CHAPTER 11

HAZARDS OF CELL AND TISSUE CULTURE SYSTEMS

Working with Human and Other Primate Cells and Tissues

Human isolates from malignant tissues or those from tissues susceptible to or likely to harbor mammalian oncogenic viruses should be handled under biosafety level 2 conditions. All established or permanent cultures of human lymphocytes should be handled on the assumption that they harbor the Epstein-Barr virus. Under no condition should an individual handle lymphoid cells of a line derived from him- or herself, or a first degree relative.

At least 24 documented cases of infection of laboratory workers handling primary cell cultures (e.g., primary rhesus monkey kidney cells) have occurred in the past 30 years.[1][2] While a limited number of laboratory-associated infections have been reported as resulting from the handling of human and other primate cells, there is a more significant risk to acquiring infection with HBV or HIV from exposure to human blood and other body fluids,[3][4][5] and OSHA has developed a bloodborne pathogens standard.[6] Procedures have been published to reduce contamination of cell cultures with microorganisms[7][8]or other cells.[9]

The potential laboratory hazards associated with human cells and tissues include the bloodborne pathogens HBV and HIV, as well as agents such as *Mycobacterium tuberculosis* that may be present in human lung tissues. Other primate cells and tissues also present risks to laboratory workers.[10] Potential hazards to laboratory workers are presented by cells transformed with viral agents, such as SV-40, EBV, or HBV, as well as cells carrying viral genomic material. Tumorigenic human cells also are potential hazards as a result of self-inoculation.[11]

Human and other primate cells should be handled using Biosafety Level 2 practices and containment. All work should be performed in a biosafety cabinet, and all material should be decontaminated by autoclaving or disinfection before discarding.[12][13][14][15] All employees working with human cells and tissues are to be enrolled in the Bloodborne Pathogens Program, and work under the policies and guidelines established by the University Exposure Control Plan.[16] Employees should be offered hepatitis B immunization, and be evaluated by a health care professional following an exposure incident.

Working With Other Cell Cultures

Many biochemistry, physiology, microbiology and cancer research laboratories use cell cultures as routine source materials. The actual hazards of this work are not clearly recognized and may be minimal, with certain exceptions. Most cell cultures are known to harbor viruses, either adventitiously or deliberately. In these cases the appropriate procedures for the known or presumed virus should be used with the cell culture. Primary and permanent cell lines from mouse, hamster, human, rat, etc. should therefore be handled as if they carry low risk viruses.

References

1. Davidson, W.L. and Hummler, K. 1960. B-virus infection in man. Annals of the New York Academy of Science **85:**9970-979

2. National Research Council, 1989. Safe handling of infectious agents. In: Biosafety in the Laboratory, Prudent Practices for the Handling and Disposal of Infectious Material, NRC, National Academy Press, Washington, D.C. Pg. 13-33.

3. McGarrity, G.J. and C.L. Hoerner. Biological Safety in the Biotechnology Industry. In: Laboratory Safety: Principles and Practice. ASM Press, Washington, D.C., 1995.

4. Centers for Disease Control. 1988. Update: Universal Precautions for Prevention of Transmission of Human Immunodeficiency Virus, Hepatitis B Virus and Other Bloodborne Pathogens in Healthcare Settings. MMWR, **37**:377-382, 387, 388.

5. Centers for Disease Control and Prevention. 1989. Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Healthcare and Public Safety Workers. MMWR **38**, No. S-6.

6. U.S. Department of Labor, Occupational Safety and Health Administration. 1991. Occupational Exposure to Bloodborne Pathogens. 29 CFR Part 1910.1030:231-243.

7. McGarrity, G.J. and Coriell, L.L. 1971. Procedures to reduce contamination of cell cultures. In Vitro **6**(4):257-265

8. McGarrity, G.J. 1976. Spread and control of mycoplasmal infection of cell culture. In Vitro **12**:643-648

9. Nelson-Rees, W.A., Daniels, D.W., and Flandermeyer, R.R. 1981. Cross-Contamination of Cells in Culture. Science **212**: 446-452

10. McGarrity, G.J. and C.L. Hoerner. 1995 (3)

11. Weiss, R.A. 1978. Why cell biologists should be aware of genetically transmitted viruses. National Cancer Institute Monograph 48:183-189.

12. Barkley, W.E. 1979. Safety considerations in the cell culture laboratory. Methods Enzymol. 58: 6-54.

13. Grizzle, W.E. and Sarah S. Polt. 1988. Guidelines to avoid personnel contamination by infective agents in research laboratories that use human tissues. Journal of Tissue Culture Methods 11:191-199.

14. Caputo, J.L. 1988. Biosafety procedures in cell culture. Journal of Tissue Culture Methods 11:233-227.

15. Caputo, J.L. Safety procedures. In: R. Ian Freshney and Mary G. Freshney, Eds, Culture of

Immortalized Cells, Wiley-Liss, Inc., 1996.

16. Occupational Exposure to Bloodborne Pathogens (6)