waste treatment, as well as a large alkaline hydrolysis “digester” for the disposal of animal remains. Paul is a member of the Cornell Institutional Biosafety Committee and directs the Vet College’s rabies risk management program. Before taking this position in 1999, he worked in the environmental engineering field with a specialty in industrial wastewater management. Paul is a graduate of Cornell University (BS, Civil and Environmental Engineering) and the University of Massachusetts (MS, Environmental Engineering), and is a Registered Professional Engineer as well as a Registered Biosafety Professional. As a member of ABSA’s Professional Development Team, Paul is co-coordinator for ABSA’s Principles & Practices of Biosafety class as well as an instructor for BSL-3 courses offered by ABSA and the Eagleson Institute. Paul serves as ABSA’s representative on the ANSI committee to develop a national standard for the verification of BSL-3 facility performance.

Capsule

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What’s new, what’s hot, what’s timely? If you don’t have time to search the Internet for the latest developments that might impact your work environment, you just might find some of this information in this “Capsule” column. Please e-mail any comments or suggestions to felix.gmuender@bh.com.sg or to Co-Editor Barbara Johnson at barbara_johnson@verizon.net or Co-Editor Karen B. Byers at karen_byers@doci.harvard.edu.

Nosocomial Transmission of Measles, Environmental Viral Hazards from Food and Water, Lethality of H5N1, and Laboratory-acquired Brucellosis in Turkey

Nosocomial Transmission of Measles: An Updated Review

Bothelo-Neversa et al. (2012) report that on a global level over the past decade, improved vaccination coverage has substantially decreased the incidence and mortality of measles. In the Americas, endemic measles has been eliminated; in the Pacific region, elimination goals are within reach. However, in Southeast Asia and Africa, many countries are still at risk of missing the WHO elimination targets. In Europe, the incidence has declined too, except in Western Europe where it has increased because of suboptimally vaccinated pockets of individuals (antivaccination groups) and people with limited access to health care (for instance, the Roma ethnic group that was displaced from Eastern to Western Europe).

With the elimination of endemic measles, transmission in healthcare settings has become more relevant. Risk can be thought of as a function of likelihood and severity. On the likelihood side, a number of factors favor rapid spreading of nosocomial measles (Bothelo-Neversa et al., 2012). With a basic reproduction number of between 7.7 and 15, measles is highly contagious even before the onset of rash-es. The early signs are nonspecific and include fever, cough, and conjunctivitis, which are very similar to common cold symptoms. Hence, because of this unspecific presentation, healthcare workers in regions with low measles incidence may miss the symptoms as potentially contagious measles and, as a consequence, patients may have already transmitted the virus in waiting and admission areas. The virus can persist in aerosols for extended periods, which is ideal for transmission in crowded settings such as healthcare facilities (Bothelo-Neversa et al., 2012).

On the severity side of the risk equation, nosocomial measles is more severe than the community-acquired illness. Patients in emergency care units and triage wards, as well as those with underlying risk factors, are at a higher risk.


Virus Hazards from Food, Water, and Other Contaminated Environments

Rodriguez-Lázaro et al. (2012) report in a review article that numerous pathogenic viruses of human and animal sources can be transmitted by water and food, and infect people after ingestion and occasionally through skin contact. The article begins with a systematic overview of the
relevant food and environmental virus hazards and reveals by which routes these viruses are shed into the environment and reach food and drinking water.

The most important human pathogenic viruses in this context include the families of the Caliciviridae, Adenoviridae, Hepeviridae, Picornaviridae, and Reoviridae. For these, Rodríguez-Lázaro et al. (2012) review sampling methods, first-choice detection and surveillance methods, and their limitations.

The caliciviruses include norovirus and sapovirus, which are the most important viral agents for acute gastroenteritis and diarrhea in all age groups worldwide. The major route of transmission is food and water contaminated with fecal matter and vomitus, fomites, and person-to-person contact. Sapoviruses affect mostly young children.

Adenoviruses include numerous serotypes, some of which cause gastroenteritis in children by the fecal-oral route. Water-borne outbreaks have been reported after visiting swimming pools with insufficient water disinfection.

Hepatitis E virus is the sole member of the Hepeviridae and is a relevant cause of hepatitis in regions with inadequate water supply and poor hygienic conditions. Only isolated cases were reported in industrialized countries.

Hepatitis A virus is the most prominent representative of the Picornaviridae in this context. Infections have declined substantially in countries with effective immunization programs and improved sewage treatment and hygiene practices, which have severely curtailed the fecal-oral route of transmission.

The Reoviridae family includes rotavirus and astrovirus, which are water-borne pathogens affecting mostly children, and prominent agents of gastroenteritis.

The above-mentioned viruses can be of zoonotic or human origin, and disease is associated with the consumption of contaminated water and food of animal origin or after manipulation by infected humans. Contaminated animal feces can contaminate crops if used directly as fertilizer or indirectly after reaching surface water that is used for irrigation. Contaminated human feces can also reach surface water used for irrigation of fruits and vegetables.

Rodríguez-Lázaro et al. (2012) report that most pathogenic viruses emerging in human populations are of animal origin. Once an outbreak happens in a community, human-human transmission, contamination of food by food handlers, and fomite-human transmission become relevant too. After an outbreak, healthcare workers are the first who face an occupational exposure, and nosocomial-related infections can spread quickly.

Good sampling strategies are important for the early and accurate identification of environmental virus hazards and allow for deploying rapid and successful countermeasures, but they are not cheap. Cost-benefit analyses are not available. The authors (Rodríguez-Lázaro et al., 2012) cite various international bodies, such as the International Organization for Standardization (ISO), the European Committee for the Normalization (CEN), the European Food Safety Authority (EFSA), and national bodies, such as the U.S. Department of Health and Human Services (USDHHS), that have defined principles and/or standards for the sampling of food and water, and mention that the World Health Organization (WHO) and the European Centre for Disease Prevention and Control (ECDC) have devoted considerable energy to developing integrated surveillance networks.

The last section of the review (Rodríguez-Lázaro et al., 2012) focuses on detection methods, as well as on evaluation and interpretation of test results. A short paragraph is devoted to laboratory safety. The large variety and complexity of samples and the possible heterogeneous distribution of a small number of viruses in the sample render detection not always easy. In addition, the presence of test-inhibitors may interfere with the detection methods. Often, to isolate virus from environmental samples, a concentration step is required before a test can be done. The available detection tests include cell culturing (plaque assay, TCDL50 [tissue culture infective dose assay]), molecular methods (PCR [polymerase chain reaction], real-time PCR, NASBA [nucleic acid sequence-based amplification]), as well as immunological methods (EIA [tissue culture infective dose assay], RIA [radioimmunoassay], and ELISA [enzyme-linked immunosorbent assay]). After detection, an identification or characterization test is required (sequencing, multiplex PCR, immunostaining, etc.). The authors (Rodríguez-Lázaro et al., 2012) discuss the strengths and weaknesses of the tests. A test method may be useful for one type of virus, but not for another.

The topic of so-called index viruses is also presented. Classical indicators such as fecal coliforms are still in use, but recently their adequacy has been questioned. To this day, available data are not yet sufficient to use index viruses as a more accurate or sensitive tool to monitor the quality of water and food.


Is H5N1 Really Highly Lethal?

Toner and Adalja (2012) stress that the answer to this question is central in the current debate over research on genetically modified H5N1 influenza viruses. The authors mention that not all H5N1 viruses are equal; some, which are so-called low pathogenic H5N1, are not closely related to the viruses of concern. The lineage of the original highly pathogenic avian influenza strain that has evolved over the last 15 years includes several descendent strains and sub-strains, with different death rates. As of January 2012, WHO has registered 583 people with an H5N1 infection, from which 344 have died. The fatality rate of WHO-confirmed cases is 59%. The figures are not challenged, but the question remains as to whether all human infections have resulted in symptoms and how many have gone un-
noted. The authors (Toner & Adalja, 2012) identified 22 seroepidemiological studies; the majority of these studies found no or little evidence of subclinical H5N1 infections. Four studies had to be excluded for methodological reasons. Of the remaining 18 studies, in 11,477 persons only 144 were found to be seropositive (1.25%). The authors note that many of the 18 studies suffer from inadequate design and methods and conclude that it is impossible to draw a final conclusion on what the prevalence of asymptomatic seroconverters means in terms of fatality rate. For instance, an irrelevant seroconversion could have happened after an exposure to contaminated water. Toner and Adalja (2012) confirm that people who are infected become seriously ill and a large proportion die. In response to this article, Zelicoff (2012) writes in a letter to the editor that “morbidity from novel influenza strains does not equate with an impending pandemic, let alone one with high mortality.” Zelicoff (2012) suggests that “it would appear likely that a systematic, prospective cohort study is in order to adequately capture the frequency of asymptomatic infection.”


Laboratory-acquired Brucellosis in Turkey

Sayin-Kutlu et al. (2012) report about a multicenter survey conducted in 38 hospitals in 17 of the 81 provinces in Turkey. Thirty-eight of the 667 interviewed laboratory workers had experienced a lab-acquired brucellosis (LAB, 5.8%). Statistical analysis revealed the three most important factors that reduce the likelihood of an LAB are using a biosafety cabinet class II (odds ratio 0.13, P value 0.009), full adherence to glove use (odds ratio 0.27, P value 0.004), and longer experience as a lab worker (odds ratio 0.86, P value <0.001). Performing bacterial isolation, being a staff member, and being male increased the odds of an LAB significantly (5.12, 3.21, and 2.14, respectively). Brucellosis is still endemic in Mediterranean and Middle Eastern countries, including Turkey. In many of these countries, laboratory facilities and equipment are not appropriate. In the Turkish study (Sayin-Kutlu et al., 2012), the interviewees diagnosed with LAB named inadequate facilities such as lack of biosafety cabinets and tools (79%), lack of knowledge about the mode of transmission (52%), and ignoring the risk of infection (64%) as the cause of LAB.


Beyond Traditional Biosafety

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Biobusafety professionals have ever-expanding roles at their institutions. In this Beyond Traditional Biosafety column, we focus on topics that may fall outside the scope of the traditional biosafety role, but where the expertise of the biosafety professional may be called upon to provide a valuable contribution to his or her institution. Please e-mail any comments or suggestions to Ted Myatt, tedmyatt@gmail.com, Co-Editor Barbara Johnson at barbara_johnson@verizon.net, or Co-Editor Karen B. Byers at karen_byers@dfci.harvard.edu.

Construction in Healthcare Facilities—Risks from Opportunistic Fungi and Control Solutions

Construction, demolition, and renovation activities are common occurrences in a healthcare facility. Hospitals are constantly seeking to better utilize current space, as well as to expand to accommodate growing needs. Potentially, construction work in hospitals can place patients, staff, workers, and visitors at risk for serious health issues. These include risks from inhalation exposure to opportunistic fungi, the focus of this article.

Airborne dust and other debris generated during construction work can contain opportunistic fungi that are generally harmless to the average person, but can cause serious infections in severely immunocompromised patient populations. The primary infection control concern during hospital construction is exposure to fungal elements that can cause a group of invasive fungal respiratory diseases. One such disease, aspergillosis (caused by Aspergillus spp., most commonly A. fumigatus, A. flavus, and A. terreus), can affect compromised patients such as those undergoing high-dose chemotherapy for hematological malignancies with or without stem cell or bone marrow transplants, and those with auto-immune disease, solid organ transplants, and immunosuppressive diseases such as AIDS (Kauffman, 2010; Maschmeyer, 2007; Muller, 2002; Yeghen, 2000). Aspergillosis can take several forms. These include nonin-