A novel approach to hemostasis

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Chemistry Seminar on *use of mesoporous glass as hemostats*

Monday Dec. 4 at 4 pm in 303 Schrenk

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MISSOURI S&T

Abstract: Hemorrhage is the most common cause of mortality during both surgery and combat. In the conflicts in Iraq and Afghanistan it accounted for almost 50% of fatalities before evacuation. Commercial organic and inorganic hemostats are the current options for staunching blood flow but have inherent drawbacks. Organic dressings such as cellulose retard bleeding by providing a suitable matrix for blood cell adhesion, but their acidic nature causes inflammation. Inorganic hemostats, usually based on kaolinite clays or zeolites, are somewhat effective in arresting hemorrhage; their net negative surface charge activates the contact pathway of coagulation, and their structure facilitates the rapid absorption of water from the blood, but the exothermic setting reaction that they exhibit when interacting with blood causes endothelial injury. Their efficacy also depends on the coagulation function of the host.

Mesoporous bioactive glasses (MBGs) are distinct from the bioglasses used for orthopedic reconstruction as they possess ordered channel structures and high specific surface area. MBGs have been shown to react with blood without producing an exotherm but their potential for hemostasis has been retarded by both their pedestrian clotting ability and an absence of antimicrobial activity.

Here, I report on a patented series of tantalum-based mesoporous glass compositions of matter which have demonstrable potential as hemostats in a wide range of bleeding environments due to the dual physical and chemical clotting characteristics of these proprietary materials. I will discuss the processing and characterization of these novel materials alongside their evaluation in a range of laboratory and living systems. I will also discuss how the evolution of this technology recently lead to the patent encompassing it being licensed to a US based entity working in the military space.

About the speaker: Mark Towler was appointed Doshi Professor in Missouri University of Science and Technology in 2023. Prior to this, he was Professor (Strategic Hire) in the Department of Mechanical and Industrial Engineering at Toronto Metropolitan University (Canada) with a cross-appointment in neighbouring St. Michael's Hospital. He previously held faculty posts in Alfred University (NY) and the University of Limerick (Ireland). He has a PhD (1997) in Biomaterials from Queen Mary College (London, UK).

Towler has generated over $28M funding to sustain active research programs on devices for hard tissue applications, *in-vitro* diagnostics, bioglasses and biofilm inhibition, leading to the publication of 180 papers in the peer reviewed literature. He has invented eight granted patents and is the co-founder of Crescent Operations a private equity funded company which launched a diagnostic for fracture risk, Osentia (www.osentia.co.uk), based on the exclusive licensing of four of those patents.

Towler is looking forward to his time in the USA where he intends to learn the language. Despite working quite hard at science, the Nobel Prize still eludes him. As a committed football player (we don't call it soccer) he eagerly awaits his debut for England FC; it can't be long now……