# Immunotherapies

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## Immunotherapies

<table>
<thead>
<tr>
<th><strong>Immunotherapies</strong></th>
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<tbody>
<tr>
<td>- <strong>Vaccines</strong> (toxoid, attenuated live, killed cell vaccines, subcellular, DNA, peptide)</td>
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<td>- <strong>Adjuvants</strong> (nonspecific immune stimulant)</td>
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<td>- <strong>Passive Antibody</strong> (IVIG, humanized monoclonal antibodies or immunotoxins)</td>
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<tr>
<td>- <strong>Cytokines</strong> (IFN, IL-10, IL-12) or cytokine antagonists (anti-TNF, soluble cytokine receptors)</td>
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<td>- Co-stimulator or suppressor signaling molecules (CTLA-4)</td>
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| - Adoptive transfer of immune cells  
  – Immune Tc cells  
  – Lymphokine activated NK cells |
| - Antagonist peptides (inhibit specific T cells by blocking TcR) |
| - Oral tolerance (ingestion of antigen induces suppressive factors[TGF-β]) |
Immunosuppressive agents

- **Corticosteroids** (block cellular infiltration, cytokine release, T cell maturation, etc.)
- **Azathioprine** (inhibit lymphocyte proliferation)
- **Cyclosporine** (inhibit IL-2 gene expression)
- **Anti-lymphocyte serum** (causes lymphocyte destruction and removal)

Immunosuppressive agents

- **Anti-CD3** (causes T cell destruction)
- **Anti-CD4** (causes T cell destruction)
- **Cytotoxic drugs and ionizing radiation**
  (block cell proliferation, lymphopoiesis)

Immunotherapeutic agents: applications: mechanisms of action

- **Anti-TNF-alpha**: inflammatory bowel disease and rheumatoid arthritis; inhibits inflammatory actions of TNF-alpha
- **Anti-CD20**: non-Hodgkin’s lymphoma:
  ADCC destruction of B cells
- **Anti-lymphocyte globulin**: treatment of acute graft rejection: depletes T cells via ADCC or inhibits of cell function
Immunotherapeutic agents: applications: mechanisms of action

- **Interferon-alpha:**
  - viral hepatitis: anti-viral
  - Hairy cell leukemia: anti-proliferative
- **Interferon-beta:**
  - Gliomas: anti-proliferative?
  - Multiple sclerosis: anti-viral, antagonism of interferon-gamma
Humanized monoclonal antibodies

- Use of mouse monoclonal antibodies for immunotherapy in humans is limited by immune responses in humans against the foreign mouse antibody proteins.
- Complementarity determining regions (CDR) of mouse monoclonal antibodies can be grafted onto the framework of a human immunoglobulin. Recombinant antibodies are less immunogenic and induce less allergic reactions.