**Transcript of The Three Lines of Defense of the Immune System**

Our Body's Immune System:
The Three Lines of Defense
By Liam du Preez

Biology B3 Our body is exposed to many different diseases and infections every moment of our lives. The smallest cough or sneeze can cause a chain reaction of devastating effects on your internal systems. However, your Immune System is equipped with just the right kinds of weapons they need to counter attack against these attackers.

**The First Line of Defense:** Non-Specific Protection Skin - Tough Outer layer of dead Cells that most bacterica are unable to penetrate or grow on. Sweat and Oil destroys microorganism growth.

Saliva, Tears, and Mucuous Membranes are all Internal non specific Protection that kills pathogens as well.

Cilia, microscopic hairs, move pathogens into the Digestive Juices and Internal Membranes listed above.

Strengths of the Outer Layer Weaknesses of the Outer Layer Many open spots for Pathogens to go through, including Eyes, Ears, Mouth, and Nose.

**The Second Line of Defense**: Internal Non-Specific Defenses The Inflammatory Response White Blood Cells Specialized Proteins At areas of skin penetration, Chemical Alarms are sent via surfaces cells.

Mast Cells release Histamine, a chemical alarm which causes blood vessels to expand, causing blood to flow to area.

Blood Plasma, Phagocytes, and White Blood Cells travel by blood, causing disease to be destroyed quickly.

Symptoms of I.R. are redness, heat, swelling, pain, and fever.

Most are found in Interstitial fluid, and lymphatic System, main soldiers of internal defense.

Neutrophil are small macrophages, which after they devour the pathogen by phagocytosis, release a chemical that kills both of them, think of it as the 'kamikaze' cell.

They can identify which structures to attack, and which to leave alone by analyzing cell's structures.

Natrual Killer cells attack differently from macrophages and Neutrophil. They recognize and kill infected body cells by poking holes in that cell's membrane, thereby killing it.
Mainly Focus on direct attack or halting of their reproduction.

Interferon\* is produced by infected cells, which causes other cells around it to prepare for infection, which blocks virus reproduction.

\*\*\*(Interferon attacks multiple Viruses, so it is non specific)

Interferon is now mass produced for medical purposes.

**The Third Line of Defense:**
Targeted Defense (Humoral and Cell Mediated Response) Lymphocytes Helper T Cells attach onto antigens present on the outside of an infected macrophage, and message helping cells to create immunity.

Cell Mediated - Helper T Cell causes Cytotoxic T Cell to arive and attack the infected cell by poking holes in its membrane with Preforin, thereby killing it.

Humoral- B Cells are activated by Antigen molocules that attach to B Cell receptors, then these activated B Cells grow and develop into plasma cells, which then secrete antibodies which clog all antigens of a specific pathogen, thereby killing it. Antigens: a large molecule, usually a protein, that provokes an immune response Macrophage: 'Big Eater', a destroyer of foreign microorganisms in your body, which consumes by Phagocytosis, which is absorbing its prey into its own membrane.