Haiti Q & A

Questions posed to a US doctor returning from a stint as a volunteer

• How would you assess the current state of medical care?
  – It’s improving, but there’s no central organization managing things.

• What are the primary medical needs going forward?
  – Clean water and food. Everything else is secondary.

• Do you see those needs being met?
  – No. There’s little evidence of a long-term commitment.

• What struck you the most during your visit?
  – A mother caring for her badly burned child who displayed the same love that my wife does for our kid. They’re just like us...just poor.

• What did it mean to you to volunteer there?
  – I came back with an even greater appreciation for what it’s like to practice medicine in the US. The poorest of the American poor is better off than 99% of Haitians.
The Immune System

- A defensive mechanism that reduces potential adverse effects from exposures to:
  - Biological agents (e.g., bacteria, viruses)
  - Mutated cells
  - Certain chemicals
- It is also a target for toxicity
  - Significant immunosuppression (e.g., HIV, chemotherapy) can greatly reduce the ability to fend off an assault from the agents above

Immune Response

- Two basic types of responses between a chemical and the immune system:
  - **Stimulation**: Allergic reactions may occur in response to antigens and other chemicals whereby the immune system is stimulated to recognize the foreign bodies and mounts a response against them
  - **Suppression**: Can lead to an increased susceptibility to infectious agents or the enhancement of tumor formation due to a depressed recognition and response to aberrant or mutated cells.

Organs of the Immune System

- Positioned throughout body
  - Called lymphoid organs or tissues
Primary and Secondary Lymphoid Tissues

- **Primary lymphoid tissue** is composed of
  - Bone marrow — the tissue from which immune cells are derived and the source of all blood cells
  - Thymus — the tissue in which T lymphocytes are produced
- **Secondary lymphoid tissue** is composed of
  - Spleen — where immune cells are housed
  - Lymph nodes — small bean-shaped structures scattered throughout the body found along the lymphatic vessels, with clusters especially in the armpits, neck, abdomen, and groin
    - Each lymph node contains specialized compartments where immune cells congregate and encounter antigens

Cells of the Immune System

- The myeloid progenitor cells develop from multipotential or pluripotential stem cells
  - These cells develop into the adult blood cell types and respond early to infections.
  - Phagocytic neutrophils engulf bacteria
  - Basophils and mast cells can liberate stored histamine and other chemicals associated with allergy and infection.
  - Eosinophils play a role in fighting viral and parasitic infections and in asthma pathogenesis.
Cells of the Immune System (2)

- The lymphoid progenitor cells also develop from stem cells
  - The progenitor cells develop into small nongranulated white blood cells known as lymphocytes
  - B lymphocytes act to help eliminate viruses contained in infected cells
  - T lymphocytes are concentrated in the lymph nodes and produce antibodies
  - Natural killer (NK) cells release cytotoxic (cell-killing) granules that destroy tumors and virally-infected cells

Antibodies

Antibodies protect the host from infectious agents via several mechanisms:

- Antibody-dependent cell cytotoxicity
- Virus neutralization
- Opsonization
  - This pathogen destruction process can cause damage to healthy surrounding cells
- Complement-mediated lysis

Immunological Disorders

There are four basic types of immunological response:

- Type I hypersensitivity (anaphylactic response)
- Type II hypersensitivity (antibody-dependent cellular hypersensitivity)
- Type III hypersensitivity (immune complex deposition)
- Type IV hypersensitivity (cell-mediated hypersensitivity)
Immunological response:

• **Type I hypersensitivity** (anaphylactic response) is a reaction provoked by exposure to an allergen
  - Exposure may be by direct contact, ingestion, inhalation, or injection
  - Symptoms include inflammation, swelling, bronchoconstriction, and decreased blood pressure, which is life threatening.

Immunological response:

• **Type II hypersensitivity** (antibody-dependent cellular hypersensitivity)
  - Specific antibodies mark for attack “self” cells
  - Examples: various autoimmune problems, including Rheumatic fever

Immunological response:

• **Type III hypersensitivity** (immune complex deposition) results when complexes of antigens and antibodies deposit in body tissues and are “cross-linked”
  - This marks the tissue for assault by cytotoxic cells
  - Common sites include kidneys and lungs
  - Examples include lupus and malaria symptoms
Immunological response:
• **Type IV hypersensitivity** (cell-mediated hypersensitivity) results when an individual has become sensitized to an antigen from a prior exposure
  – Re-exposure results in a delayed hypersensitivity, usually in 12–48 hours
  – Example: allergic contact dermatitis

Immunosuppression by Toxicants
• Representative chemical categories:
  – **Pharmaceutical compounds** such as corticosteroids and anti-tumor drugs
  – **Halogenated aromatic hydrocarbons** such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).
  – **Polyaromatic hydrocarbons** (PAHs)
  – **Nitrosamines** such as dimethylnitrosamine and diethylnitrosamine.
  – **Pesticides**
  – **Metals** have been shown to be associated with a number of effects on immune function

Examples of Chemical-Induced Immunological Disorders
• Allergic contact dermatitis has been associated with exposures to a number of different chemicals:
  – Metals such as platinum, nickel, and chromium—type IV reactions
  – Formaldehyde—types I and IV reactions
  – Isocyanates such as toluene diisocyanate—types I and IV reactions
Examples of Chemical-Induced Immunological Disorders (2)

- Asthma has been linked to exposures to chemicals both at the workplace and elsewhere
- Occupational reports causally implicate several chemicals and processes
  - Bakers exposed to flour
  - Clam shuckers
  - Bacterial enzymes in laundry detergent
  - Toluene diisocyanate in spray paint and polyurethane foam
  - Red-cedar wood and wood products

Case Study #3: Dark and Lovely?

Refer to the handout provided (Part 2).

- Questions:
  - Considering the differences between a benign tumor and a malignant tumor, why might a benign tumor be easier to treat?
  - Judy learned that every single person has these cell cycle genes so cells in our body can divide when necessary. What are some normal circumstances where our bodies might need to make more cells?
  - Every person has these cell cycle proto-oncogenes, but not every person has cancer. Why might this be the case?