

Update of Negative Pressure Automatic Control System in High Protection Laboratory and Review of Abnormal Events-an Example of Tainan Biosafety Level 3 Laboratory

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Abstract

The outbreak of severe pneumonia with novel pathogens (Covid-19) in 2020 showed the importance of high-protection laboratory (BSL-3/ABSL-3 and above) and biosecurity. We addressed the improvement of the Tainan Biosafety level-3 negative pressure system as an example to demonstrate the functionality and accident handling of a negative pressure laboratory and shared the practical experience for laboratory management in Taiwan. First, each unit was monitored by the negative pressure system according to client's demands. The intake and exhaust fan units were used in main and standby modes in turn. Biological safety cabinet (BSC) exhaust and environmental exhaust were linked to each other. There were three operational modes: the energy save mode, normal mode with BSC low airflow, and normal mode with BSC high air-flow, which saves energy by adjusting the operational situation. All parameters of the laboratory, including the value of negative pressure, temperature, and humidity, were monitored using dynamic graphics and were integrated into the central control system. The administrator could be notified via the network when an abnormal condition occurs. Secondly, according to Article 20, Item 2 of the "Administrative Measures for Infectious Biological Materials", if an abnormal event of negative pressure of high-protective laboratories occurs and cannot be recovered immediately, the event must be reported within 24 hours. Except for immediate recovery, laboratory members should notify the central and local authorities via the laboratory information management system (LIMS) in one day, and then follow the "Regulation of High Protection Laboratory Suspension Procedure" for one month or one-year suspension period. In face of the occurrence of highly infectious diseases internationally, domestic institutions are aware of the urgency

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of disease detection, vaccine development, and the necessary demand for high-protection laboratories. The staff of laboratory biosafety management must keep pace with the times. To maintain normal operations and handle accidental events, the staff should be familiar with basic knowledge and safety principles to avoid biohazards.

Keywords: High protection laboratory, negative pressure automatic control system, abnormal negative pressure, accident notification