Specific immunity is mounted against certain specific antigens, such as protein expressed by the tuberculosis bacterium (150), in the case of immune response against tuberculosis infections, against a tumor antigen, such as mesothelin (151), in the case of immune response against pancreatic cancer, or against myelin proteins, in the case of multiple sclerosis (152). In contrast, innate immunity is stimulated by certain molecules, or more accurately classes of molecules, that are shared by many bacteria or shared by many viruses. These molecules include bacterial lipopolysaccharide, bacterial peptidoglycan, and viral nucleic acids. Each of these molecules, or more accurately classes of molecules, binds to a toll-like receptor (153). TLRs are expressed by DCs, neutrophils, and other cells of the immune system.

The importance of specific immunity is self-evident to any person familiar with vaccines. However, what is less well-known to the layperson, is that an efficient specific immune response often requires simultaneous stimulation of the innate immune system. In the case of bacterial infections, where a vaccine is administered, the bacterial infection generates its own innate immune response (there is no need for the physician to administer a drug that stimulates the innate immune response). But in the case of vaccines against cancer the physician needs to administer a drug that stimulates innate immunity. These types of drugs, which may be administered with chemotherapy or a vaccine, against infections or cancer, are called *immune adjuvants*. Immune adjuvants include CpG-oligonucleotides, imiquimod, and bacillus Calmette-Guerin (BCG). BCG is used for treating bladder cancer (154).

## j. Expression of a Given Receptor Protein by NK Cells and Expression of the Same Receptor by Tregs

This provides a specialized type of paired concepts. This is the situation where a receptor that occurs on one type of immune cell can trigger an immune response that is opposite that where the same receptor is expressed on a different type of immune cell. In this example, the receptor protein is CD25. CD25 is part of the IL-2 receptor. In this example, the two types of immune cells are NK cells and Tregs.

Certain signaling molecules may be expressed on the plasma membrane of NK cells, a type of immune cell that kills other cells, and also on Tregs, a type of immune cell that is immunosuppressive. CD25 is part of the IL-2 receptor, that is, it is an IL-2 receptor alpha chain. The fact that CD25 is expressed by NK cells and also by Tregs suggests that CD25-mediated signaling may have different downstream results, depending on the cell in question, because of the fact that NK cells are cytotoxic, while Tregs are immunosuppressive. The immunosuppressive activity of Tregs

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