

iGEM & Sustainability in the lab

Presented by iGEM Lund 2026

Orientation week, BIO, FOOD, PHARMA

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Content

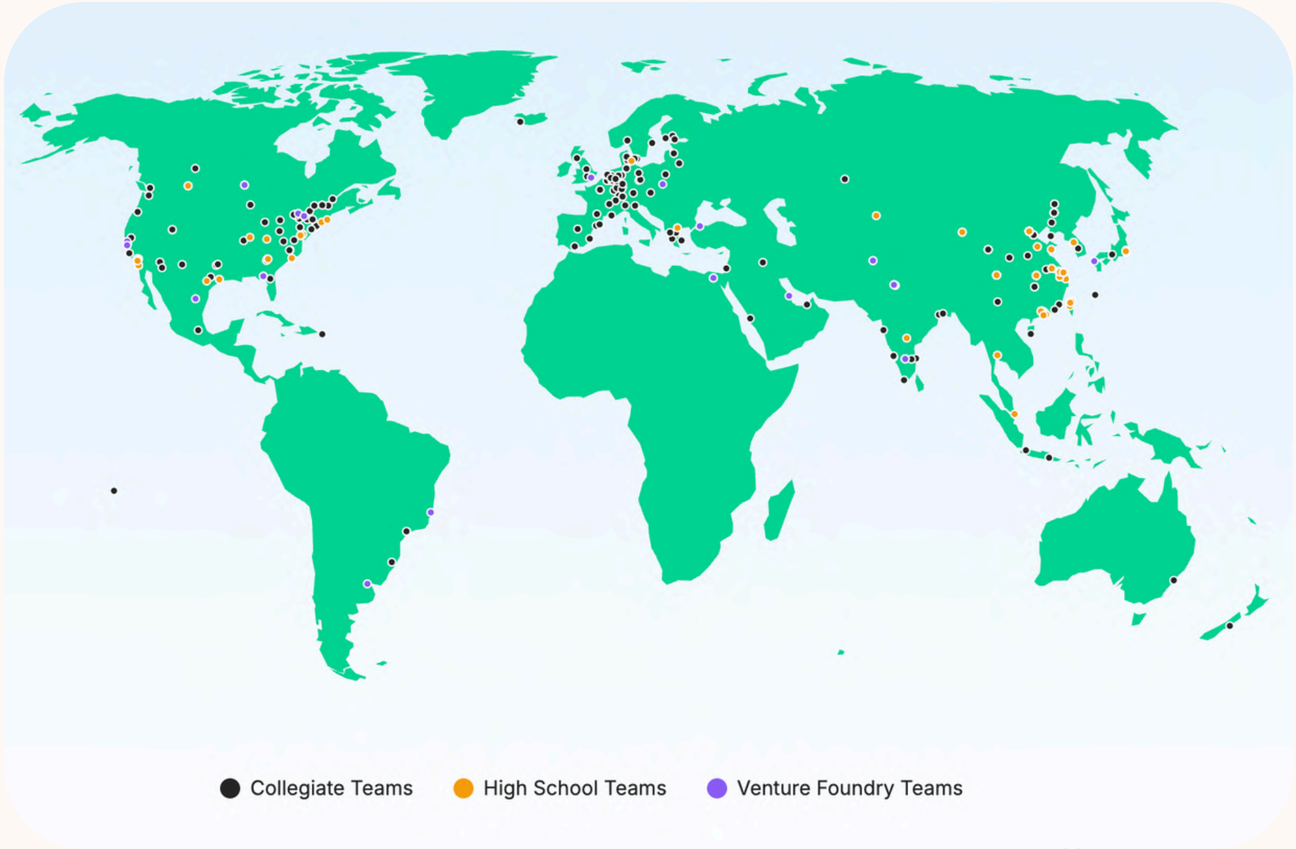
- iGEM introduction
- Why do we need sustainability in the lab?
- Areas of sustainability
- Case study



What is iGEM?

- **I**nternational **G**enetically **E**ngineered **M**achine
- Largest synthetic biology competition
- Teams use engineering to solve real world problems.
- **450+ teams**, 50+ countries, thousands of students every year.





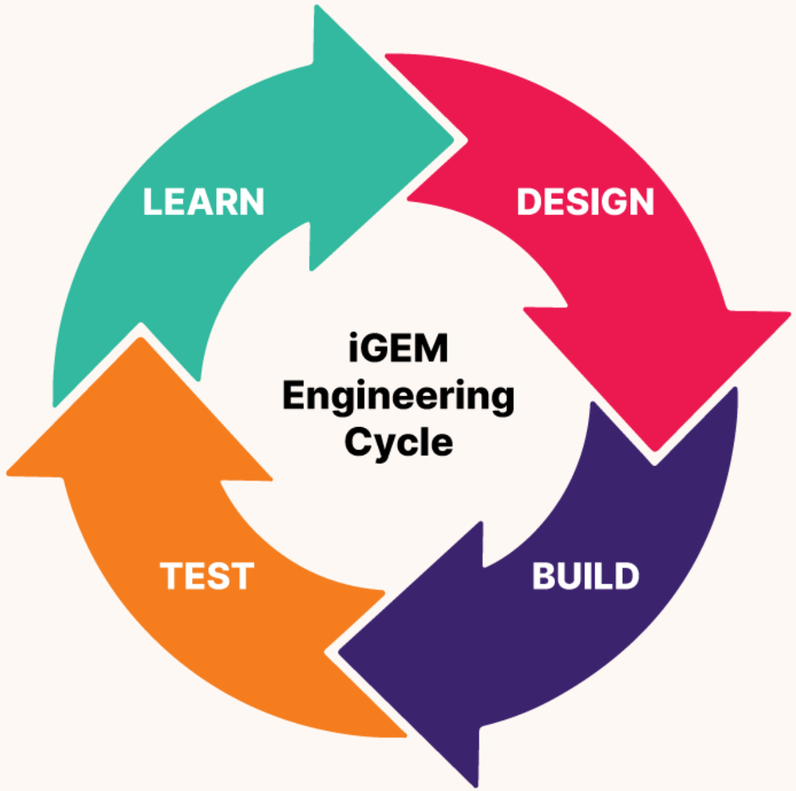
https://teams.igem.org

What is iGEM?

- One **year** of designing, building, and testing a genetically engineered system; then defend it in front of a jury at the Big Jamboree (in Paris!).

It is multidisciplinary!

- Experimental design
- Laboratory work
- Dry lab/Mathematical modelling
- Outreach to experts, industry, policymakers & stakeholders
- Biosecurity & ethics
- Education
- Science communication
- Teamwork & more



https://technology.igem.org/engineering/bootcamp

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- This year's project: **AnTigone**

AnTigone

- Developing an engineered gut bacteria to target hyperandrogenism in **PMOS** (PCOS).
- PMOS = Polyendocrine Metabolic Ovarian Syndrome



PMOS (also know as PCOS)

Polyendocrine **M**etabolic **O**varian **S**yndrome (formerly PCOS) is a common hormonal & metabolic disorder.



~10–13% of women worldwide are affected; up to 70% undiagnosed.

Current treatments are symptom-based and not specifically designed for treating PMOS.



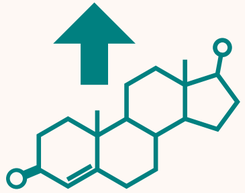
Lifestyle changes.



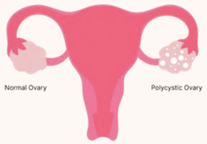
Medication
(COC, Metformin, anti-androgens).

→ need for targeted strategies.

Rotterdam Criteria



Hyperandrogenism



Polycystic ovarian morphology



Ovulatory dysfunction

Hyperandrogenism as central, clinically relevant driver of PMOS symptoms:



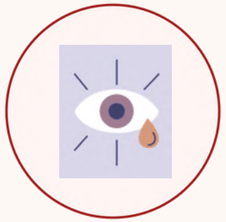
anovulatory infertility



Irregular periods, obesity



acne, hirsutism, alopecia



Low mood, anxiety, depression

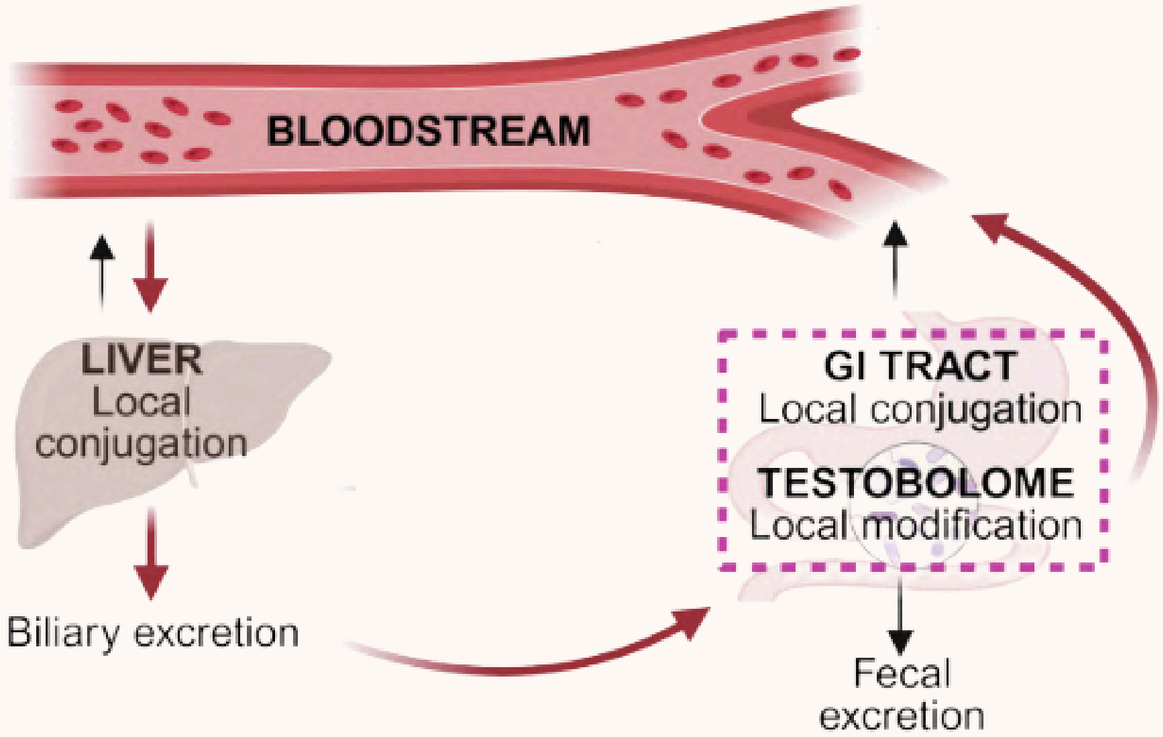
Our question: can we lower excess androgen levels (more specifically testosterone) locally to have an effect on the entire body?

iGEM Lund's Approach

Developing an **engineered probiotic** that deactivates testosterone in the **gut** for a systemic effect.

How it works!

- Androgens (e.g. testosterone) are produced in the ovaries and adrenal glands.
- Travel through the **bloodstream** to the **liver**, and pass into the **gut.**
- There, gut bacteria reactivate and recirculate them back into the blood stream.
- This reactivation step is AnTigone's target.



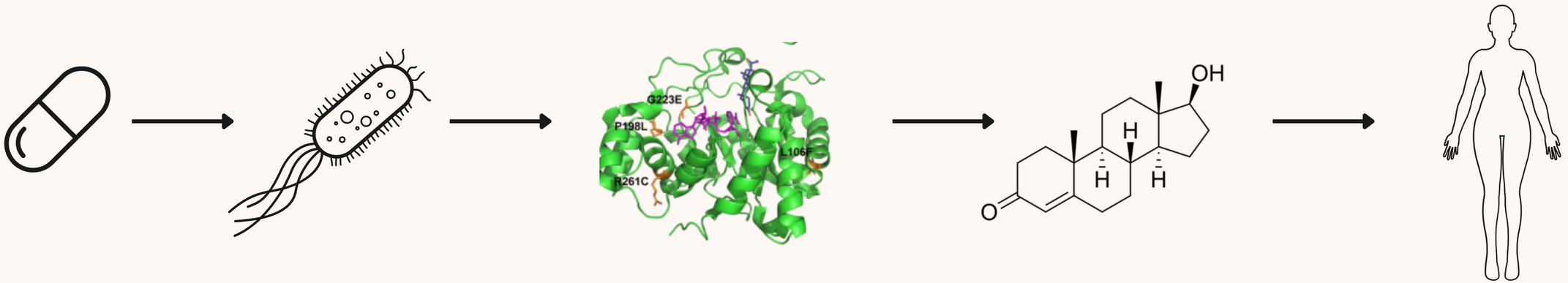
The interaction between testosterone metabolism and the intestinal microbiome (testobolome).
From: The testobolome in microbial testosterone metabolism and human health

iGEM Lund's Approach

Developing an **engineered probiotic** that deactivates testosterone in the **gut** — for a systemic effect.

How it works!

Oral capsule → Containing beneficial bacteria → Produce an enzyme → Metabolizes testosterone into a less active form → Lowering bioactivity of recirculated testosterone



Result: less active testosterone is recirculated, hopefully lowering hyperandrogenism symptoms.

Sustainability in the Lab!

Why do we need sustainability in the lab?

- Scientists play key role in educating and tackling climate crisis.



BUT

- Laboratories are responsible for **60-65%** of university's total energy consumption.
- Laboratories consume at least five to ten times more energy than an office building of equivalent size.

→ Clear need to address this if we want to address climate crisis and be good example.
→ start early to build good habits.

In which areas can a lab be more sustainable?

Mentimeter Question

In which areas can a lab be more sustainable?

- Energy
- Water
- Waste
- Green chemistry





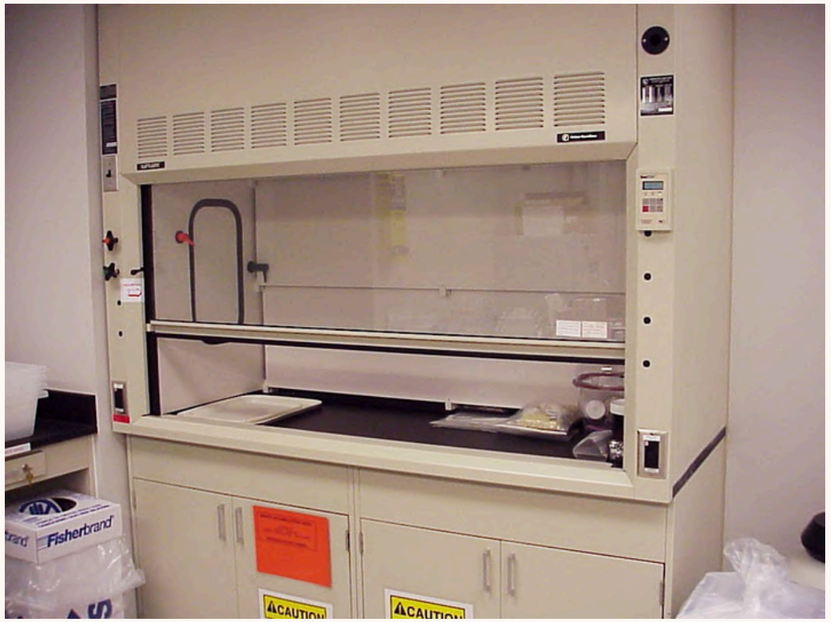
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Energy

Biggest consumers in Labs are fume hoods and ULT* freezers.



https://commons.wikimedia.org/wiki/File:Fume_hood.jpg



https://www.flickr.com/photos/vladamk/51159029935/

*UTL = **U**ltra-**L**ow **T**emperature

Energy

How much more energy does a fume hood and a ULT freezer use compared to an average household?

Mentimeter Question

Energy

Biggest consumers in Labs are fume hoods and ULT* freezers.

- Fume hoods: **3.5** times more energy than average household.
- ULT freezer: **2.7** times more energy than an average household or 20–25 kW h per day.



VS



How can we reduce this?

- Close fume hood sashes, when not in use.
- Turn of equipment, when not in use. (ASK! Not everything can be turned off!)
- Not every ULT freezer has to work at -80°C (no research), -70°C can work as well.

*UTL = **U**ltra-**L**ow **T**emperature

Waste

World-wide laboratory research produces an estimated **5.5 million tonnes** of (single-use) plastic waste annually.



Waste

How many percent of global plastic waste does this correspond to?

Mentimeter Question

Waste

- World-wide laboratory research produces an estimated **5.5 million tonnes** of (single-use) plastic waste annually, corresponding to **2%** of the global plastic waste (2014).

How can we reduce this?

- **Reduce**
  - Experimental setup
  - Use reusables
- **Reuse**
  - Some items considered disposable can be reused, when cleaned and sterilized correctly, inform yourself!
- **Recycle**
  - Use recycling stations correctly, separate waste correctly.

Water

How much more water do laboratories use per square metre compared to office spaces?

Mentimeter Question

Water

- Laboratories use about **five times** more water per square meter than office spaces.



How can we reduce this?

- Optimize autoclave use
- Use closed-loop cooling systems
- Reduce water flow (already implemented in some labs at KC).

Green Chemistry

How many principles of green chemistry are there?

Mentimeter Question

Green Chemistry

How can we apply green chemistry in the lab?

- Using/replacing sustainable chemicals (renewable, non-hazardous).
- Smaller trial experiments to avoid waste.



Tips for sustainable practices

- Be aware of the impact
- Monitoring resource use
- Sharing equipment
- Sharing knowledge and best practice, and developing skills
- Stay actively involved

Lab work is very individual
=> individual solutions necessary.



Your Turn: Show Us Your Sustainability Hack



https://upload.wikimedia.org/wikipedia/commons/c/cb/Lab_technitian_using_ink_for_experiments.jpg?utm_source=commons.wikimedia.org&utm_campaign=index&utm_content=original

- Get into groups of 4–5.
- Brainstorm together: what's a **creative**, **sustainable** habit do you already practice? Or look up a real-world example so clever or effective it makes you go "wow."
- Narrow it down to your group's top 3.
- Present your top 3 to the room.
- Win a prize XD

Present Your Ideas!

THANK YOU!



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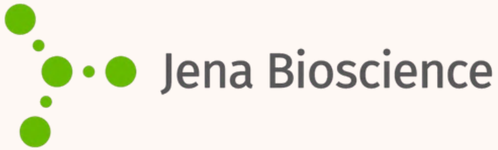






















LU Innovation
FROM INSIGHT TO IMPACT



Thank You!

Questions?

Our Instagram:

igem_lund

Feedback Form:

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Sources

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