

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Investigation)
(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: JBBC302

Project Title: The microplastic of Hong Kong

Project Type: Investigation

To our best knowledge and after thorough literature research, as at 24/6/2022, there are similar works. The reference links are as below:

<p>Detecting Microplastics in Soil: https://pubs.acs.org/doi/full/10.1021/acs.jchemed.8b00392 How to analyze plastics forensically: https://publiclab.org/notes/maxliboiron/07-19-2018/how-to-analyze-plastics-forensically Earthworms lose weight in soils polluted with microplastics: https://www.sciencenewsforstudents.org/article/earthworms-lose-weight-soils-polluted-microplastics Procedural steps for extracting microplastics from fish guts: https://www.researchgate.net/figure/Procedural-steps-for-extracting-microplastics-from-fish-guts_fig1_336139864</p>

The enhancement our project has made for the existing related products or research is summarized as below:

Our project contains more types of materials and a larger range of places where the things are collected, which will have a more accurate conclusion.

*Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.

I. Background

The problem of Microplastic has become more severe in recent years in the world. Hong Kong is no exception. Microplastic exists in many ways in our daily lives, such as in seafood and facial products. It doesn't only affect the environment but also humans. We have done multiple types of experiments on the main source of microplastic.

II. Objectives

To investigate the content of Microplastics on food, such as freshwater and saltwater fish and soil in Hong Kong waters,
 To find out some solutions to alleviate the problem of microplastic in Hong Kong

III. Hypothesis

soil, the fish and the saltwater from Hong Kong are supposed to contain microplastic.

IV. Methodology

A freshwater fish (Tilapia, a common fish used in the Chinese meal)
 A saltwater fish (Mugil cephalosporin Linnaeus, a common fish used soil in the flowerpots of CSWCSS
 seawater (collected from Tung Chung)
 Chemicals:
 Dilute potassium hydroxide solution (10% concentration) (30mL)
 Dilute hydrochloric acid (2M)
 Zinc chloride (1.4g/M)
 Hydrogen Peroxide (3% concentration)
 Iron (II) sulphate (0.2m)

Experimental equipment:

Test tube, light microscope, stereomicroscope, gas jar, knife, scissors, reagent bottle, filter paper (diameter: 7cm, holes: 8-10µm), forceps, protective gloves, safety goggles, dropper, funnel

Extraction of fishes' intestines and stomachs (Preparation of the experiment):

Step 1:	A knife was used cut off the fish head of both fishes
Step 2:	Stomachs and intestines of the fishes were took
Step 3:	They were submerged into 10% KOH with for 24 hours
Step 4:	Stomachs and intestines of saltwater fish and freshwater fish were put into 2 test tubes respectively
Step 5:	A boiling tube was filled up with 30mL of pure KOH only (Control set-up)
Step 6:	The 3 test tubes were put into a beaker filled with water
Step 7:	The beaker was put into an oven and incubate it (60°C for 24 hours)

Experiment 1 (test of the amount of microplastic in seawater)

Step 1:	The seawater was filtered through vacuum filtration
Step 2:	A slide was put onto the filter paper to obtain the microplastic

Experiment 2 (test of the amount of microplastic in soil)

Step 1:	The soil was filtered with a sieve
Step 2:	A high destiny solution of zinc chloride (density ~ 1.4 g/mL) was prepared in order to separate the plastics in the sample from the rest of the soil sample

Step 3:	10g of soil to 100mL of zinc chloride was poured
Step 4:	Vacuum filtration was used to filter suspended things
Step 5:	The filtered substances were poured into a beaker of 60mL of tap water
Step 6:	Dilute hydrochloric acid was added slowly to the beaker while measuring the pH value of the solution until it reaches 2-3
Step 7:	2g of iron (II) sulphate was added to the beaker
Step 8:	3 ml of hydrogen peroxide was added to the beaker
Step 9:	Wait until there are no more gas bubbles formed which indicates the end of the reaction
Step 10:	Vacuum filtration was used to filter the solution
Experiment 3 (test of the amount of microplastic in freshwater fish)	
Step 1:	The test tube which is containing the stomach and intestines of the freshwater fish was taken out from the oven
Step 2:	The oil which was suspended on the top of the test tube was poured into waste bottles
Step 3:	Vacuum filtration was used to filter the solution in the test tube
Experiment 4 (test of the amount of microplastic in saltwater fish)	
Step 1:	The test tube which is containing the stomach and intestines of the saltwater fish was taken out from the oven
Step 2:	The oil which was suspended on the top of the test tube was poured into waste bottles
Step 3:	Vacuum filtration was used to filter the solution in the test tube

IV: Results

A 4x10 lens of the microscope was used to observe the sample obtained in the above experiments

The appearance of microplastics is translucent.

The size of microplastics is less than 0.5mm.

The shapes of microplastics is fibers, films, foams, and fragments

- Microplastic in sea water
In 50ml of seawater, around 30 pieces of microplastic have been filtered.
The type of microplastic included some rubber band remains, small plastic sheet and also plastic rope.
- Microplastic in soil
In 10g of soil, we have filtered around 90 to 100 microplastic.
- Microplastic in freshwater fish and saltwater fish
In the 15ml corroded stomach and intestines of the fresh and saltwater fish, we have filtered around 10 microplastic for both.

According to these results, microplastics have already caused serious intrusion into nature.

Referring to the results which have been investigated, microplastic have affected the biological chain. It was found that are some microplastic inside the stomach and intestines of the fish, noether it is saltwater or freshwater. If a person ingest too much microplastic, his cell will become damaged and potentially cause cancer.

This is some investigation of how Microplastics affect human body:

<https://theconversation.com/were-all-ingesting-microplastics-at-home-and-these-might-be-toxic-for-our-health-here-are-some-tips-to-reduce-your-risk-159537>

Besides humans, microplastic also cause serious damage to the ecological environment.

According to the result, every 10g of soil already had at least 90 to 100 pieces of invisible microplastic about 0.5mm under a 4x10 lens.

When the soil contains many microplastic, it may affect organisms. The microplastics can have a toxic effect on fish and other aquatic life, including reducing food intake, delaying growth, causing oxidative damage and abnormal behavior. For example : earthworm, when the soil where the earthworm lives contains a lot of microplastic, the earthworm will lose weight or even die. If the number of earthworms decreases, there will be a lack of soil which is good for growing plants.

This is some investigation of how Microplastics affect earthworms:

<https://iopscience.iop.org/article/10.1088/1755-1315/631/1/012006/pdf>

Therefore, this report can show how microplastic affect residents in Hong Kong.

At the same time, appeal to people to stop using some products containing microplastic and reduce the use of plastic products.

V. Conclusion

After investigating these items, we will try to draw up some plans or study some methods that can help to slow down or even solve the microplastic problems, such as reduce waste at source and make good use of some products made by microplastics.