Reviews and Resources

BOOKS

The Soviet Biological Weapons Program—a History

The Soviet biological weapons program, which began in 1928, was greatly expanded during the period between 1973 and 1990. During that period it went through two major phases, the most remarkable second phase occurred at the same time the Soviets were in the process of ratifying the 1972 Biological and Toxin Weapons Convention (BWC), which forbids the development, manufacture, and storing of biological weapon (BW) agents.

This book, which largely is based on extensive interviews with Soviet scientists and institute managers, documents from the Soviet Central Committee, as well as declassified U.S. and U.K. documents, comprehensively reviews the long, complicated history of the Soviet BW program. The first 10 chapters are a chronological description of the historical aspects of the BW programs, starting with applied research on classic pathogenic bacteria initiated as the “first generation” of BW work in 1928 up to the more sophisticated, genetic engineering-oriented work on both bacteria and viruses through the late 1980s and early 1990s. It is a comprehensive and somewhat atypical historical presentation, since great pains are taken not only to present the facts, but to provide considerable space to what is not known about various aspects and institutions involved in this work. In addition to describing the various projects, the historical chapters clearly identify which institutions, and in most cases, which investigators were involved. Chapters three and four focus on the military institutions, including the open-air testing site located on Vozrozhdeniye Island in the Aral Sea. Accomplishments relating to the development and weaponry of multiantimicrobial-resistant Bacillus anthracis, Francisella tularensis, and Yersinia pestis are revealed.

It is not possible, in this short review, to cover the wide range of bacteria and viruses that were weaponized by the various Soviet research institutes described in this book. However, a demonstration of the sophistication that was attained is worth illustrating by one particularly strange project. This involved inserting a gene coding for the production of a myelin-like peptide into an expression plasmid and then inserting the plasmid into a Legionella pneumophila host. The purpose was to stimulate the immune system of the victim to mount an inflammatory response that attacked the host’s myelin surrounding nerve cells and destroy brain cells that make and repair myelin, to create an artificial version of multiple sclerosis (p. 194–195). This is just one illustration of the complexity and malevolence of the Soviet BW program. The last history chapter describes the weaponry and delivery systems for Soviet BW agents, including consideration of using an ICBM BW delivery system, as well as their intended targets.

The remaining chapters (chapters 11 to 23) present contemporary issues relating to the Soviet BW program and the reaction of agencies and the press outside of the Soviet Union and Russia. Chapter 11 is one of the most impressive chapters. It is an excellent review of the complex issues involved in attempts to differentiate offensive from defensive BW activities. It is a well-balanced presentation that contains a wide range of opinions from experts in the field. Regardless of the criteria used, the authors clearly state the following: “This book demonstrates without any question whatsoever that the Soviet Union maintained an offensive BW program of enormous and unprecedented magnitude. Nothing in the discussion that follows should be misunderstood to suggest otherwise” (p. 329).

Other chapters cover a variety of relevant subjects. There is an interesting discussion on how a U.S. covert BW misinformation campaign, directed at the Soviet Union, may have helped convince them that the United States had an active offensive program after 1969. The chapter on the 1979 release of Bacillus anthracis spores from a military biological facility in Sverdlovsk continues the discussion presented in a previous historical section to provide a broader discussion on the implications of the complete denial on the part of Soviet and Russian officials that the accident occurred. The implication of this incident for the United States and others is summarized as follows: “Despite this incredible record of disinformation and prevarication by senior officials . . . damage to the BWC seems in retrospect to have been slight because State Parties to the BWC, with the exception of the United States and the United Kingdom, chose to look the other way . . .” (p. 445–6). One might expect that the chapter entitled Soviet Research on Mycotoxins would focus on the 1981–1982 US government allegations that the Soviet Union was re-
responsible for use of trichothecene mycotoxin (yellow rain) in Laos, Cambodia, and Afghanistan. Although this incident is adequately covered, the real impact of this chapter is to provide details on over 10 Soviet institutes performing research on Fusarium toxins.

Additional chapters cover the Gorbachev and Yeltsin years with a discussion of how Soviet policies were set by the Politburo of the Central Committee. However, policies relating to discontinuing BW activities were complicated due to the powerful influence of senior military officials. Although progress on arms control was successful during this period, progress toward transparency of the BW program was greatly influenced by the military. Leaders like Yeltsin spoke publicly about the Soviets having violated the 1972 BWC, and both Gorbachev and Yeltsin may have had intentions to become more open about their BW program, but both leaders were hampered in carrying out these intentions by “...a small coterie of the senior hierarchy of the Soviet and then Russian military together with several allied civilian officials [who] successfully guarded the offensive BW program, prevented its eradication, and fought off all attempts to reveal its dimensions and purpose” (p. 678). As the authors point out, currently it remains unknown whether the Soviet offensive BW program remains active in Russia. The last chapter deals with the successes and failures of extensive international efforts from 1993 until today to prevent the proliferation of BW expertise from former Soviet BW facilities.

In 921 pages of text, annexes, and notes, this book is certainly destined to be a significant source document for microbiologists, policy makers, historians, and students interested in this important subject. Each topic is presented in detail, and as noted previously, the authors are careful to present facts and openly declare what may be implied or is undocumented. It is an impressive compilation of our current knowledge of this extensive program. Transparency was never a characteristic of the Soviet BW program, and several institutions remain closed to this day, but Leitenberg and Zilinskas have done a commendable job in using their extensive sources to help remove some of the mystery of how and why the Soviet Union invested such an incredible amount of money and manpower on research, development, and testing of new and modified agents generated by its biological weapon programs.

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The Fecal Bacteria

The recent success of Meta-HIT, the Human Microbiome Project, the Earth Microbiome Project, and other large-scale sequencing efforts are revolutionizing our understanding of which sequences, 16S rRNA or metagenomic, are found in which people and environments. However, sequences are not enough: there is a critical need to relate the information gained by these new technologies to the wealth of knowledge painstakingly accumulated over centuries in the laboratory about microbes as organisms and as participants in ecology and physiology. "The Fecal Bacteria" provides exactly these links for, as the title might suggest, the fecal bacteria, including information about the evolution, ecology, and environmental persistence of the many diverse taxa that inhabit the feces of primarily mammals and birds (reptiles, amphibians, and fish are mentioned briefly with specific reference to Escherichia coli).

The book consists of 13 chapters by different combinations of authors, with the usual benefits (deep subject matter expertise on each topics) and drawbacks (repetition in introductory material and less coherence than might otherwise have been achieved) from this approach. Topics covered include gut physiology; ecology and function of the gut microbiota; sources, prevalence, and fates of specific groups of fecal bacteria; source tracking; and both culture-based and culture-independent methods for monitoring fecal bacteria in the environment.

Several of the chapters will be of particular interest in connecting physiological and genomic properties of fecal bacteria to function in the gut: the first chapter, by Krause and Khafipour, provides a comprehensive overview of types of mammalian gut along with the types of fermentation and bacteria that appear in each, and the second, third, and seventh chapters, by Carrero-Colon et al., Willing and Jansson, and Johnson, respectively, provide an excellent summary of which major groups of indicators are found where in the environment (although a table summarizing these relationships could be a valuable addition to a future edition), factors known to affect the fecal microbiota (e.g. infant development, obesity and antibiotics), and known effects of specific groups of fecal bacteria on human health (including antibiotic resistance and horizontal gene transfer), respectively. Chapter 4, by Yost et al., provides a detailed summary of sources other than humans of fecal bacteria in the environment, which is complemented well by chapter 6 by Whitman et al. summarizing the fates of these bacteria and especially the roles of different types of environment (marshes, rivers, lakes, etc.) and abiotic and biotic factors on the survival of specific groups of fecal bacteria, and by chapter 8 by Nevers & Boehm providing a more rigorous modeling approach to complement the observational data.

The methodological chapters on source tracking and detection may require updates relatively soon given the intense activity in new methods development in these areas, although the summary of approaches currently accepted by regulatory agencies and that