Antimicrobial properties of copper

Ancient vedic civilization exploited the antimicrobial properties of copper long before the concept of microbes became understood in the nineteenth century. It has been documented that the first use of copper in vedic India was in 8700 BC.[1] In addition to several copper medicinal preparations, it was also observed centuries ago that water contained in copper vessels or transported in copper conveyance systems was of better quality (i.e., no or little visible slime formation) than water contained or transported in other materials.

It is fascinating how Vedic sages were able to understand the antimicrobial characteristics long before the word 'microbe' was even pronounced in the modern world.

Here what the MODERN SCIENCE says about Antimicrobial copper[2]:

Science suggests that Antimicrobial Copper kills bacteria with a multifaceted attack. The questions and answers below summarize active and ongoing research seeking to explain how Antimicrobial Copper is a highly effective touch surface.

How does copper affect bacteria?

Science suggests that copper surfaces affect bacteria in two sequential steps: the first step is a direct interaction between the surface and the bacterial outer membrane, causing the membrane to rupture. The second is related to the holes in the outer membrane, through which the cell loses vital nutrients and water, causing a general weakening of the cell.

How can copper punch holes in a bacterium?

Every cell's outer membrane, including that of a single cell organism like a bacterium, is characterized by a stable electrical micro-current. This is often called "transmembrane potential", and is, literally, a voltage difference between the inside and the outside of a cell. It is strongly suspected that when a bacterium comes in contact with a copper surface, a short circuiting of the current in the cell membrane can occur. This weakens the membrane and creates holes.

Another way to make a hole in a membrane is by localized oxidation or "rusting." This happens when a single copper molecule, or copper ion, is released from the copper surface and hits a building block of the cell membrane (either a protein or a fatty acid). If the "hit" occurs in the presence of oxygen, we speak of "oxidative damage", or "rust." An analogy is rust weakening and making holes in a piece of metal.

After punching holes, how do copper ions further damage the cell?

Now that the cells main defense (its outer envelope) has been breached, there is an unopposed stream of copper ions entering the cell. This puts several vital processes inside the cell in danger. Copper literally overwhelms the inside of the cell and obstructs cell metabolism (i.e., the biochemical reactions needed for life). These reactions are accomplished and catalyzed by enzymes. When excess copper binds to these enzymes, their activity grinds to a halt. The bacterium can no longer "breathe", "eat", "digest" or "create energy."

How can copper's effect be so fast, and affect such a wide range of microorganisms?

Experts explain the speed with which bacteria perish on copper surfaces by the multi-targeted nature of copper's effects. After membrane perforation, copper can inhibit any given enzyme that "stands in its way," and stop the cell from transporting or digesting nutrients, from repairing its damaged membrane, from breathing or multiplying.

(Interesting NO!! I too was shocked at the brilliance of our ancient vedic scientists who were known by the name "RISHIS" This makes you wonder what made all these brilliant scholars held back their knowledge.)

References:
[1] http://www.portal.gsi.gov.in/portal/page?_pageid=127%2C713659&_dad=portal&_schema=PORTAL

[2] http://www.antimicrobialcopper.com/us/scientific-proof/how-it-works.aspx

http://en.wikipedia.org/wiki/Antimicrobial_properties_of_copper
— with Rajiv Malhotra, Meena Das Narayan, Debanik Bhattacharjee, Suresh En, Saswati Sarkar, Srikanth Satturi, Suresh Nakhua, Pradeep Dixit, Haresh Raichura, Jemin Panchal, Kiran KS and Salil Gewali.