Minimizing Hazards Associated With Live-Virus Immunotherapeutic Cancer Vaccines

Sheri McMahon, RN, BSN

Therapeutic cancer vaccines that use attenuated vaccinia viruses as delivery vectors are undergoing clinical trials at dozens of sites internationally. Even in an attenuated form, these live viruses can cause severe illness if they are accidentally transmitted to immunocompromised people, pregnant women, or people with certain skin conditions. Oncology nurses should become familiar with how to manage patients' vaccine injection sites to minimize these risks to patients' close contacts and the community at large.

At a Glance

- Immunotherapeutic vaccines in clinical trials show promise in oncology treatments.
- Viral vector vaccines are generally safe for those working with them, and precautions needed are similar to those of other biohazardous materials, such as chemotherapy.
- Staff and patient education are important and necessary to minimize potential risks and hazards associated with the administration of immunotherapeutic vaccines.

Sheri McMahon, RN, BSN, is a senior nurse specialist in the Office of Research Nursing at the National Cancer Institute, National Institutes of Health in Bethesda, MD. The author takes full responsibility for the content of the article. The author did not receive honoraria for this work. No financial relationships relevant to the content of this article have been disclosed by the author or editorial staff. Mention of specific products and opinions related to those products do not indicate or imply endorsement by the *Clinical Journal of Oncology Nursing* or the Oncology Nursing Society. McMahon can be reached at sheri.mcmahon@nih.gov, with copy to editor at CJONEditor@ons.org.

Key words: vaccine; vaccinia; injection, risk; restrictions; safety

Digital Object Identifier: 10.1188/16.CJON.602-604

During the past decade, a great deal of research interest has been focused on therapeutic cancer vaccines. These vaccines are designed to combat tumors by stimulating new responses and expanding existing responses from the patient's own immune system (Wong, Li, Mooney, & Dranoff, 2016). As of this writing, only two such vaccines have been approved by the U.S. Food and Drug Administration (FDA): sipuleucel-T (Provenge®) for metastatic prostate cancer and talimogene laherparepvec (IMLYGIC®) for metastatic melanoma (National Cancer Institute, 2015). However, many more vaccines are being investigated. One class of investigational vaccines, which are now undergoing clinical trials at hundreds of sites internationally, use modified vaccinia viruses as vectors for delivering vaccine agents to tumor sites. In this class of vaccines, the vaccinia viruses are attenuated live viruses, which means that potential hazards are associated with the vaccines' use, not unlike the hazards associated with common live-virus vaccines, such as the measles, mumps, and rubella vaccine. Oncology nurses should become familiar with how to recognize and minimize these potential hazards.

Although viral vector vaccines are generally safe for the patients who receive them, a potential risk exists to certain populations if the patient sheds live virus from the injection site (Gilbert, 2013; Rotz, Dotson, Damon, & Becher, 2001). Even in an attenuated form, vaccinia virus can cause severe illness in immunocompromised people and in people with certain skin conditions (Sepkowitz, 2003). If a pregnant woman is exposed, it can be hazardous to the fetus (Rotz et al., 2001). Therefore, precautions must be followed to ensure the safety of patients' close contacts and the community at large.

The primary goal in the development of therapeutic cancer vaccines is to induce a response to tumor-specific antigens. Teaching immune cells to recognize malignant cells as foreign is the primary goal and major challenge in the development of effective cancer vaccines. In antigen-specific approaches, a tumor-associated antigen is directly targeted, either by loading antigen-presenting cells or by using protein, peptide, RNA, or DNA alone or via a vaccine vector (Geary & Salem, 2013). Some vaccines incorporate a live virus as part of the delivery system to allow the antigen to reach its intended target. Viral vectors are straightforward to engineer and can carry a large amount of genetic material. A great deal of experience exists with pox virus vectors, such as vaccinia virus, a double-stranded DNA virus related to cowpox virus, which has been used to vaccinate against smallpox for more than 100 years (Rotz et al., 2001). Pox viral vectors are ideal because they can infect human cells but cannot incorporate themselves into human DNA. They can contain a large amount of foreign DNA, can efficiently infect