FEATURE ARTICLE

# Dendritic Cells: Emerging Roles in Tumor Immunotherapy

Patricia C. Buchsel, RN, MSN, FAAN, and Elaine S. DeMeyer, RN, MSN, AOCN®

The purpose of this article is to examine the use of myeloid dendritic cells (DCs) as immunotherapy in the treatment of cancer. DCs can be stimulated either from circulating blood or bone marrow progenitor cells using cytokines, particularly granulocyte macrophage–colony-stimulating factor (GM-CSF) (e.g., sargramostim, Leukine®). GM-CSF has been shown to promote maturation, mobilization, and antigen presentation of DCs in vivo or ex vivo as a therapeutic cancer vaccine. Once stimulated, DCs can present tumor antigen to naive T cells to initiate an immune response. In addition to myeloid-related DC stimulation, antitumor properties of GM-CSF include direct cytotoxicity, antiangiogenesis properties, and potential upregulation of antibody-dependent cellular cytotoxicity. Oncology nurses need to be knowledgeable regarding new therapies. Using knowledge gained through reading professional journals and self-education, nurses can inform patients of new therapies, which may increase patients' hope.



The advent of recombinant hematopoietic colony-stimulating factors (rhCSFs) in the early 1990s revolutionized supportive care of patients with cancer receiving myelosuppressive therapy. Agents such as granulocyte macrophage–colony-stimulating factor (GM-CSF), granulocyte–colony-stimulating factor (G-CSF) (e.g., filgrastim, Neupogen® [Amgen, Thousand Oaks, CA]), and pegylated G-CSF (Neulasta®, Amgen) have considerably reduced neutropenia that can lead to significant morbidity and mortality. Clinicians recently may have begun to appreciate the effect of these agents on other cellular compartments, such as dendritic cells (DCs) and natural killer (NK) cells (Waller & Ernstoff, 2003). Of the currently available cytokines, GM-CSF has the ability to stimulate DCs (specifically, myeloid-related DCs [DC1s]), which play an important role in coordinating immune cellular activity to attack cancer and toxic agents.

Unraveling the secrets of tumor immunobiology has allowed researchers to manipulate the immune system to stimulate or suppress immune activities that cause tumor cells to escape immune surveillance. An area of great interest in scientific research is the exploration of in vivo and ex vivo methods to enhance the immune system to upregulate the antigen-presenting capacity of macrophages and DCs and to increase the number and function of cytotoxic T lymphocytes. Researchers also are exploring the use of cytokines in combination with targeted therapies, such as rituximab, to enhance antibody-dependent cellular cytotoxicity (ADCC). By improving the mechanism of action of rituximab, researchers aim to improve response rates in lymphoma. The intensity of the research is evidenced by the growing number of publications and clinical trials reporting clinical benefits using GM-CSF alone or in combination therapy for a number of diseases (Armitage, 1998; DeMeyer & Buchsel, 2005). Table 1 lists current National Cancer Institute open trials involving DC therapy.

## At a Glance

- Tumor immunotherapy is a treatment that enhances the immune system to destroy cancer cells.
- Strategies to improve dendritic cell (DC) function include augmentation with granulocyte macrophage–colony-stimulating factor (GM-CSF) use alone, in DC-based vaccines, as a vaccine adjuvant, or in combination therapy and may play a role in enhancing antibody-dependent cellular cytotoxicity.
- Nursing implications include the need to seek an understanding of the evolving uses of GM-CSF as a possible antitumor agent, to encourage patients to enter approved clinical trials, and to manage the care of those seeking emerging treatments.

This article has several purposes.The first is to offer a brief discussion of the relationship between a defective immune system and cancer. An appreciation of the relationship is essential to

Patricia C. Buchsel, RN, MSN, FAAN, is a clinical instructor in the College of Nursing at Seattle University in Washington, and Elaine S. DeMeyer, RN, MSN, AOCN®, is president and chief executive officer of Creative Cancer Concepts, Inc., in Rockwall, TX. Both authors received an honorarium from Berlex for writing this article. 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. (Submitted April 2005. Accepted for publication January 8, 2006.)

Digital Object Identifier: 10.1188/06.CJON.629-640