they express antigens characteristic of that particular stage of development. The immaturity of the cells provides the physician with information about the relative aggressiveness of the cancer.

Another aspect of immunotherapy is the development of monoclonal antibodies that enhance the immune system’s ability to fight the cancer. Monoclonal antibodies are developed by inoculating an animal with the tumor antigen and recovering the specific antibodies produced. The antibodies are then given to the person with that cancer to assist in the destruction of the tumor. Monoclonal antibodies are also recreated, or cloned, in the genetic laboratory by recombining DNA to produce the specific antibody. Techniques involving recombinant DNA have been used to combine these antibodies with toxins and drugs that are then delivered selectively to the tumor sites.

A number of cytokines (normal growth-regulating molecules) with antitumor activity have been synthesized. Alpha interferon, bacillus Calmette-Guérin (BCG, which has been used for many years as an inoculation against tuberculosis), and interleukin-2 (IL-2) have shown some therapeutic benefit in eliciting increased immune responses. Combination strategies have also helped stimulate the function of macrophages.

A most promising discovery has been the recently identified natural killer (NK) cells. These cells are like large granular lymphocytes, but have a cell surface phenotype different from that of T lymphocytes or macrophages. They have demonstrated a spontaneous cytotoxic effect on some types of cancer cells. They also provide a strong resistance to metastasis and secrete cytokines. When augmented by biologic response modifiers such as IL-2, they show increased tumor destructive activity (Battiato & Wheeler, 2000).

The use of hematopoietic growth factors (HGF) has been one of the most successful in biotherapy. HGF, such as granulocyte colony-stimulating factor (G-CSF) and erythropoietin, offset the suppression of granulocytes and erythrocytes that results from chemotherapy (Battiato & Wheeler, 2000).

As promising as these biotherapies are, they are accompanied by serious side effects and toxicities. IL-2 can cause acute alterations in renal, cardiac, liver, gastrointestinal, and mental functioning. Alpha interferon causes mental slowing, confusion, and lethargy and, when used in combination with 5-fluorouracil or IL-2, severe flulike symptoms—chills and fever of 103°F to 106°F (39.4°C to 41.1°C), nausea, vomiting, diarrhea, anorexia, severe fatigue, and stomatitis—may result. The toxic effects are probably exaggerations of the normal systemic effects that these substances cause when fighting infection. For example, IL-2 is known to raise body temperature substantially in an attempt to create a hostile environment for foreign invaders.

Box 10–11 discusses nursing implications for clients receiving immunotherapy. For nursing care of specific problems, refer to the appropriate nursing diagnoses later in this chapter.

**Photodynamic Therapy**

Photodynamic therapy is a method of treating certain kinds of superficial tumors. It is known by several different names: phototherapy, photoradiation, and photochemotherapy. Clients suffering from tumors growing on the surface of the bladder, peritoneal cavity, chest wall, pleura, bronchus, or head and neck are candidates for this treatment. The client is given an intravenous dose of a photosensitizing compound, Photofrin, which is selectively retained in higher concentrations in malignant tissue. This drug is activated by a laser treatment that is started 3 days after the drug injection and administered for 3 days. The drug interacts with oxygen molecules in the tissue to produce a cytotoxic oxygen molecule called singlet oxygen.

**NURSING CARE OF CLIENTS RECEIVING IMMUNOTHERAPY**

Immunotherapy can consist of various substances used alone, such as interleukin-2, or combination biotherapy, such as alpha interferon with 5-fluorouracil. The nurse’s role is to enhance the client’s quality of life.

**Nursing Responsibilities**

- **Monitor for side effects:** Alpha interferon may cause mental slowing, confusion, and lethargy; combination therapy of 5-fluorouracil or interleukin-2 and alpha interferon may cause severe flulike symptoms, with chills and fever of 103°F to 106°F (39.4°C to 41.1°C), nausea, vomiting, diarrhea, anorexia, severe fatigue, and stomatitis; erythropoietin may cause acute hypertension.
- **Monitor enzymes and other appropriate biochemical indicators for acute alterations in renal, cardiac, liver, or gastrointestinal functioning, which can be side effects of interleukin-2.**
- **Evaluate response to therapy by conducting a thorough evaluation of clients’ symptoms.**
- **Assess clients’ coping behaviors and teach new strategies as needed.**
- **Manage fatigue and depression.**
- **Encourage self-care and participation in decision making.**
- **Provide close supervision for clients with altered mental functioning, either by caretakers or frequent nursing visits to the client’s home.**
- **If client is unable to manage alone, teach medication administration and care of equipment to caregivers.**

**Client and Family Teaching**

- **Minimize symptoms by managing fever and flulike symptoms:** increase fluid intake, take analgesic and antipyretic medications, and maintain bed rest until symptoms abate.
- **Seek help for serious problems not managed by usual means, such as dehydration from diarrhea.**
- **Use correct techniques for providing subcutaneous injections.**
- **Identify how to work and care for ambulatory pumps when medication is administered through an intercatheter or vascular access device.**