Water You Drinking? Development of a Novel Filter Utilizing Nanotechnology and Porous Materials to Remove Bacteria and Heavy Metals from Polluted Water for Third World Country and Military Applications

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Nearly 1 million deaths a year are attributable to drinking polluted water. Currently a filter with the goal of removing heavy metals and bacteria does not exist. This study shows promise as a novel cost efficient, home-based, effective solution for filtering heavy metals and bacteria from water. A water filter was designed to remove heavy metals (Lead, Cadmium, Cobalt) and Coliform bacteria. Its heavy metal removal efficiency was tested using commercially activated carbon, 3 types of organically derived activated carbon, crushed seashells, and iron magnetite nano-crystals. Bio-sand and charcoal were then used to filter Coliform bacteria from water. The concentrations of heavy metals and presence/absence of Coliform bacteria were determined before and after using each filtration material. It was determined that tea waste derived activated carbon, crushed sea shells, iron-magnetite nano-crystals, and bio-sand were the most effective and removed 94% of heavy metals, reduced Coliform bacteria to EPA safe levels 100% of the time, This filter is also 31 times cheaper than existing technologies. A portable filter for military applications was also developed, which removed 99.9% of heavy metals, reduced Coliform bacteria to EPA safe levels 100% of the time, and is 377 times cheaper than existing technologies. To verify if my water filter was an ecologically safe alternative, the heartbeat patterns and life spans of Daphnia magna were studied. It was found that the average lifespan increased by 700% and heartbeat patterns were much healthier, making my filter a safe alternative to commercially available water filters used in industries.

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