Copper

Copper is a chemical element with symbol Cu (from Latin: cuprum) and atomic number 29. It is a soft, malleable, and ductile metal with very high thermal and electrical conductivity. A freshly exposed surface of pure copper has a reddish-orange color. Copper is used as a conductor of heat and electricity, as a building material, and as a constituent of various metal alloys, such as sterling silver used in jewelry, cupronickel used to make marine hardware and coins, and constantan used in strain gauges and thermocouples for temperature measurement.

Cuprotosis is a novel cell death mechanism that has recently been discovered and is still being studied. It is characterized by the accumulation of copper ions in cells, leading to the activation of specific signaling pathways that ultimately lead to cell death. Researchers have found that cuprotosis may play a role in the development of cancer and other diseases and that it may be a potential target for new therapeutic strategies.

Copper ions (Cu) grafted chitosan coating was prepared using the pneumatic spraying method on the silicone rubber surface. Coating's surface properties, morphology, composition, Cu releasing behavior, antibacterial, and anti-inflammatory activities are investigated and discussed. Surface properties, composition, and morphology were investigated by scanning electron microscopy (SEM) and contact angle measurements. The antibacterial activity has been tested with Escherichia coli and Staphylococcus aureus suspensions in vitro. Besides, the morphology of the biofilm was inspected with a field emission SEM. To evaluate the anti-inflammatory activity and Biosafety of the coating in vivo, the optimized coating samples, and control groups were implanted subcutaneously into the back of mice. The bacterial environment model was established by injection of the bacterial suspension.

The morphology and bacterial adhered on the surface of catheters and the surrounding tissues were analyzed after 5 days of implantation. As in vitro results, the number of adhered bacterial on the surface of the silicone rubber surface was decreased, and the anti-inflammatory rate was increased by the intensify of the Cu content in chitosan coating. As for in vivo results, after 5 days of implantation, there was no evident inflammation in the surrounding tissues of all catheters in all without the S. aureus injected group. In the injected Copper modified chitosan-coated group; the inflammation, the number of the adhered bacteria were observed less than other injected samples without Cu; no inflammation was noticeable. Results indicate that the Cu-modified chitosan coating can confer excellent antibacterial and anti-inflammatory activity as applied to medical catheters ¹⁾

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Gu G, Erişen DE, Yang K, Zhang B, Shen M, Zou J, Qi X, Chen S, Xu X. Antibacterial and antiinflammatory activities of chitosan/copper complex coating on medical catheters: In vitro and in vivo. J Biomed Mater Res B Appl Biomater. 2022 Mar 7. doi: 10.1002/jbm.b.35047. Epub ahead of print. PMID: 35253986. From: https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki**

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