TIPS

ON REDUCING LABORATORY PLASTIC WASTE

A RE (duce/cycle/use) laboratory guide made by the University of Westminster iGEM team

CONTENTS: (*This page shall remain ignored until we fill out the tips, they can then be categorised accordingly with their applications)*

PROLOGUE

Out of all the things that laboratory work could have been for us this summer, it felt like we worked in a slaughterhouse of the future. The laboratories were full of various single-use plastics, ranging from the more obvious ones such as pipette tips and eppendorf tubes to more surprising ones such as agar plates and packaging materials.

We found that about 1.8 percent of all plastic waste comes from Bio-Scientific research; or approximately 5.5 million tonnes of laboratory plastic waste only throughout the previous year. This mass equals the amount of hydrogen that the sun evaporates into space every second. To give the number in better context, it equals the mass of the Palace of the Romanian Parliament, the world's heaviest building.

As bioscientists, we really wanted to take action against this issue by offering other teams to visualise the issue and spread awareness through collaboration, with which we already managed to make them see that the problem we are dealing with is in fact big. By writing up this guide, we are hoping to offer you helpful information that we have managed to collect about disposing of plastic waste.

The guideline started off ambitiously named "101 Tips On Reducing Laboratory Plastic Waste" which we failed to fulfill due to a lack of insight and/or creativity.

Instead, we managed to bring up a few generally accepted tips on reducing the waste, while explaining what science has offered us so far on tackling the issue by other, perhaps generally more economic and easier steps to take, when considering bio-experimental research.

TIPS

1. Reuse the originally provided micropipette tip boxes by autoclaving them
2. Buy micropipette tips in bulk (thin plastic bags instead of thick box packagings)
3. Reuse pipette tips if pipetting from the same source into sterile containers and with unspecified volumes or switching to glass pipettes, as they reduce the amount of plastic pipettes wasted.
4. When ordering products and lab equipment, make sure to order in bulk not only to reduce plastic use during shipments but to reduce CO2 emissions as well
5. When ordering standard materials, always choose the providers who can prove that their company focuses on sustainability
6. Always use glassware whenever possible for non-microbial experiments. Glass can be autoclaved, sterilised, used and reused again and ultimately fully recycled.
7. When starting an experiment calculate the minimum number of plastic consumables you will need. Try eliminating unnecessary duplicates and colonies you want to test.
8. Prepare master mixes! It not only saves you time but also reduces the amount of centrifuge and PCR tubes needed for your experiment.
9. Cut plastic labels in half. By doing so, you get twice the use of a single label.
10. Prepare culture media in bulk. Preparing specific culture media requires a lot of single use plastic to measure liquids. By preparing and storing bulk media you save on time and on plastics!
11. Plastic specimen bags that are for disposing lab material can be switched to biodegradable bag, as they are degradable and helps the environment.
12. Autoclave tapes can ultimately contribute to plastic waste if you use too much and they are also expensive, so if you reduce the amount of tape used you can reduce plastic waste and save money!
13. Instead of using plastic petri dishes, glass petri dishes can be used and the glass petri dishes can be autoclaved, in order to destroy the bacteria and it can be used again.

Furthermore:

Laboratories essential need plastic gloves, thereby the amount gloves that has been waste is enormous, this is because, we use it and dispose it. However, to be eco - friendly and save money for the university, we should reuse it again, which is by decontaminating the gloves by ethanol, as they are known for destroying any bacteria present. As the university of westminster iGEM 2018 were being sustainable and eco - friendly by reusing the gloves again and again.

Another option is to switch to metal, such as stainless steel, which is very ideal for pipettes tips, that are consumed more in labs. It enable the company or universities to save considerably a lot of money, it allows them to spend money on other aspects of the lab, such as, new equipement. Also, pipettes tips been used for single use can be still autoclaved again, firstly rinsing it will distilled water and then autoclaving. Which will combat the plastic pipettes tips issues !

Reuse the polystyrene boxes again for ice, as it come in handy for keeping the cells in the ice.

Always purchase the pipettes tip that are in bags and refill the pipette box. Which is eco- friendly.

The tips from above suggest that the plastic material should used many times and it should be sterilized. However, if the plastic material is damaged , therefore, the plastic material should be disposed, as it can lead to many complication to the experiment that's been conducted.

https://www.labmanager.com/business-management/2016/03/a-greater-greener-commitment#.W8YDD7J97IV

Potential Uses

The aim is to reduce the plastic waste that has been consumed by the universities laboratory, and to make aware the amount of plastic is been used. As we already know that plastic pollution is been affecting our marine organisms, therefore, as

iGEM peers we should make aware the companies that manufacture plastic equipments such as, plastic pipettes to completely ban the manufacture of plastic equipments, and look for alternative ideas, such as biodegradable plastic, such as, Polylactic acid (PLA), Polyhydroxyalkanoate (PHA) and etc. As many companies are changing their perception on plastic, such as coffee shops, as the coffee cups are replaced to plant based material and some are made from PLA. Therefore, the manufacture can learn from other companies to change the use of plastic. As every year the technology are always improved in every department , this determines that the laboratory equipment will be replaced to biodegradable plastic. As proven that bioplastics are degradable and the compounds that are released from the bioplastic are less harmful to the environment. Whereas, plastic such as, Polyethylene terephthalate (PET) they release harmful chemical, which harms the environment. Also another option is that they can switch to glass equipments, such as, glass pipettes and glass petri dishes. Which, will be eco- friendly so the equipment can be used, as many time you want to and they can washed with special laboratory detergent, such as decon 90. Instead of using plastic pipettes for 30 seconds and disposing, which is not eco - friendly and waste of money. Therefore, washing it up with distilled water will be eco- friendly and efficient.

As before the experiment start, as it should happen before every experiment they should have calculated the right amount of volume of solution and eppendorf tubes they need. Therefore, by doing this way it cuts down the amount of eppendorf is been wasted and also the tube can be washed to be reused again.

During our project, we used standard pipettes, however Ultra Low Retention Pipette could be effective in reducing plastic waste, due to its hydrophobic layer that prevents irreversible retention of contaminants and can be effectively reused just by washing it by specific laboratory deterrents that does not destroy the bond on the pipettes. Therefore, this could be a eco- friendly.

Either way plastic waste such as clinical waste have to be incinerated under EU regulation. This is because, it contains humans samples, chemical, and etc. Therefore, incineration has been useful for producing electricity for homes, building and factories. Another advantage is that it will cut back the plastic that ends up on our landfill, as they are the major contributors for releasing greenhouse gases into the atmosphere.

Conclusion

The information from this booklet is to consider the lab to go greener and more environmentally friendly. We are hoping to combat the problem plastic pollution,

as soon as possible.These ideas will be transferred to iGEM 2019, in order them to know the factor of plastic waste. Also, we are hoping to integrate with other iGEM teams by giving them the ideas that we considered, so this issues will be big invitation for iGEM teams across the world. Therefore, iGEM will find a solution and hopefully they consider the following points that has been proposed.

Reference

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