UNDERSTANDING ANTI-BACTERIAL AND ANTI-FUNGAL PROPERTIES

The cornerstone of LSI Healthcare’s anti-microbial flooring is a naturally occurring and highly effective agent. Silver has long been known for its anti-microbial properties. It has proven to be safe with non-toxic effects on people, animals and plants. Protective Floors™ incorporates state of the art application technology to adhere this anti-microbial agent right into the top layers of the tile. The particles are randomly oriented and distributed evenly throughout the surface and backing layers and are engineered to last the life cycle of any project.

The key to the effectiveness of Protective Floors™ anti-microbial agent is moisture in the environment. This same moisture that is required for microbes to grow releases the Protective Floors™ agent in the surface, to attack the microbes in multiple ways. It prevents respiration by inhibiting transportation functions in the cell walls and inhibits cell division or reproduction. In general it disrupts the cells metabolism making them inactive.

A microbe can be bacteria, mold or even fungi. Too small to be seen by the human eye, particles of 10 microns or less are mainly invisible. To put this in perspective, a human hair is 50-150 microns, dust 1-100 microns and microbes are 0.5-10 microns in size.

People are a major source of contamination. Through the bodily regenerative process of losing skin flakes, oils and hair and human behavior such as coughing, sneezing and general motion all, plus many more, contribute to contamination on a level that is invisible to the human eye.

Anti-microbial properties inhibit the growth of all microbes (bacteria, mold and fungi) on surfaces, while anti-bacterial properties are only effective against bacteria. The following tests show you how effective Protective Floors™ is against micro-organisms and provide an overall perspective on how Protective Floors™ combats germs.

Antifungal Test (AATCC Method 30)

In the first test, a standard antifungal test procedure is used, known as AATCC Method 30. The fungus used in the test is Aspergillus niger which causes mildew commonly found in the environment. The test for antifungal properties starts out with a Petri plate carrying a layer of agar nutrients that will support fungal growth. The microbiologist places a small piece of the sample on its surface. (image 1) A solution containing spores of Aspergillus niger is dropped onto the Petri plate and sample. (image 2)
The plate is placed in an incubator, set at 28°C, for 7 days. Fungi grow more slowly than bacteria; these conditions encourage optimal growth. The following week, the microbiologist removes the plate from the incubator and assesses the situation. In the right picture is a Protective Floors™ treated sample. (image 3) On the left, shown for the sake of comparison, is an un-treated sample. (image 4)

The sample of Protective Floors™ (image 3) has no fungus growing on it or even close to it. The un-treated sample (image 4), however, has done nothing to slow down the growth of the fungus.

**Antibacterial Test (AATCC 147)**

The second test is approved by regulatory agencies for bacteria; AATCC Method 147. In this test we are looking to see how effective Protective Floors™ is at inhibiting the growth of *Staphylococcus aureus*, bacteria found on the human skin. This test is carried out in a Petri plate coated with agar. (image 1) The microbiologist prepares the plate by streaking, across the surface of the agar, five lines of a liquid solution containing live bacteria. At this point the lines look like water. (image 2) A small sample piece of Protective Floors™ is placed over the live bacteria. (image 3) The Petri plate is placed in an incubator, set at 37°C, for 24 hours. Agar provides nourishment for the bacteria. Warmth, moisture and food should encourage the bacteria to spread fast.
The following day, the microbiologist removes the Petri plate and checks whether the bacteria beneath the sample has grown or not. The sample in the right hand plate (image 4) had been correctly treated with Protective Floors™, and for comparison we show you one that had not been treated (image 5). The yellow streaks are lines of bacteria that have grown so thickly that we can actually see them.

![Image 4](image4.png)  ![Image 5](image5.png)

The Protective Floors™ treated sample has no streaks of bacteria growing through it, or even close to it. Unbroken streaks of bacteria can be seen on the untreated sample.

**Quantitative Bacterial Testing (ISO 20743 : 2007)**

In this test we are looking to measure the number of bacteria on a Protective Floors™ treated sample when compared to one that is untreated. This is the ISO 20743:2007 quantitative analysis. The AATCC Method 147 and AATCC Method 30 tests give either a pass or a fail result, which is often all that is required. This test gives a definitive and quantitative value to its antibacterial properties. A known amount of bacteria is put onto both a Protective Floors™ treated sample and onto an untreated sample. The samples are incubated for 24 hours to allow the bacteria time to grow. After 24 hours, the samples are shaken in a liquid solution to remove all of the bacteria from the samples. The liquid is then tested to see which sample had the highest bacterial counts. Below is an image of a typical result.

![Treated](treated.png)  ![Untreated](untreated.png)

The photo on the left shows a 99% reduction in bacteria. The Protective Floors™ treated sample had roughly 2 million fewer bacteria than the untreated.
In the face of the growing *Methicillin-resistant Staphylococcus aureus* (MRSA) crisis, Protective Floors™ can play an integral part in environmental counter-strategies to fight against the spread of antibiotic resistant infection. MRSA is emerging and spreading worldwide, and the number of infections is increasing outside the hospital setting. MRSA survives much longer on products that contain no counter measures to combat the microbes. It is more important than ever to broaden our arsenal beyond therapeutic options to include built-in protective measures involving high-traffic areas and materials in our environment. Schools, Offices, Healthcare and communal environments are key places to start.