

### What's the Best Anti-Butt? Algae, Coconut or Banana - Designing Eco-Filters

Research from a previous science fair was conducted that showed cigarette butts do harm the environment, in particular watersheds. Collecting cigarette butts discarded near the storm drains at the Peterborough Regional Health Centre proved this. Butts weighing the same amount were put in test tubes filled with equal amounts of distilled water. Then equal amounts duckweed (*Lemnoideae*) was added in a series of twelve test tubes and snails in another series of twelve test tubes. Controls containing only the duckweed and snails were also prepared. These organisms were chosen, as they are bio-indicators. Both were severely stressed by the chemicals that they were exposed to from the butts as determined by death rates. This year experiments were conducted to find out if there is any kind of solution that can be used to clean up the problem of the chemicals in cigarette butts harming the environment after being discarded near storm drains.

Many smokers do not use garbage cans to discard their butts; evidence being the streets outside of most public buildings is littered with them. Usually they smoke on sidewalks near roads where the drains are. There is some research that indicates people are known to use coconut husks as a water purification system so they were included in this experiment. Dried up banana peels were used because they are known to have compounds that bind to arsenics, a known toxin in cigarettes. Lastly, filamentous algae found in a road-side ditch on The Trent Severn Waterway was used as it is more likely to be naturally exposed to cigarette butts chemicals through watershed contamination and recent research indicates they are known to absorb poisons from water systems.

This experiment consisted of collecting cigarette butts from the hospital grounds and creating toxic water by soaking 60 g in jar full of water for two days. The butts were removed through a strainer and 15 mL was poured into each test tube. One control had only tap water. The second control had just the toxic water. In six test tubes containing 15 ml of toxic water each even amounts of algae was added. Three of these sat for 4 days and 3 for 13 days. The same thing was repeated for 0.5 g of the ground up coconut husks and shells and then repeated again for 0.5 g of dried and ground banana peels. After the algae, coconut and banana peels sat for four and thirteen days a centrifuge was used to spin out the debris and separate it from the water. It was collected and saved. To determine whether the natural filters cleaned the water 15 ml was placed in six test tubes containing 25 duckweed. At regular intervals green index, root growth and overall growth was observed. Crickets were also used as bio-indicator. A food gelatin was made with the treated water and the toxic water and death rates were compared. Results and conclusions will be discussed at the fair.