Defense of our Bodies against a Hostile World
The Immune System and Defense of our Bodies

First Lines of Defence

- saliva: antibacterial enzymes
- tears: antibacterial enzymes
- skin: prevents entry
- mucus: linings trap dirt and microbes
- stomach acid: low pH kills harmful microbes
- "good" gut bacteria: out compete bad

Immune System

- Tonsils
- Thymus
- Spleen
- Appendix
- Lymph nodes
- Lymph vessels
- Bone marrow

Pathogens

- Skin
- Mucous
- Stomach acid
- Sanitation/Regulation
- Complement response
- Phagocytes
- Granulocytes
- Lymphocytes (B-cells, T-cells)
## The Body’s Protective Mechanisms

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Immune Responses: Innate and Adaptive Defenses

(a) Innate defenses
- Surface barriers
  - Skin
  - Mucous membranes
- Internal defenses
  - Phagocytes
  - Fever
  - NK cells
  - Antimicrobial proteins
  - Inflammation

(b) Adaptive defenses
- Humoral immunity
  - B cells
- Cellular immunity
  - T cells

Source: http://classes.midlandstech.com/carterp/Courses/bio211.
Specialized Immune Cells

**INNATE IMMUNITY**
(rapid response)
- Macrophage
  (primary white blood cell)
- Natural Killer Cell
- Neutrophil
- Dendritic cell
- Eosinophil
- Basophil

**ADAPTIVE IMMUNITY**
(slow response)
- B Cell
- T Cell
- Antibodies
- CD4+ T Cell
- CD8+ T Cell
Specialized Immune Cells for Specialized Functions
Cells Interact in Highly Regulated Ways: Important to Distinguish “Friend” from “Foe”
Monotherapy and combination treatment opportunities

- Antagonists of immune checkpoints (blocks the “Self-Don’t Attack” Signal)
- Modulators of tumor microenvironment: effect on immune cells surrounding tumor
- Immune priming for cancer specific proteins using vaccines and activators
Checkpoint Signaling:
“Belong to Self” = “Don’t Attack”
- Priming patient’s Dendritic Cells to activate cancer specific T-cells against “Mutated Proteins”
- Amplify activated population of patient’s T-Cells against tumor’s profile
- Block “Checkpoint” signaling from tumor to T-cell
Immuno-Oncology Precision Medicine
Defining the Future

- Tumor Biopsy
- Patient’s Blood
- Combination of Checkpoint Inhibitors + Patient-Specific Tumor Vaccine

Bioinformatics
- Sequencing
- DNA/RNA Profiling
- ID Tumor Antigens
- Antigen Synthesis
- Dendritic Cell Priming