Crabyotics: Novel Chitosan Water Filtration - Structure and Filtration, Year Two

Chin-Lopez, Andrea
Archuleta, Anthony

Antibiotic resistance is caused by over-prescription and under metabolism of antibiotics. Eventually through sewer and water processing, antibiotics find their way into our drinking water and food, because they cannot be filtered/neutralized through traditional processing. Chitosan is a biopolymer produced through deacetylation of crustacean shells. It has microscopic pores that can be adjusted during deacetylation which absorb molecules of a certain size, allowing for filtration. Deacetylation occurs after boiling shells in 25% 6M Sodium Hydroxide (NaOH), soaking the shells in 3M hydrochloric acid to deproteinize the shells, then controlling the boiling time in 50% 6M NaOH at temperatures above 80oC for 5, 10 and 15 minutes. The chitosan was placed in methylcellulose, within a filter in a syringe filtration device, and then exposed to water with one dosage of different antibiotics. The filtrate was placed onto bacteria plates. An increase in bacterial growth indicated filtration of the antibiotics. The filtrate was passed through a spectrophotometer which indicated clarity of the solution. Previous experimentation indicated approximately 60% of antibiotics were filtered through one filtration; therefore experimentation was performed to structure a stronger filter, with multi-level filtration. Chitosan with longer deacetylation filtered out narrow and broad spectrum antibiotics most efficiently. The triple filter reduced antibiotic presence by 98% and was nearly complete with medium deacetylation. As the deacetylation time and number of filters increased, the bacterial growth increased. Work continues to moderate chitosan pore size for varying drugs, and to develop an industrial and home filter on sewer output lines.

Awards Won:
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: $1,000 will be awarded to the winner's school.