Far-**UV Sterilray™** Efficacy on Microorganisms
A Basic Discussion

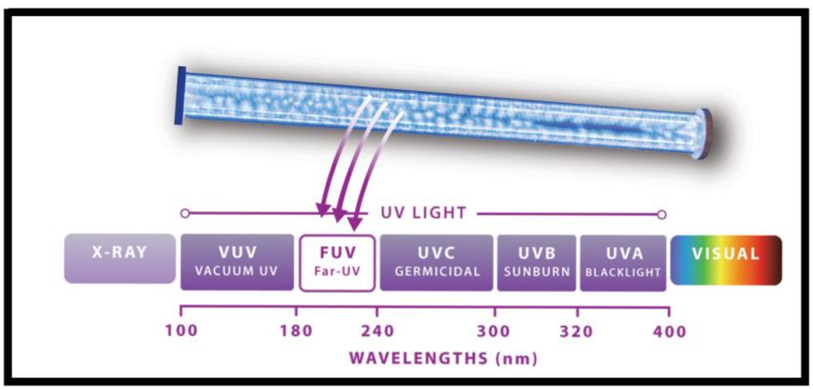
Summary:

Pathogen Path Consultants, LLC has patented Far-UV Sterilray™ ultraviolet light (222nm) that is specifically designed to break the bonds that hold together the protein molecules that make up microorganisms such as bacteria, viruses, molds and fungi. Far-UV breaks bonds because its photon energy at 540 kJ/mole is greater than the energy of the bond holding the elements of a molecule together. The molecules that form the DNA and RNA are also broken by Far-UV photons. Far-UV actually causes physical destruction. Consequently, bacteria, viruses[1] and spores that are exposed to the Far-UV light will have critical parts destroyed and cannot remain infectious.

Light spectrum:

Light is made of photon-like particles that are emitted from the sun or a lamp that hit an object making it appear brighter to our eyes. Visible light has four primary bands with different colors: The blue band has the shortest wavelength. Blue photons have much more energy than red photons, so blue light can have different effects on materials.

The UV light spectrum has multiple bands with different features similar to the visible spectrum. The color difference in the visible spectrum corresponds to a letter difference in the UV spectrum. UV bands A, B, and C each have a different effect on skin and eyes. The Far-UV is the blue band in the UV spectrum. It has a shorter wavelength and higher photon energy than the other three UV bands.



Far-UV Sterilray™ is a patented technology that is up to 1,000 times faster than germicidal UV-C.

Microorganism Chemistry:

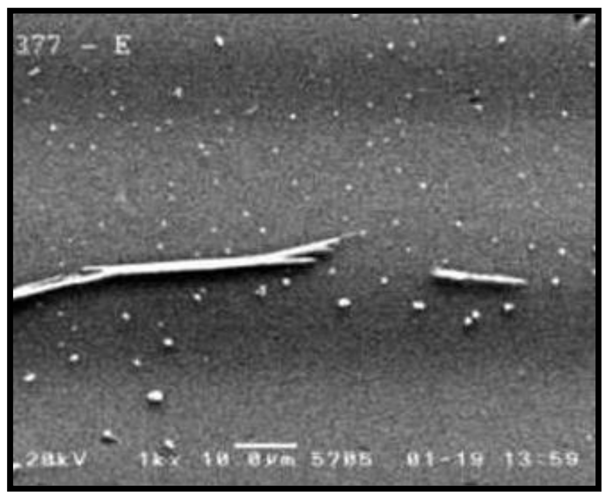
The Periodic Table lists all of the elements that form every substance and thing we know. These elements are made up of one or more atoms that are bonded together with rubber band- like structures that can flex, twist, rotate and break. Bio-molecules that make up microorganisms are a collection of these elements bonded together to form long molecules that have three-dimensional shapes. Some of these molecules are proteins, some are molecules that form proteins, and some contain the road map called DNA or RNA which are the blueprints for all living organisms.

Far-UV Features:

Far-UV Sterilray™ Technology is specifically designed to break the bonds that hold protein molecules together and thereby destroys the targeted pathogen. It does this by having a photon energy that is greater than the energy of the bond holding the elements together in the molecule. The molecules that form the DNA and RNA are also broken by Far-UV photons. Far-UV actually causes physical destruction and is not just making chemical changes to these molecules (dimer formation) as UV light at the longer wavelengths does. Consequently, bacteria, viruses[1], and spores that are exposed to the Far-UV light will be destroyed and cannot remain infectious. While mutation is usually an effective chemical block, no mutation can occur to prevent the breakage of basic organic bonds with Far-UV Sterilray™ high energy photons. They act like bullets to chemical bonds.

How Does Far-UV Work?

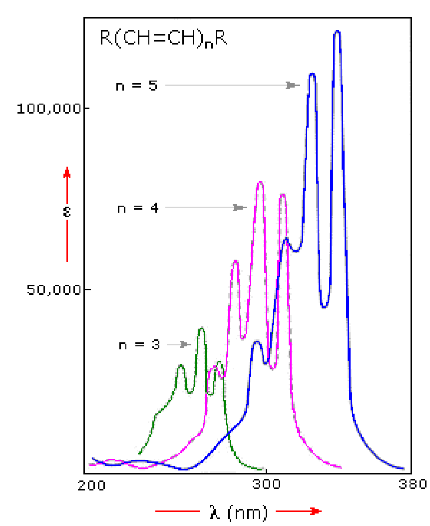
Not all chemical bonds absorb light. The proximity and type of molecules that are held by bonds making up the bio-molecules have preferential absorption to different wavelengths of the light that is shining on it. Unless absorption occurs, nothing happens to the molecules.



For example, if a red balloon is put **inside** a white balloon and a red laser is directed towards it, the red balloon will pop, but the white balloon will remain expanded because no absorption took place in its skin.

When proteins and the basic chemicals that make up the DNA and RNA of the microorganism absorb Far-UV light, some bonds will break. When these bonds break, it critically affects the survival and replication ability of the organism. A micrograph on the right shows where Far-UV actually ruptured the sidewall of a bacteria outer spore coat that is rich in proteins and segmented part of it.

Chemical absorption of photons occurs when molecules with different bond energies are in close proximity. Such groups are called chromophores. But as the grouping becomes more complicated and more groups are close together (n increases), the chromophore's peak absorption shifts towards longer wavelengths and is greatly reduced in the ultraviolet.



This is the reason normal mammalian cells are insensitive to Far-UV photons and do not exhibit damage until the dose becomes very high. The amount of absorption occurring is of critical importance.

[1] Over 40 tests have been conducted by independent lab facilities using Far-UV Sterilray™ to test its killing ability on many pathogens including MRSA, VRE, and C. diff spores.