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BCH 414 (PARASITE BIOCHEMISTRY)

High metabolic activity of some Protozoa pathogens result in the high production of reactive oxygen intermediates. How is this possible?

Reactive oxygen intermediates such as Reactive Oxygen Species (ROS) are used by the immune system to fight against pathogens. They are deadly weapons used by phagocytes and other cell types, against pathogens. Upon contact with pathogens, the host immune systems generate Reactive oxygen species (ROS) as defense mechanisms to clear pathogens present and is one of the earliest antimicrobial defense mechanisms put forward by phagocytic cells. Antioxidants are also known as protectors of host organisms against infections. A paradox occurs because the inhibition of ROS by antioxidants promotes infection.

Reactive Oxygen Species act as signaling molecules and thus, the elevated levels of ROS is expected to dampen the persistence of the microbes within the host cell. These ROS include hydroxyl radicals, hydrogen peroxide (H_2O_2), and superoxide anions (O_2^-). ROS have the nature of unpaired electrons in their outer orbital which make highly reactive species. ROS acts against pathogens in the following ways:

- By directly damaging the pathogen's genetic material, the pathogen's DNA through distortion of bases.

- Indirectly, it activates pro-inflammatory cytokines, thus creating an environment not suitable for the microorganisms.
- ROS has also been found to cause apoptosis of the host cell, thereby ensuring complete elimination of the pathogen.

Metabolism is a set of complex chemical reactions used by the cell to sustain life. The metabolic activities of the pathogen are what the pathogens use to sustain their life in the host cell. As the pathogens thrive by means of its metabolic activities, the production of ROS by the host cell to eliminate them is stimulated and increases. This in turn increases the metabolic activity of the pathogen in an effort to thrive in the host cell. This leads to a chain reaction characterized by high metabolic activity on the part of the protozoa pathogen and the production of ROS on the part of the host until the pathogen is eliminated.

Entamoeba histolytica causes amebic dysentery and is an intestinal protozoan parasite. *E. histolytica* trophozoites are microaerophilic and have been shown to consume oxygen. These parasites are usually exposed to highly toxic reactive species during tissue invasion, colonization and extra intestinal propagation. The capacity of *E. histolytica* trophozoites to survive reactive oxygen and nitrogen species is integral to its pathogenic potential and disease outcome.