THE HUTCHINS SCHOOL (AUSTRALIA)

DO STORM WATER DRAINS INFLUENCE THE AMOUNT OF PLASTICS IN WILD MUSSELS?

Names of team members: Will Mather, Alexander Kuzis

Plastics are used in almost every product we use today. Food packages, polyester jumpers and toys all contain plastic. However, what happens to this plastic once it has been used?

Plastic, unlike most other materials, does not decompose. Instead, over the time the plastic exists, it breaks into smaller and smaller pieces. These pieces can end up anywhere, but in suburban areas, they often end up on streets. These pieces of plastic are then washed down gutters and out of storm water drains. These plastics can end up being caught in the gills of common bivalves, such as mussels and oysters. This poses a risk, not on, to the shellfish and other predators that eat it, but us, humans. Many people collect and consume mussels from the shores along the Derwent River. How much plastic are these people consuming?

Our investigation examined the amounts of plastics inside mussels at different distances from storm water outlets. First, we collected the mussels from 10 sites from 4 locations. However, we only tested 2 sites from each location: At the storm water drain; and 100m north (along the shore) from the drain. We tested these sites at both of our locations: Blackmans Bay and Kingston.

To examine the amounts of micro plastics in mussels, we first had to digest the mussels with hydrogen peroxide (35%), bleaching and dissolving the mussel flesh. The bleached mussel flesh was then filtered and dried of any excess liquids. The result was filter paper with crusty green mussel on them. The mussels were then examined at a microscope. The amounts of plastic threads were observed and recorded.

We found that over 50% of the mussels collected in Kingston contained one or more plastic threads. In total, 25% of the mussels collected from Blackmans Bay contained plastic.

THE EFFECT OF MICROWAVE ENERGY ON THE BACTERIA ON FRUIT

Name of team member: George Scott

Fruit was irradiated in a microwave for differing times to see the effect of bacteria on the skin of fruit. Two types of fruit were used, apples and pears. Swabs were applied to agar plates which were stored in an incubator for nine days at 37℃.

Preliminary findings suggest that with more irradiation, more bacteria was present on the skin of the fruit. Full analysis and discussion will be presented at the ISSC Hong Kong 2017.

THE EFFECT OF TIME ON CONCENTRATION OF VITAMIN C IN ORANGE JUICE

Name of team member: Struen Vanderplas

Ascorbic Acid or Vitamin C is an essential nutrient and is required for tissue repair in the human body. The human body does not synthesize vitamin C, so it must acquire this nutrient through diet. Fresh orange juice has a relatively high concentration of vitamin C when compared to other fruit juices, and is consumed by many as their primary source of Vitamin C. However, Vitamin C molecules break down when they are exposed to oxygen and many people may be receiving less vitamin C than required. This project is investigating the effect of time after a bottle of orange juice has been opened, on the concentration of Vitamin C in that bottle of juice.

The concentration of Vitamin C in different orange juice samples are measured by Ultra-Violet Spectrometry. The Beer-Lambert Law states that the absorbance of a solution is directly proportional to the concentration of the absorbing species in the solution and the path length. The wavelength at the point of maximum absorbance in the different samples of orange juices is plotted next to the wavelength at the points of maximum absorbance in known concentrations of Vitamin C solution. This data is then used to determine the concentration in each of the orange juice samples. As Vitamin C molecules breakdown when they react with oxygen, I predict that the concentration of vitamin C in a bottle of orange juice will overtime, decrease after the bottle has been opened. At the time of writing this abstract, this investigation is not complete. Findings will made available at the ISSC Hong Kong in July.

EMP PROTECTION: TESTING THE EFFECTIVENESS OF CONDUCTIVE METALS AS FARADAY CAGES

Name of team member: Alex Stephens

Electromagnetic Pulses (EMPs) occur in many forms. Despite usually proving insignificant in terms of their interference with humans' daily lives, powerful EMPs are capable of destroying and disabling electrical equipment. In the event of an exceptionally powerful EMP, such as an HEMP (High Altitude Electromagnetic Pulse) or NEMP (Nuclear Electromagnetic Pulse), entire electrical systems and grids can be disabled; events that would prove catastrophic in the cases of highly electrically dependent areas. Faraday Caging, equipment-housing bodies made of conductive material, can be used to protect electrical equipment from potentially damaging electromagnetic pulses.

I investigated the effect of different conductive metals on the efficiency of the Faraday cage using an EMP generator. A number of factors, including but not limited to a material's conductivity, weight and commercial availability/price will be tested to determine which material(s) are the most suitable for use as Faraday Caging. Full findings will be available at the ISSC Hong Kong 2017.