Steve Lewis 00:10
Welcome to Speaking of Mol Bio, a podcast series about molecular biology and its trending applications in life sciences. I'm Steve Lewis, bringing you another episode of our Mol Bio Minutes mini episodes. Today's topic is sustainability in the lab. This is Sune Lund Sporring with insights and advice on a greener future for your research team.

Sune Lund Sporring 00:39
We borrow the world from our children. I am Sune Lund Sporring. I'm a master in chemistry and a PhD in clinical medicine. I work for Thermo Fisher Scientific as a research manager within plastics with a special focus on sustainability. Imagine this, you are in the lab...fume hood whirring...plastics everywhere... and it feels like you're drowning in waste. You can't help but wonder, "Am I the world's biggest polluter?" How do you even start tackling this mess? Today, we are diving into waste to make our lab greener. Stick around as we share some cool tips and tricks to cut down on your carbon footprint.

First of all, you are not the first to struggle. Let me quote a familiar face to many of us, Kermit the Frog, "It's not easy being green." And it's not, but you can eat the whole elephant, just do it in small bites. Here are a few bites that include bio-based plastics, something close to my heart. "Hey, don't bio-based plastics contaminate my samples?" No, they don't molecularly identical. If you choose the right ones, mind you. After today, you'll know the basics of bio-based plastics, how to avoid some plastic pitfalls and help separate wheat from chaff in sustainability.

So everything we do at work matters, from resource efficiency when shutting the fume hood, when we leave, to using sustainable materials. My Green Lab has reported that laboratories are one of the largest energy consuming sectors in the U.S.. I include a link to a ton of good ideas from My Green Lab on how to reduce our impact as lab scientists.

In Thermo Fisher Scientific we take the environment serious. We design for sustainability on both new and existing products. For example, let's look at water baths. A large one uses the same energy as an air conditioning unit every hour. For some applications, using so called Thermo Fisher Lab Armor™ Beads reduce this energy consumption by up to 75%, simply because you're using aluminum pellets instead of water—they don't evaporate. Now, a lot of ideas here today, but please find more on the Greener by Design homepage link provided in the notes.

There are a lot of things that can save energy in a laboratory. Some of those are outside our control as scientists, but ventilation, natural light, the placement of a lab can make a huge difference. Just putting a lab on the South side of a building can sometimes use 10 to 20% more energy than on the North side simply because of cooling. The energy saving from switching one old fume hood to a modern one can be roughly equivalent to the annual energy consumption of about two households. This matters. So as mentioned before, cool innovation is often the most effective answer to our climate problems and it's time to pull out an elephant.

Let's focus on plastics waste for a minute. Estimated 1.8% of global plastics are used in labs. That's 5.5 million tons per year. Strangely enough, the plastic recycle industry considers us as a low volume. So, I

figured, why not instead accept reality and then design something that, in practice, have almost no carbon footprint from the get-go. We take a step back—today almost all plastic is fossil based with significant carbon footprints. We pull up oil that's used to make plastic. Imagine instead, we made it from waste, such as used cooking oil or waste pulp from the paper industry, not from crops. That's important. This is what we call first generation bio-based plastic, they're made from crops. That's what we did 10 years ago. There are all kinds of problems associated with that, land and water use, fertilizers, pesticides. No, no, no, this is from waste. This is the best way to make bio-based plastics, and we call it second generation feedstock. Carbon footprints drop dramatically. And since we can introduce the feedstock at the very first chemical steps, we can often end up with molecularly identical plastics to the fossil-based. By the way, before we move on, I just want to touch upon bio-based versus biodegradable, because these are not the same. You can have products that are bio-based and biodegradable. Or you can have bio-based that are not biodegradable. We just change the raw materials so that we get the same plastic, it doesn't make it biodegradable. For lab plastic this, most of the time, doesn't make sense, because our plastics are contaminated. So, we have not developed entirely new plastics that require a lot of testing first. We just switch the feedstock. No change in chemistry, to a change and risk adverse lab or pharma world and significant carbon reduction. That's the best of two worlds, and fortunately this is possible.

So how are these plastics used in the lab. Same as old ones, because they are the same. And just to compare, one kilogram of fossil-based plastics raw material generates maybe three kilograms of CO_2. It depends on the plastic type. A bio-based generates almost nothing. It was made from CO_2 drawn from the atmosphere, as opposed to being pumped from the Earth. And this is not science fiction. In 2024 Thermo Fisher launched four families of bio-based products. I'll focus on one of them, on the PCR plastics.

Now plastics for PCR are notoriously difficult because they need to be inert, thermo stable, low binding to DNA. So we typically use polypropylenes of special grades. We need polypropylene, but we hate the carbon footprint. The answer, let's use a second generation bio-based plastic, a low carbon variant with exactly the same properties. After a little work here in Thermo Fisher Scientific we today have around 25 SKUs of PCR bio-based Sustain Series plastics. That's how we identify it for you. All identical in performance to the fossil-based that you know so well. It is still the exact same plastic, just with a different feedstock—waste material, like agricultural residue, the feedstock is added so early that the monomers are identical, and only way to discern them is by carbon 14 dating, not something that you do all the day long in the labs, right? Well so our idea, carbon reduced plastics, we make them Sustain, as I just mentioned. And for transparency, we include a so-called Green Fact Sheet so everyone can check if the carbon reductions make sense. These are available also on the home page. This is my kind of solution. It's one of the many problems with sustainability in the labs, real change that also fits our daily routines. Often, this is the difficult combination, right. We can make something that's far more expensive and very difficult to use and you have to revalidate everything, not this time. This is something you can just use as it is.

It's time for a quick recap. What did we learn today? Labs consume a substantial amount of energy. And while it can be challenging to maintain an overview, we can tackle the problem. We just have to do it step by step. We can adopt greener practices in research. So when you buy new equipment, consider

the energy usage and return the old one. Look for innovative solutions, like Lab Armor™ Beads for water baths. Then switch to bio-based plastics if they exist, like for PCR, Sustain consumables that has a dramatic reduction in carbon. And if you don't see it on the market, if you don't have it, demand it, use your feet to talk. Show the producers what you want. I included a host of links to statements and references that you can check out if you want to learn more.

Thanks for tuning in. Remember, every small step we take towards sustainability makes a difference. If Kermit the Frog can be green, so can you. If you enjoyed this episode, please share it with your colleagues. Let's keep pushing for greener labs together. Until next time, stay curious and stay green.

Steve Lewis 09:29
That was Sune Lund Sporring, Senior Manager of R&D at Thermo Fisher Scientific. As always, for these Mol Bio Minutes episodes, we recommend that you check out the Episode Notes to find links to the helpful resources that Sune covered today. We'll have another Mol Bio Minutes mini episode next month. But up before that is a great interview and discussion I had about some amazing science. Stay tuned for that to drop and until then, cheers and good science. Speaking of Mol Bio is produced by Matt Ferris, Sarah Briganti, and Matthew Stock.