Biological safety in the medical laboratory

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Medical laboratories primarily process and perform testing on human specimens to provide results and interpretation for individual patient management, infection control, and public health purposes. Any clinical specimen potentially contains biological agents, such as viruses, bacteria, fungi, or parasites. It is therefore essential to ensure biological safety in the medical laboratory to prevent laboratory-acquired infections by laboratory staff and dissemination of any infectious agent from the laboratory.

Micro-organisms have generally been categorised into four Risk Groups, and medical laboratories are classified into four Biosafety Levels (BSLs). Each BSL has designated requirements in terms of architectural features and ventilation, safety equipment such as biological safety cabinets, use of personal protective equipment, and adoption of safe microbiological practices by qualified and trained personnel. Human specimens, which potentially contain human pathogens, are required to be handled at least at BSL-2. Pathogens that pose a high individual and community risk, with the potential to cause serious disease and that can be readily transmitted, with no effective treatment or preventive measures, are generally recommended to be handled with BSL-4 precautions. Nevertheless, such classifications, with only four levels, cannot be implemented mechanically. Risk assessment must incorporate various factors, such as the specific laboratory procedures and route of transmission of the pathogen.

In March 2014, the world was first alerted to the ongoing outbreak of Ebola virus disease (EVD) in West Africa. As of 19 April 2015, 26044 confirmed, probable, and suspected cases of EVD had been reported in the countries with widespread and intense transmission (namely in Guinea, Liberia, and Sierra Leone), with 10808 reported deaths. The Ebola virus, first described in 1976, has been generally regarded as a Risk Group 4 agent, and handling of live cultures is therefore essential to ensure biological safety in the diagnostic medical laboratory, nucleic acid testing of specimens from EVD cases.

As elaborated above, while the medical laboratory must support patient diagnosis and management, as well as public health measures, it is essential to maintain biological safety in the laboratory to protect both the laboratory worker and the environment. This can only be achieved when quality standards in medical laboratories, in terms of facilities, equipment and specialist supervision, are duly enforced and continually maintained.

References