Chapter

29

MALIGNANT CELLS

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Occupational Setting. Workers at risk include (1) laboratory workers who handle malignant cells during the performance of in vitro and in vivo research, (2) histology and pathology workers involved in the preparation and processing of neoplastic tissues, (3) medical and nursing staff involved in surgical procedures (i.e., aspirates, biopsies, resections) on cancer patients, (4) surgical scrub personnel who handle sharp instruments contaminated with malignant cells, and (5) housekeeping workers (especially those in cancer research areas) exposed to sharp objects contaminated with malignant cells.

Exposure (Route). Reports of cancer from exposure to malignant cells are quite rare. However, the most likely route of occupational transmission appears to involve needlestick or sharp object (i.e., surgical instruments, histologic tissue cutters, broken pipettes) injuries to workers' hands. Injuries whereby malignant cells are cutaneously injected or possibly implanted into an open wound probably have the greatest likelihood of occurrence and ultimate viability.

A review of studies reporting needlestick injuries found that 34–50% of health care workers were injured and that 10–70% of those injuries were due to recapping of needles.[1] Studies of hospital workers have shown that the highest incidence of needlestick injuries occur in housekeeping personnel (during trash disposal) and laboratory and nursing personnel (during needle disposal or recapping).[2,3] Pathologists and surgeons have also been shown to be at increased risk for cutaneous injuries from sharp instruments and needlesticks (especially those involving the distal fingers of the nondominant hand) during operative procedures.[4,5] Although the incidence of cutaneous injuries resulting from sharps contaminated with viable cancer cells is unknown, it probably represents only a small fraction of the cutaneous injuries incurred by potentially exposed workers.

Pathobiology. Transplantation of foreign human tissue to a healthy recipient normally leads to an immune response resulting in destruction of the transplanted tissue (rejection).[6] Southam et al.[7,8]

showed that normal recipients given subcutaneous injections of human cancer cells responded with a marked local inflammatory reaction and a rapid complete regression of the cancer implants within 3–4 weeks. In contrast, cancer cell injections given to advanced cancer patients caused little or no acute inflammatory reaction; the cancer cells typically grew for 3 weeks or longer before regression, and in some recipients growth continued beyond 6 weeks.[8] One recipient exhibited local recurrence of tumor growth even after three excisional biopsies, and another recipient had lymph node metastasis.[7] In another study, local cancer growth occurred in two patients who received small allogeneic tumor implants as part of an immunotherapy protocol for advanced cancer.[9]

Scanlon et al.[10] reported that some patients with advanced cancer have even tolerated tissue grafts from other animal species. Growth of transplanted cancer cells has also been reported to occur in healthy immunocompetent individuals. In one case, death from metastatic disease was reported in a woman who received a small melanoma graft taken from her daughter as part of an immunotherapy protocol.[10] In another case, a healthy 19-year-old lab worker developed an actively growing adenocarcinoma of colonic origin on her hand following a needlestick injury. At the time of the injury, only a small superficial wound was noted, with no apparent injection of the cancer cell suspension. The tumor, which was widely excised after 19 days, showed no evidence of an inflammatory response or necrosis. The worker was free from recurrence 4 years after the injury.[11]

The occurrence of transplanted cancer cell growth and metastasis in some individuals appears to be related to alterations in immune functioning. Rejection of foreign tissue depends on recognition of cell surface major histocompatibility (HLA) antigens and involves both cell-mediated and humoral immunities.[6] The most important cell-mediated reactions involve both CD4+ T-helper cells and CD8+ cytotoxic T cells, which play a crucial role in the recognition of foreign tissue cells and regulation of the immune response.[6] Therefore, HIV/AIDS patients and other immunocompromised individuals with impairment of their cell-mediated immunity may be at increased risk for developing viable neoplasms when exposed to malignant cells. The occurrence of cancerous growth in two apparently healthy immunocompetent adults is not well understood. It may be due to certain mechanisms that allow the tumor cells to escape immunosurveillance, such as loss or reduced expression of histocompatibility antigens, shedding or modulation of tumor antigens, and production of immunosuppressive factors.[6]

Treatment. Injuries should be medically treated as with other needlestick or cutaneous injuries. In addition, the injury site should be periodically evaluated for any tumor growth for at least the ensuing 3–4 weeks (immunocompromised individuals may require longer follow-up). If tumor growth occurs, wide excision of the tumor with close follow-up should be considered. This treatment was apparently effective in at least one of the reported cases.[11]

Medical Surveillance. All percutaneous injuries should be handled in accordance with OSHA's *Bloodborne Pathogens Standard*, which covers workers occupationally exposed to unfixed human tissues or blood products.[12]

Prevention. All nonessential sharps should be eliminated where possible, especially in laboratory situations. The risk of needlestick injury can be reduced by eliminating all needle recapping and nonessential unprotected needle use; needleless or protected needle devices should be used where possible.[13] Where the use of needles or sharp instruments is indicated, workers should be trained in the safe techniques for handling and disposal (i.e., using puncture-resistant containers) of these objects. Additionally, workers should be encouraged to report all needlestick and contaminated cutaneous injuries so that appropriate postexposure treatment can be given and so that the incident can be studied to prevent similar accidents in the future. Further, worker education and training, needle handling, and sharps disposal should be conducted in accordance with OSHA's *Bloodborne Pathogens Standard* and NIOSH's *Guidelines for Protecting the Safety and Health of Health Care Workers* to reduce the likelihood of injuries.[12,14]

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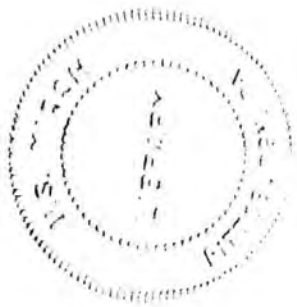

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