury Strilchuk of the IRSE takes visitors to the epicentre of the Polygon, where the ground is strewn with spherical pebbles of molten rock known as kharitonchiki. Strilchuk estimates 90% of the vast test ground could be returned to agricultural use within 5 years. "You could suffer more from the stress of worrying about coming here than from radiation itself", he says. Meanwhile, he and colleagues sometimes swim or fish in a flooded bomb crater called Atomic Lake. "The water is very clean", he says.

Tom Parfitt