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Investigation of the mechanical strength of explanted polypropylene hernia meshes

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Over twenty million hernia repair surgeries are performed worldwide each year. Many of these repairs are accomplished through the use of a prosthetic mesh material rather than sutures because meshes have been shown to reduce post-operative complications and recurrence rates. Long-term implants, such as hernia meshes, continuously activate the inflammatory response, bathing the material with oxidants such as hydrogen peroxide and hypochlorous acid. Polypropylene, the most commonly-used hernia repair material worldwide, is an aliphatic hydrocarbon, which is susceptible to oxidation. Constant exposure of the mesh to these oxidants may lead to degradation of the material over time. There is evidence that many patients experience chronic pain and/or embrittlement of the mesh material over time, particularly for polypropylene hernia mesh materials. For this reason, mechanical testing was utilized to characterize polypropylene meshes explanted from human subjects to determine if oxidative degradation could play a role in these changes. We expected to find a decrease in the overall strength and percent elongation of the materials and increase in Young's Modulus after exposure to the harsh biological environment.