Biosorption of Heavy Metals by E. coli

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The release of heavy-metal-contaminated effluents into rivers, lakes, and oceans plays a large role in the degradation of aquatic environments. Organisms that take in these metals pass them up the food chain in accumulating amounts that can become dangerous to humans when consuming fish and shellfish. In this study, a method of removing heavy metals from aqueous environments called biosorption was tested using a strain of E. coli. The process involves bacteria adsorbing the heavy metal and leaving the solution with a less concentrated amount of metal. Copper (II) chloride, cobalt chloride, and nickel nitrate were tested for absorption by E. coli K12. The hypothesis being tested was that the nickel and copper solutions would show the greatest change in concentration because past studies showed that E. coli binds nickel and copper more effectually than other metals. The bacteria were introduced to the metal-containing solutions and the absorbency was recorded using a spectrophotometer over time. Results showed significant decreases in the concentration of the nickel and copper solutions. From the differences in concentration measured from 10 to 20 minutes, nickel had an average difference of -.00125 mol/L, copper had an average difference of .003225 mol/L, and cobalt had an average difference of -.009368 mol/L. For the 20-30 minute interval, nickel had an average difference in concentration of -.009 mol/L, copper had an average of -.010525 mol/L, and cobalt had an average of -.007995 mol/L. Statistical tests proved that the decreases in concentration of copper and nickel from the 20-30 minute increment were significant. These results indicate that E. coli K12 could be a sufficient biosorbent of nickel and copper in natural environments.