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The Moscow Embassy Microwave Signal

Lately, there has been a great deal of scientific, public, and media attention about the health and safety of prolonged human exposure to radio-frequency (RF) radiation, especially with regard to cancer. The situation has been acerbated, in part, by dissemination of a report from a US government-sponsored experimental study [1, 2]. Indeed, release of the laboratory-rat cancer result was deemed as something of a public-health obligation by the reporting government entity: the National Institute of Environmental Health Sciences/National Toxicology Program [3].

The recent interest in this topic prompted me to recall an event that occurred in the mid 1970s, when the biological and health effects of RF and microwave radiation were brought to the fore by revelation of two US ambassadors to Moscow dying of cancer, and the then-ambassador Walter Stoessel threatening to resign in 1976, because of widespread staff concerns regarding potential health implications of an unusual microwave signal the Soviets were directing at the US Embassy in Moscow [4]. (Stoessel died of leukemia in 1986. He was 66 years old [5].)

Available reports suggest that since the 1960s, it had been known that the Soviets were targeting the upper floors of the central wing of the embassy in Moscow with low-level microwave radiation from nearby buildings, first from one, and then two sites [4, 6]. Indeed, it actually may have begun as soon as embassy staff had moved into the complex on Tchaikovsky Boulevard back in 1953, and persisted through at least 1988.

The levels of microwave exposure went up and down over the years. The direction and intensity of the 0.5 GHz to 10 GHz microwave signal changed in 1975 from $0.5\ \mathrm{mW/m^2}$ for nine hours per day to 0.1 to $1.5\ \mathrm{mW/m^2}$ for 18 hours per day, but it was always directed toward or aimed at the upper floors of the embassy. Only background levels were detected elsewhere in the embassy complex.

It is noteworthy that these levels were actually below what was considered as safe for human exposure in the US at the time. As a matter of fact, between 1966 and 1982, the American National Standards Institute (ANSI) guideline for safe human exposure to microwave radiation was $100\ \mathrm{W/m^2}$. Essentially, the same standard was adopted by the US Occupational Safety and Health Administration (OSHA). In contrast, the Soviets' standards were $1\ \mathrm{mW/m^2}$ and $10\ \mathrm{mW/m^2}$ for general public and occupational exposures, respectively [7]. The Soviet standards were derived from observations made in laboratory experiments using small animals, and surveys of people occupationally exposed to microwave radiation.

The existence of the microwave signal had been kept secret for years. This was because at the time, no one knew exactly why the Soviets were doing it, or that there might be any health consequences (a point I will get back to later).

Conjectures on intent and purpose abounded; the reasons why the Soviets did it remained a mystery. Speculations ranged from the Soviets' attempt to disable or interrupt communication signals from American electronic listening devices, to energizing electronic snooping gadgets

that may have been implanted in the building prior to American occupancy, to influencing the psychological states or brainwashing embassy staff.

At the time, Soviet publications and scientific understanding concerning microwave interaction with animal behavior and neurophysiology, including the central nervous system, were replete with accounts of direct effects of low-level microwave exposure on animals and humans [8, 9]. There was also broad interest in clinical and hygienic or public-health findings, especially under occupational conditions. Most of the reported hygienic effects were of the nature of subjective complaints, commencing two to five years after the start of work involving microwave radiation. Specific categories included "asthenic syndrome," characterized by depression, fatigue, headache, irritability, loss of appetite, and memory. Another category, "autonomic syndrome," featured fainting spells, heart enlargement, and pulse and pressure liability. The third group, "diencephalic syndrome," was represented by digestive abnormality, insomnia, and sexual dysfunction.

This episode harkens back to 1952, when American diplomatic security personnel discovered a tiny electronic eavesdropping device in the American Ambassador's Moscow office [10]. It was concealed inside a carved Great Seal of the US given by the Soviets to the US Ambassador to Moscow in 1945. The Ambassador proudly hung it in the embassy. It was a passive RF transponder-type sensor: a predecessor of current-day RFID sensor technology, activated by RF energy launched from an external source, which allowed Soviet agents to eavesdrop on secret conversations for seven years before detection. From that point on, the embassy was under periodic surveillance for electronic signals. There thus was a distinct reason for the discovery of the microwave signal at the embassy complex on Tchaikovsky Boulevard back in 1953.

In any case, according to reports, when Ambassador Stoessel learned about the microwave signal, he threatened to resign unless the embassy community was informed. As a result, existence of the microwave signal was finally made public in a press conference called by the Ambassador in 1976. Still, the embassy community felt betrayed about being kept in the dark for so long [6].

It is conceivable that more of the embassy community were anxious about the effect the microwave signal might be having on their health, especially since the US Congress enacted the Radiation Control for Health and Safety Act in 1968 [11]. The deliberations had highlighted a general lack of current scientific knowledge on biological effects and health implications of both ionizing and non-ionizing radiation exposure, and unveiled the considerable amount of unnecessary radiation that people were exposed to each year, including microwaves.

The US Congress had declared then that the public's health and safety must be protected from the dangers of radiation from electronic products. *The act* authorized the federal government to set *radiation* standards, monitor compliance, and undertake research. It directed the US Department of Health, Education and Welfare to establish and carry out an electronic product radiation control program designed to protect the public's health and safety from radiation emitted by electronic products, including microwaves.

An immediate benefit of Stoessel's press conference was the installation of metallic screens on the embassy's outer windows to provide a substantial degree of shielding against microwave penetration through windows into the building [5]. The nominal screening efficiencies were about 1,000 to 100,000, depending on such factors as mesh size and type of materials.

Furthermore, while apparently unknown to the embassy staff, other activities were already underway. The US government had initiated a research program, code named "Operation Pandora," at the Walter Reed Army Institute of Research. Herb Pollack, a physician, Joseph Sharp, a behavioral psychologist, and Mark Grove, a microwave electronics engineer, were principals [10]. The program subjected trained Rhesus monkeys to microwave exposures, mimicking characteristics gathered by monitors at the Moscow embassy. Microwave-induced interruption in the monkey's performance for food was studied in a classic operant-conditioning experimental protocol. The study was terminated in 1969. Reported findings included some microwave irradiation associated "aberrant behavior." However, agreement on an unambiguous consensus for behavioral psychological changes was not reached among project personnel.

Apparently, soon after the highly publicized press conference where existence of the Moscow Embassy microwave signal was finally made public in 1976, a two-year epidemiological research was initiated by the US Department of State at Johns Hopkins University, near Washington DC [12-14]. The study involved 1,827 employees and 3,000 dependents at the Moscow Embassy, and 2,561 employees and 5,000 dependents at comparable other US Foreign Service posts in the Soviet bloc as a control population, namely, Belgrade, Budapest, Leningrad, Prague, Sophia, Warsaw, and Zagreb, during the period from 1953 to 1975. The control or comparison group was chosen to match the study group in selection criteria and environmental factors such as climate, diet, disease, and general social milieu, except that the postings were not subjected to microwave irradiation.

The purpose was to assess any differences in morbidity and mortality between the Moscow and comparison groups. Extensive efforts were devoted to identify and trace the populations. Information on illness, conditions, or symptoms was gathered and validated. Death certificates were used to ascertain mortality. Standardized mortality ratios and morbidity indices for various groups were developed for the study. At completion of the study in

1978, the investigators' conclusion was that the Moscow and comparison groups did not significantly differ in overall and specific mortality, and no compelling evidence was observed to implicate the Moscow microwave signal in any adverse health effect. Nevertheless, investigators had noted that the study population was relatively young, and it might have been too early to detect long-term health and mortality outcomes.

The most perplexing question remains: what was the Soviets' purpose in microwaving the Moscow embassy?

At a later point, there was an indication that the Soviets had suggested it was a jamming signal calculated to thwart US electronic spying devices. This is a plausible but simplistic rationalization; however, the signal strengths were rather weak for jamming maneuvers.

One possibility is that the Soviets were using microwaves to activate numerous snooping devices they had implanted in the building prior to American occupancy. This obviously was an expected scenario, given the success of the bug concealed in the carved Great Seal, especially for the reason that electronic fabrication capability had advanced by leaps and bounds since 1945. However, ever since discovery of the Great Seal bug, surveillance for electronic signals had become routine at the embassy complex.

Another intriguing proposition was that the Soviets were bouncing the microwave signal off the embassy's window glass in an attempt to eavesdrop on conversations taking place inside the office. The theory was as follows: conversation-generated sound waves would set the glass window pane into tiny vibrations, which does happen, in principle. Reflection of the microwave signal impinging on the window pane would be modulated by the vibrations in amplitude and phase, which might then be electronically demodulated to reproduce conversations taking place inside the office. While feasible, there are technological challenges in converting the faint electronic signals to voice, although it is not impossible. At best, the reflected microwave intensity would be down about 90% while also being in a potentially noisy electronic operating environment. Nevertheless, given the demonstrated sophistication of the Great Seal bug from an earlier period, it could be well within the Soviets' capability.

Finally, it might have been a designed exploitation of the Soviet understanding of how prolonged exposure to low-level microwaves affects the mental state of exposed subjects. If that was the intent, the Moscow microwave signal indeed may have accomplished its intended purpose, in part. The embassy staff clearly showed anxiety after learning about the existence of the microwave signal. They were concerned about potential health effects the microwave signal might be having on them or their children. It became somewhat of a morale problem for a time.

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