

How Does Duraban work ?

The Technical Version:

The technical attributes of Duraban™ may be explained as follows:

The development of 3-(trimethoxysilyl) propyldimethyloctadecyl ammonium chloride (Si-QAC) represented monumental advance in the method of delivery of an antimicrobial. Using an alkoxy silane-coupling agent reacted to a quaternized amine researchers were able to covalently link this novel antimicrobial monomer directly to a wide range of surfaces.

The monomers then react with each other to form a cross-linked polymer of extremely high molecular weight and durability, thereby producing an essentially permanent antimicrobial surface that blankets the substrate to which it is applied. Through a series of radioisotope labelling and microbial assays researchers demonstrated that the antimicrobial activity did not result from release of the material and that it is a surface-associated phenomena.

The immobilization of an antimicrobial agent provides significant advantages over conventional antimicrobials. Since the activity is not dependent upon release and diffusion of the antimicrobial molecule, the activity remains constant over time. Moreover, the active molecule is localized in highly concentrated form on the treated surface. Since this is where proliferation of microbes occurs, the antimicrobial is effectively delivered specifically to the environment of importance. This not only extends the potency of the agent, but also minimizes the risk of the development of resistance (mutagenicity). Indeed, scientists were able to demonstrate that resistance and adaptation does not occur.

Moreover, the permanent attachment of the antimicrobial molecule to the surface avoids the potential exposure risks associated with conventional antimicrobials.

Si-QAC works through a two-step process. The positively charged action on the SiQAC molecule attracts the negatively charged cell wall of the microorganism. Initially, the hydrophobic alkyl chain penetrates the similarly hydrophobic cell wall of an organism that it comes in contact with. As the alkyl chain penetrates the delicate cell wall, the wall is weakened and punctured. Second, as the cationic quaternary ammonium group comes in contact with the cell wall it disrupts the

ion flow and causes leakage into or out of the cell wall, usually resulting in the cell losing its contents or actually bursting. The charged quaternary ammonium alkyl group remains unchanged and is available to repeat the process indefinitely.

Because of this “physical” and “electrical” killing mechanism, microbes do not get an opportunity to develop resistance or immunity to the Si-QAC. The Duraban Si-QAC therefore avoids the issues that have led to the development of resistant species such as MRSA and VRE that are currently some of the leading threats to public health globally.

Si-QAC is considerably more potent than a non-silylated quaternary ammonium compound because the silyl group bonds to surfaces (and itself) and causes the antimicrobial portion to become locally concentrated. Thus, it is not a single molecule responsible for cell death, but an enormous amount of molecules all working in unison.

An additional benefit of this almost mono-molecular thin polymeric layer is that the Si-QAC does not affect physical properties such as colour, look, feel and texture allowing its use in applications that often limit other anti-microbials.