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How to Become More Sustainable in Your Lab

Reduce waste, reuse materials, and recycle whenever possible – these are the tips you need

1. Reduce

1 Minimize your experimental design
Is it possible to perform your assay in a miniaturized design like a microwell plate?

Store your sample in the appropriately sized tube and storage boxes. Switching to smaller tubes and using correctly sized vessels reduces plastics and frees up storage space in your freezer. [3]

Example: *You can start by reducing your sample preparation and using Liquid phase Microextraction (LPME) or Solid Phase Microextraction (SPME). These techniques can be applied to obtain analytes out of very different matrices, ranging from water samples to blood samples to the detection of metabolites in cell culture supernatants [4, 5].*

2 Plan your experiments mindfully
Well-thought-out planning

... of your experimental design helps you to avoid unnecessary repetition of experiments: invest your time in good planning and save resources.

... includes paying attention to the quality of the consumables used: investing in high quality prevents distorted results and repeated experiments.

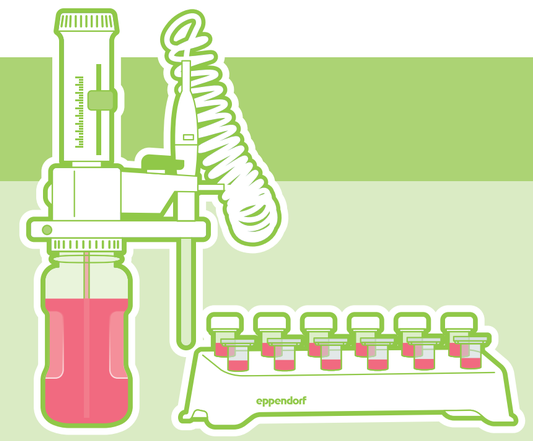
... considers the compatibility of your consumables and your instruments: some consumables only fit certain instruments and only then are best results guaranteed. Can you choose an »all-in-one solution« (like PCR master mixes) instead of adding reagents one by one?

3 Think ahead ...
Avoid unnecessary purchases and forgotten reagents through good inventory management.

Choose suppliers that use less packaging material.

Choose products which have the same quality as the ones you're using but are produced and purchased with the least possible use of raw materials.

2. Reuse



1 Plastic isn't always single-use
Consider reusing plastic items, e.g. tubes, for non-sterile or non-critical applications.

Some items can even be autoclaved and reused for sterile applications: take a look in the product specifications.

Use part of your product again. For instance, reuse plastic pipette boxes up to 100 times by using refill trays of pipette tips.

Check out if you can reorder single kit components (e.g. for your plasmid extraction kit).

2 Packaging
Reuse packaging material, like cardboard boxes or Styrofoam® boxes to send your items or use bags again as waste bags etc.

Take care and be aware that your packaging material isn't contaminated!

Ask your vendors about take-back programs.

Example: *Stainless steel bottles can be an alternative to store solvents, especially when you use larger volumes. These can be taken back and reused.*

3 Choose alternatives
Consider reusable alternatives for »single-use items«

Example: *Pre-sterilised plastic loops to transfer bacteria and inoculate culture media can be exchanged for reusable nichrome loops that are sterilised by glowing them out in the flame of a Bunsen burner. Cell spreaders made of glass can be sterilised and reused multiple times. [6]*

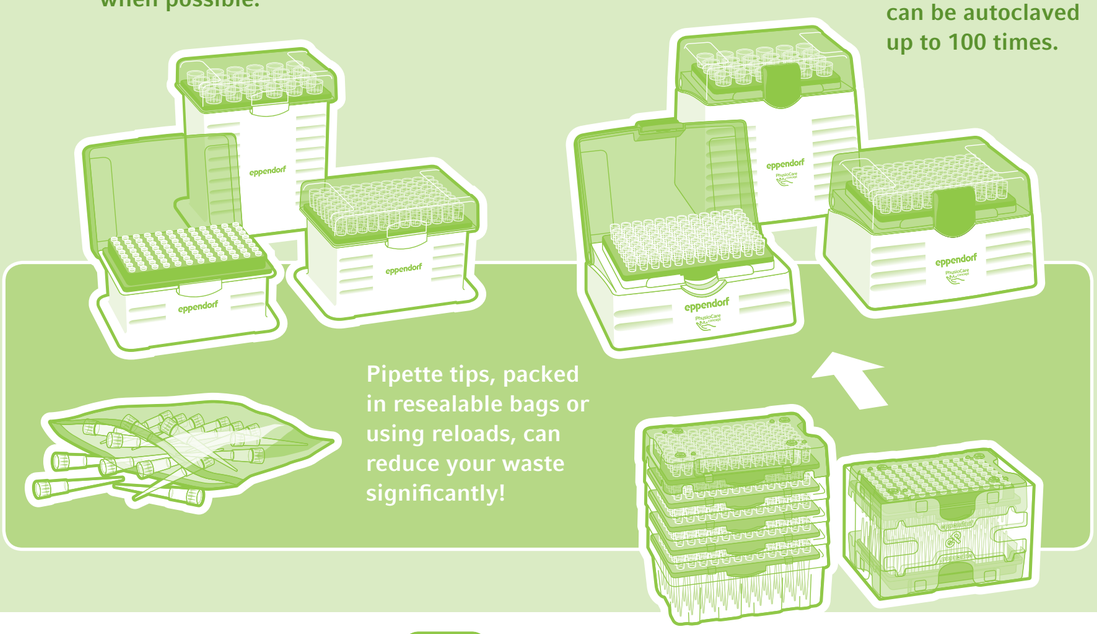
Can the result be achieved in other ways?

Example: *In some experiments, you have to dispense liquids in several tubes, e.g. HPLC-solvents into the appropriate glass vessels. Instead of pipetting the solvent, consider using a dispenser (Varispenser®2/2x) with an adapted attachment.*

4 Autoclavability of the materials reduces plastic consumption

Only use pipette tips in pre-sterilized disposable racks when you need certified sterility and freedom of endotoxin. Switch to autoclavable boxes and tips, when possible.

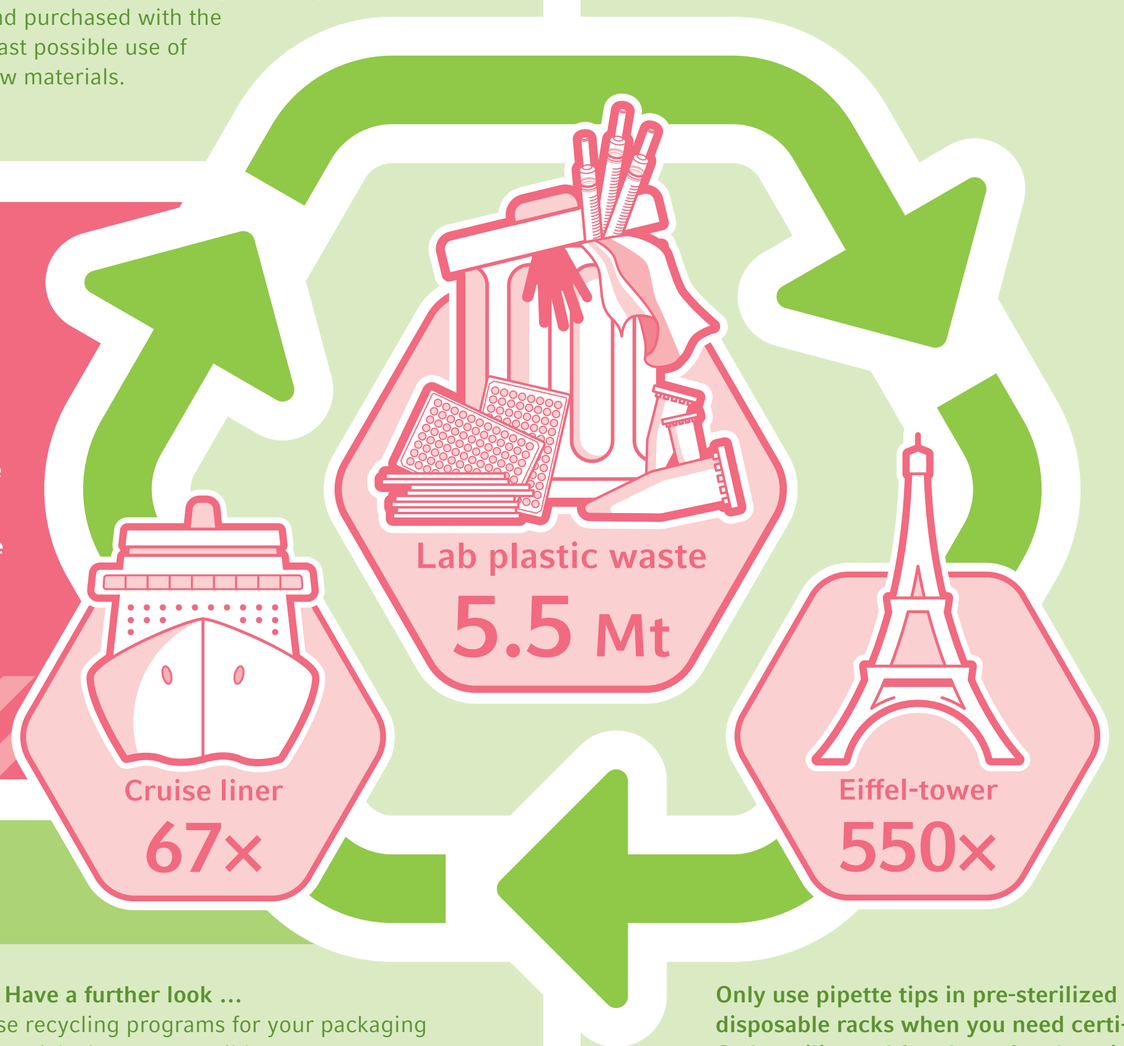
epT.I.P.S.® Box can be autoclaved up to 100 times.



Pipette tips, packed in resealable bags or using reloads, can reduce your waste significantly!

Did You Know?

About 302 Million tons of plastic waste have been generated in 2015 [1]. The proportion of plastic waste from laboratories corresponds to approximately 1.8% of the plastic waste generated worldwide (based on the year 2015) [2]. This is equivalent to 67 cruise liners or about 550-times the weight of the Eiffel-tower. We're avoiding plastics in our private life, but what about plastic waste reduction in our daily work in the lab?



4. Recycle

1 Know your waste management
Get to know the waste management and recycling streams in your institution:

How to separate the different waste streams like paper, cardboard, plastics, ... and where to dispose of it.

2 Have a further look ...
Use recycling programs for your packaging material whenever possible.

Some reagent vendors provide take-back programs, e.g. for styrofoam boxes – ask for and use them.

Some vendors use recycled content for their packaging. Choose these vendors and support them. The ACT label can be helpful – among other things, the proportion of recycled material in a package is also evaluated. The ACT label is like an eco-nutrition label for lab products, providing information about the environmental impact of manufacturing, using, and disposing of a product and its packaging.

A decision guide: glass ware or plastic ware

	Glass ware		Plastic ware	
Durability	✓		✓	
Safety		Glass breakage is problematic from the point of view of Health & Safety at work due to the risk of injury.	✓	
Stability	✓	In principle, but you have the risk of glass breakage. Always handle with care!	✓	
Single-use		The production of laboratory glassware is energy intensive.		The production of plastic items is less energy intensive than laboratory glass ware.
Multi-use	✓		✓	Depending on the application
Recyclability		Laboratory glassware is made of borosilicate, which is a high-melting special glass. It cannot be recycled (like »normal glass«) and has to be disposed of separately.		Plastic products could be recycled in principle, but there is the risk of contamination. Therefore, it is safest to dispose of it separately. If you have doubts, contact your waste management. (In some countries, this waste is still thermally recycled to recover energy and heat.)
Special requirements	Questions to ask to decide which item fits best your needs: What do you need this item for? Does it have to fulfill special requirements (such as being sterilizable)?			

3. Rethink

1 ... your routines
When establishing a new method, think about alternatives (minimize, think about safe and ecologic alternatives for solvents, etc.). Also, include keywords like »green«, »sustainable«, »resource efficient« in your literature research.

When searching for new equipment, take the resource consumption of consumables into consideration.

2 ... communication
Exchange best practices in your lab community or with other research groups.

Start by asking yourself »Where can I change something?« and be aware that even little changes are worth the effort!

Literature:

[1] Geyer, R.; Jambeck, J.; Law, K. L.: Production, use, and fate of all plastics ever made. In: Science Advances, Juli 2017 https://advances.sciencemag.org/content/advances/3/7/e1700782.full.pdf?fbclid=IwAR1W32uMhKlVO4MMhpqX9XJZniVMqiIzFDwGYQVNE-bV06kB7yte_I9PeYc (accessed 23/04/2020)

[2] Urbina M A, Watts A J R and Reardon E E 2015 *Nature* 528 479 – https://www.nature.com/articles/528479c

[3] Freezer Challenge: Good Management practices – High density storage https://www.freezerchallenge.org/good-management-practices.html

[4] Kabir A. et al., Recent Trends in Microextraction Techniques employed in analytical and bioanalytical sample preparation, Separations 2017, 4, 36 https://www.mdpi.com/2297-8739/4/4/36 (accessed 22/05/2020)

[5] Jaroch K. et al., The use of solid phase microextraction for metabolomic analysis of non-small cell lung carcinoma cell line (A549) after administration of combretastatin, Scientific Reports 2019, 9:402 https://www.nature.com/articles/s41598-018-36481-2 (accessed 22/05/2020)

[6] Can Scientists Do Away with Single-Use Plastics from Labs in India? https://science.thewire.in/environment/research-labs-single-use-plastic-waste-petri-dishes-loops-spreaders/ (accessed 22/05/2020)

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