

The background of the slide is a dense, colorful pattern of various microscopic organisms, including bacteria, viruses, and fungi, rendered in shades of green, yellow, and brown. Two large, yellow, sunburst-shaped callouts are overlaid on the background, containing text.

## What are Human Practices?

*"Human Practices is the study of how your work affects the world, and how the world affects your work." — Peter Carr, Director of Judging*

## Our Approach?

- 1. Survey:** How do Students' perceptions matchup to local employers expectations?
- 2. Safety:** Do AHL's Degrade when treated with Isopropanol or Ethyl Alcohol ?

# Human Practices: SURVEY

## Complementary surveys were given to both students and local Biotechnology companies

**For companies:** Questions evaluated how key aspects of the **iGEM experience** translated into the real world

**For Students:** Questions evaluated student perceptions of **SKILLS** learned in iGEM and how they would be perceived by potential employers in the BioTech industry

## Skills utilized by ASU 2017 iGEM Team

1. Entrepreneurship-(innovation, creativity)
2. Project Management
3. Website development
4. Molecular Biology skills
  - a. Running a PCR/Gel Electrophoresis
  - b. Running (OD600) Cell density analysis
  - c. Creating Growth/Induction Curves
  - d. Cloning of Bacterial Cells (DNA Purification, Transformation, Digests, Ligations, Screening)
  - e. Mathematical Modeling (biological processes)
5. Public Relations- Outreach & Social media
6. Fundraising for project costs and travel
7. Writing small grant proposals
8. Presenting research at an international conference

## Company Survey

1. Is a bachelor's degree required to gain employment at your establishment? (Rate from 1 - 10, 10 = "absolutely required")
2. Do you have recent grads from a local University working for your company? (yes or no; you may include a longer explanation)
  - a. If so: Were any of the skills (from the list above) influential in hiring this applicant?
  - b. How well do the following attributes describe recent or desired new-hires? (Rate from 1 - 10, 10 = "very relevant")
    - Works well in groups? \_\_\_\_\_
    - Great at technical problem solving? \_\_\_\_\_
    - Applicants do not require training to address deficiencies in fundamental science/ engineering topics or skills? \_\_\_\_\_
    - Can present their ideas/projects in a clear and understandable manner?
    - Other: \_\_\_\_\_ (Please fill with your own answer)
3. Do you employ molecular biologists/bioengineers who work with DNA, proteins, and live cells? (yes or no; you may include a longer explanation)
4. On a scale from 1-10 how important is an applied project experience in synthetic biology or engineering when hiring new applicants?
5. If you offer Internships/scholarships to college students, is prior experience in molecular biology/engineering desired? (1-10 or "we don't offer internships")

## Student Survey

1. For a career in biotechnology how certain are you that a bachelor's degree is required to gain employment in industry? (Rate from 1 - 10, 10 = "absolutely certain")
2. How many biotechnology companies are in Arizona? (Make your best guess)
3. What 3 skills (from the list above) would you think are most attractive when a biotechnology company is hiring an applicant?
4. Please rate the following attributes (from 1 - 10, 10 = "very important") based on how important they are for a new applicant to exhibit when applying at a biotechnology company.
  - Works well in groups? \_\_\_\_\_
  - Great at technical problem solving? \_\_\_\_\_
  - Applicants do not require training to address deficiencies in fundamental science/engineering topics or skills? \_\_\_\_\_
  - Can present their ideas/projects in a clear and understandable manner?
  - Other: \_\_\_\_\_ (Please fill with your own answer)
5. For you, how desirable are the following careers (rate 0 = no interest - 10 extreme interest)
  - a. Industry scientist working with DNA, proteins, and live cells (molecular biology),
  - b. Academic scientist at a University working with molecular biology
  - c. Medical doctor working with molecular biology,
  - d. Other working with molecular biology,
  - e. Other, not working with molecular biology
6. On a scale from 1-10 how important is an applied project experience (in synthetic biology or engineering) when local biotechnology companies hire new applicants?
7. Are you aware of any Internships/scholarships offered to college students, where prior experience in molecular biology/engineering desired? (yes or no) a. If yes please which ones?

# Company Surveys

## What were the Results?

(for companies that responded)

100% of companies require a Bachelors Degree for employment

46 companies contacted

3 responded

1/3 of companies that responded have ASU Grads as employees

100% of companies did not desire experience with synthetic biological lab techniques for new hires

2/3 rated "technical problem solving" and "Works well in Groups" as a desirable trait for new hires

The background of the entire slide is a dense, colorful pattern of various microscopic organisms, including bacteria, viruses, and fungi, rendered in a stylized, almost pixelated or dithered aesthetic. The organisms are scattered across the white background, with some appearing larger and more detailed than others. A central yellow spotlight beam originates from the top right, illuminating the central text area.


**With such thorough  
survey responses  
spotlighting one  
company above the  
rest seemed only  
natural**

# **Sonoran BioSciences**

**Tempe AZ**

**Do you employ molecular  
biologists/bioengineers  
who work with DNA,  
proteins, and live cells?**

*"2 out of 6 summer 2017  
employees were working  
with bacteria on antibiotic  
susceptibility tests since  
we are developing an  
antibiotic product"*



**How important are the  
these Molecular biological  
Skills when evaluating a  
new hire?**

*Running a PCR/Gel Electrophoresis*

*Running (OD600) Cell density analysis*

*Creating Growth/Induction Curves*

*Cloning of Bacterial Cells (DNA Purification,  
Transformation, Digests, Ligations, Screening)*

*Mathematical Modeling of biological processes  
Public Relations- Outreach & Social media*

*"Minimal importance. These things are pretty  
easy to teach an otherwise-competent  
engineering student."*

**How important is  
Website  
Development?**


*"not important at all.  
Partners/investors have  
been much more interested  
in the actual technology &  
data than website"*

**What skills are most  
valuable in potential new  
hires?**

*Ability to work in a lab  
environment,*

*Organization Skills,  
Writing Proficiency,*

*Presenting Research at a  
Conference*

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**How important is an applicant's ability to write small grant proposals?**

*"writing skills are very important, so this is important in that it indicates good writing ability"*

**How important is an applicant's experience with presenting at international conferences?**

*"No different than a national conference usually, but having presented at conferences is a plus"*

# Student Surveys

## What were the Results?

65 students surveyed, 65 students responded

## Who was surveyed?

Students in ASU 101: Introduction to Biomedical engineering class were surveyed

## Q #7: Aware of Biotechnology Internships?

5 responded yes  
60 responded no

Q #6: 95% of students rated "applied project experience" between 7-10

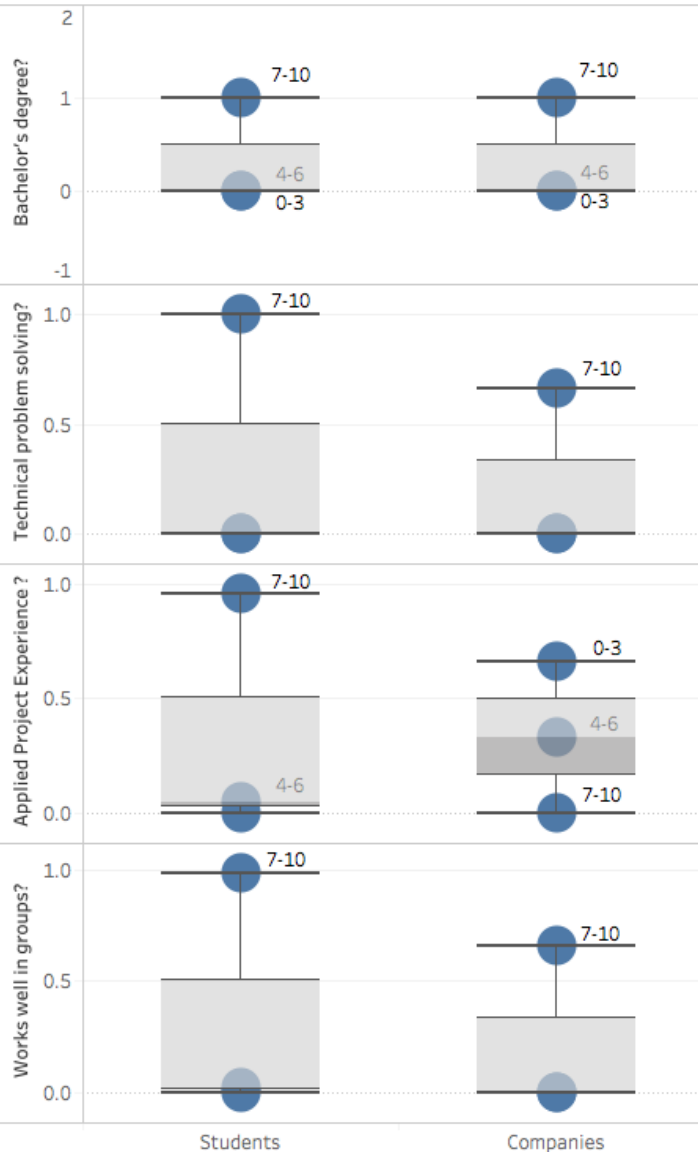
Q #4.1: 98% of students rated "works well in groups" between 7-10

100% of students rated "Technical problem solving" between 7-10



# How do student perceptions compare to Business Expectations?

% of Companies vs. Student Responses  
(Rated: 0-10)  
Least to Most Important



## Key Points:

Students and businesses agree that **Technical problem solving, working well in groups and having a bachelors degree** is beneficial for entering the **Biotechnology industry**.

## How did they differ?

Businesses care more about lab experience with positive reviews from colleagues than specific training in **Molecular biology skills such as: PCR, OD600, Cloning techniques etc.**

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## Impact

Reaching out to businesses and students allowed for our team to fully realize the possible impact that iGEM can have on a student's ability to join industry.

Learning that students and businesses both agreed that **technical problem solving, working well in groups, having a bachelors degree and having a positive/successful experience in a lab** allows for the ASU iGEM team to reinforce these concepts in the overall planning for future teams.

Understanding how the iGEM experience can impact a student's employment in a highly competitive industry ensures that the time and effort we put into these projects is not done just for recreation but can also have a focused purpose.

## Integration

Moving forward the ASU iGEM team will focus on ensuring that the skills deemed most useful by the companies surveyed are tenants of the iGEM summer/fall curriculum

**Planned additions to 2018's iGEM curriculum include:**

- Collaboration with the campus writing resources and program mentors to ensure students' writing abilities are all at a competitive level
- Greater collaboration with iGEM teams to improve the diversity of group interactions in order to reinforce the reality that industry will often have an international workforce.
- Surveying students post graduation to follow up on the impact of their iGEM experience and to verify that a bachelors degree and a positive lab experience are indeed highly useful when gaining employment in the biotechnology industry

# Human Practices: AHL DEGRADATION

## What are AHL's ?

AHL's also commonly called HSL's are officially called:

## N-acyl homoserine lactones

HSLs secreted by bacteria differ in the length of the acyl-chain moiety, saturation and substitution on the third carbon by either oxo or hydroxyl group

## Expanding on 2016 ASU iGEM AHL safety protocols

Questions ASU iGEM 2017 sought to answer:

- Will synthetic AHL's degrade when treated with 2-propanol for 15 minutes?
- Will synthetic AHL's degrade when treated with ethyl alcohol for 15 minutes?
- Will synthetic AHL's degrade when placed in the autoclave for 15 minutes on the default setting?

For more info on AHL's and 2016's AHL degradation experiments see:  
2017 AHL Safety

# Summary of Results:

(Graphs Below)

## Autoclave?

### No Degradation:

Synthetic AHLs: 3-oxo-C6  
HSL (Lux)

Supernatants: None tested  
so far

### Complete Degradation:

Synthetic AHLs: None  
tested so far

Supernatant: Rpa

### Partial Degradation:

Synthetic AHL: 3-oxo-C12  
HSL (Las)

Supernatants:  
Lux, Aub, Las, Rhl

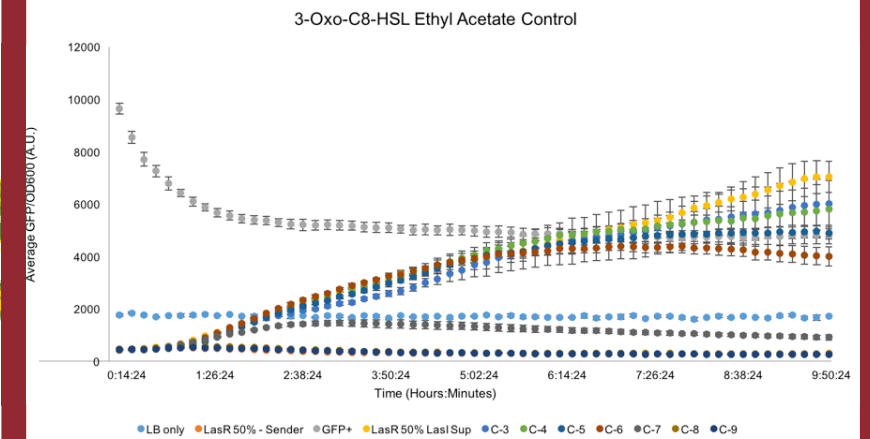
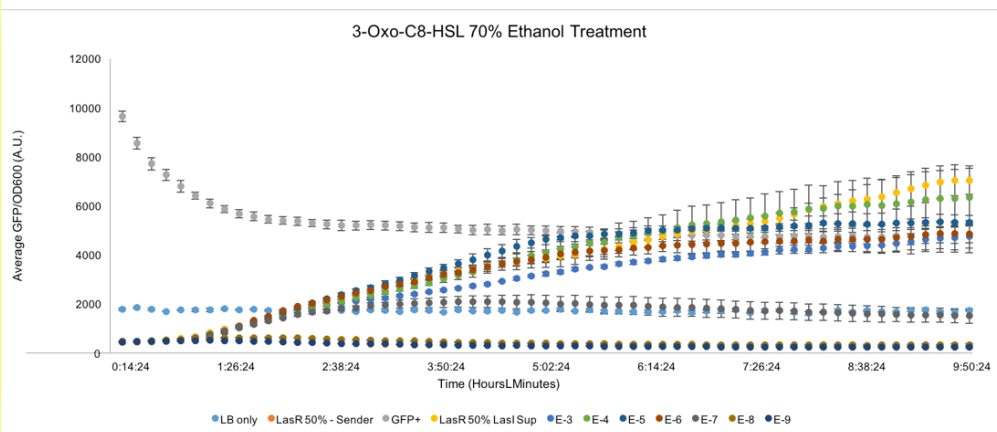
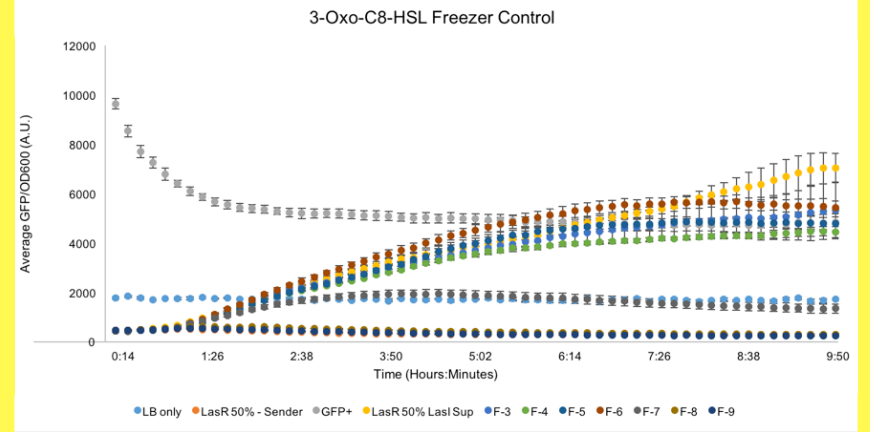
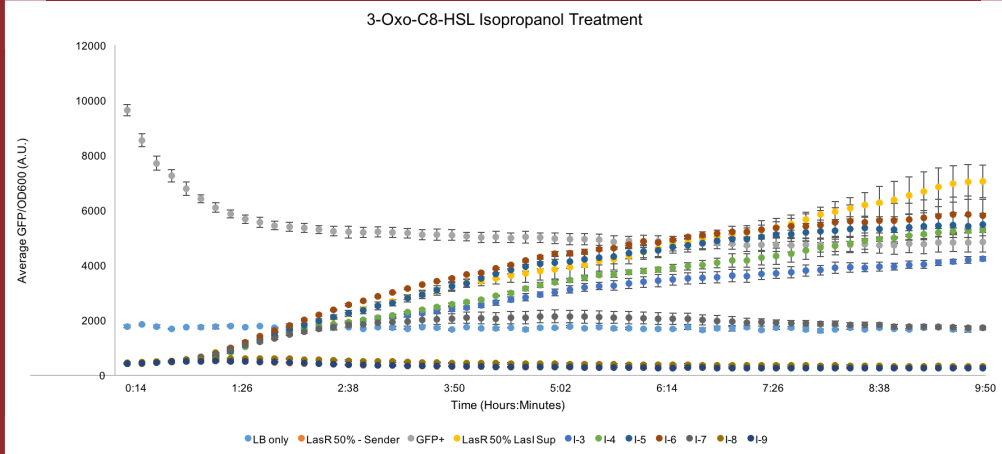
## EtOH?

70% ethyl alcohol  
does NOT degrade  
the synthetic AHL's  
for Las, Tra, Rpa in  
15 minutes

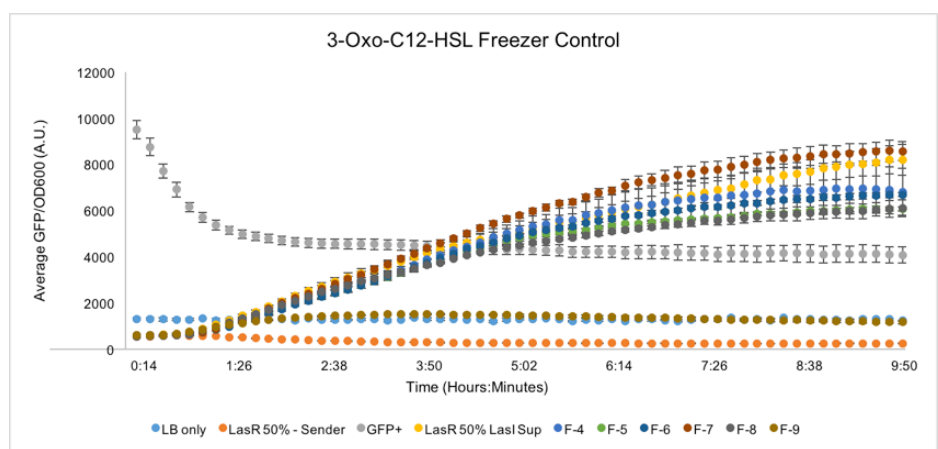
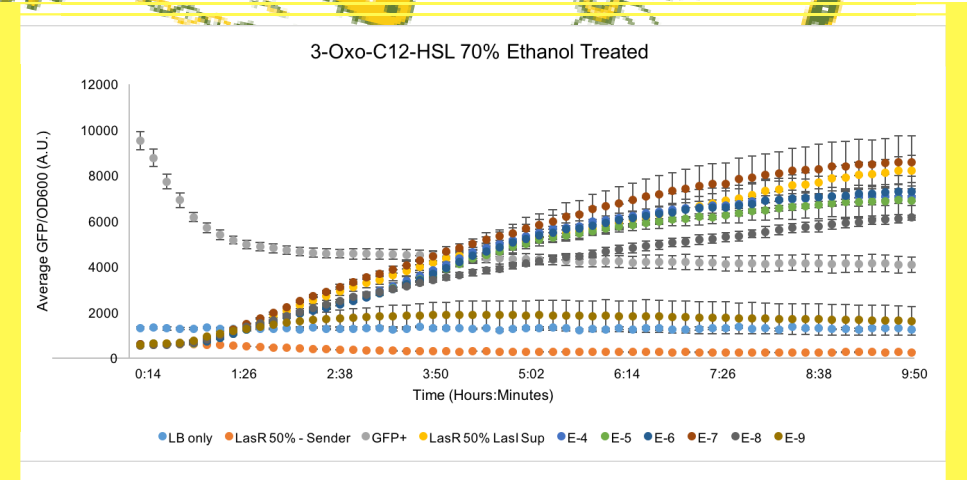
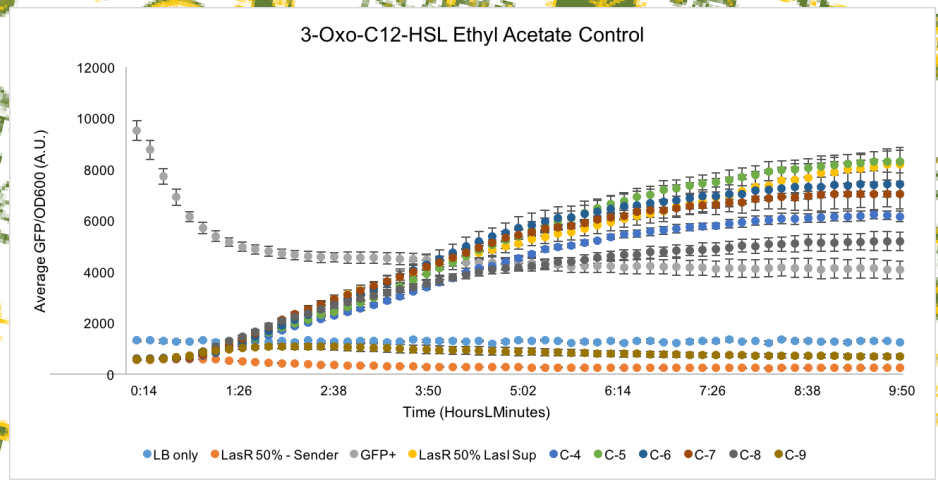
## 2-Propanol?

70% 2-propanol does  
NOT degrade the  
synthetic AHL's for  
Las, Tra, Rpa in 15  
minutes

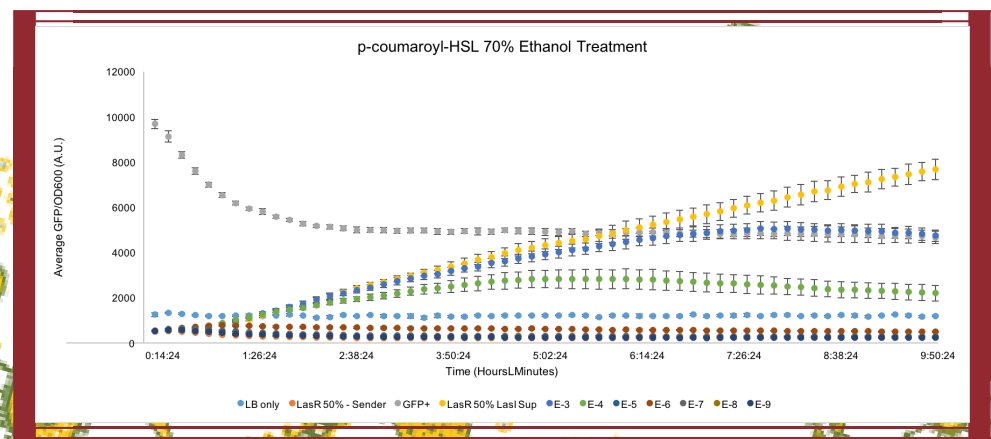
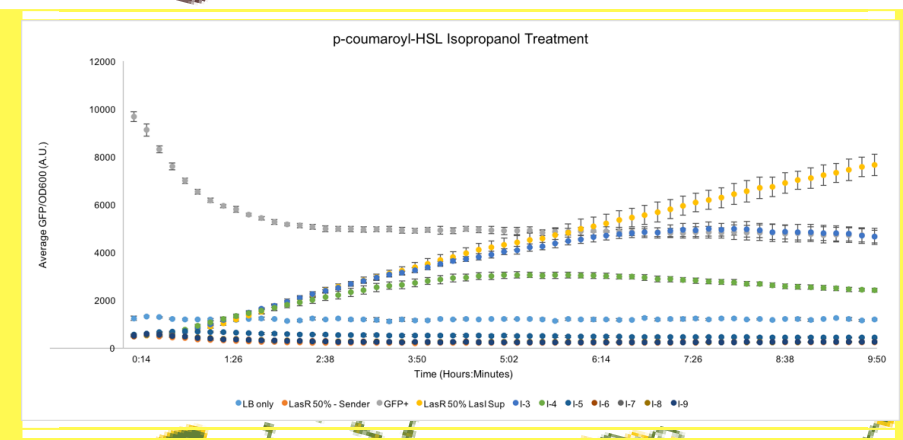
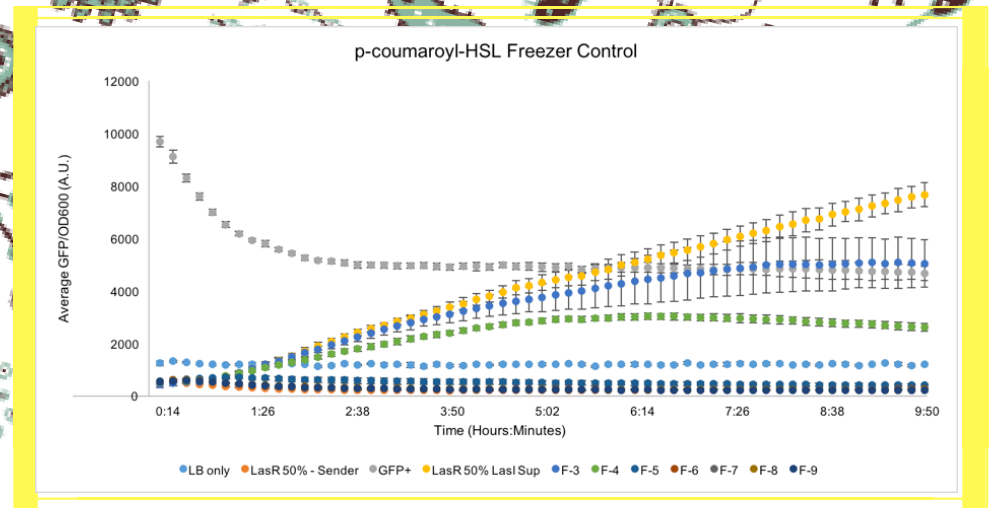
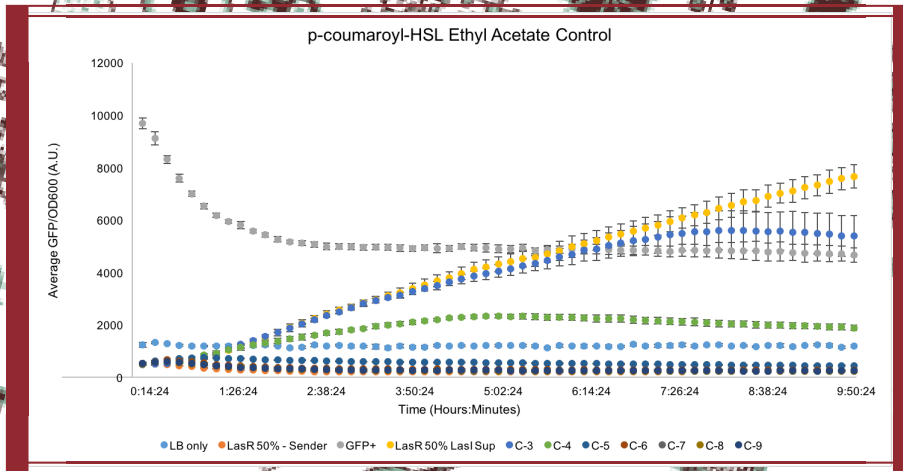
# Synthetic AHL DEGRADATION: 3-oxo C-8 HSL



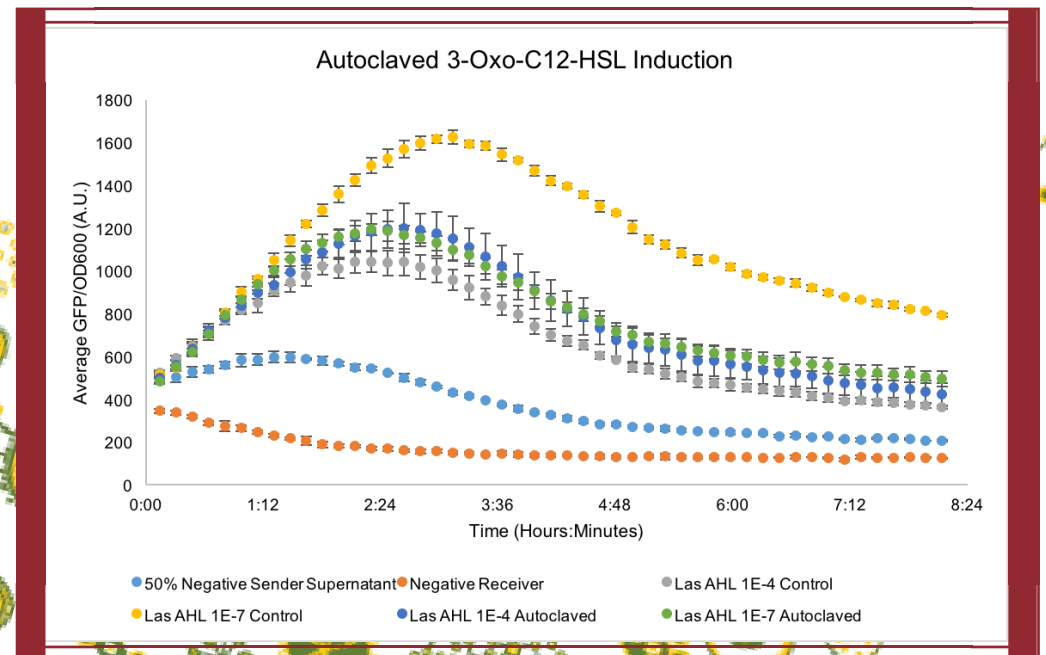
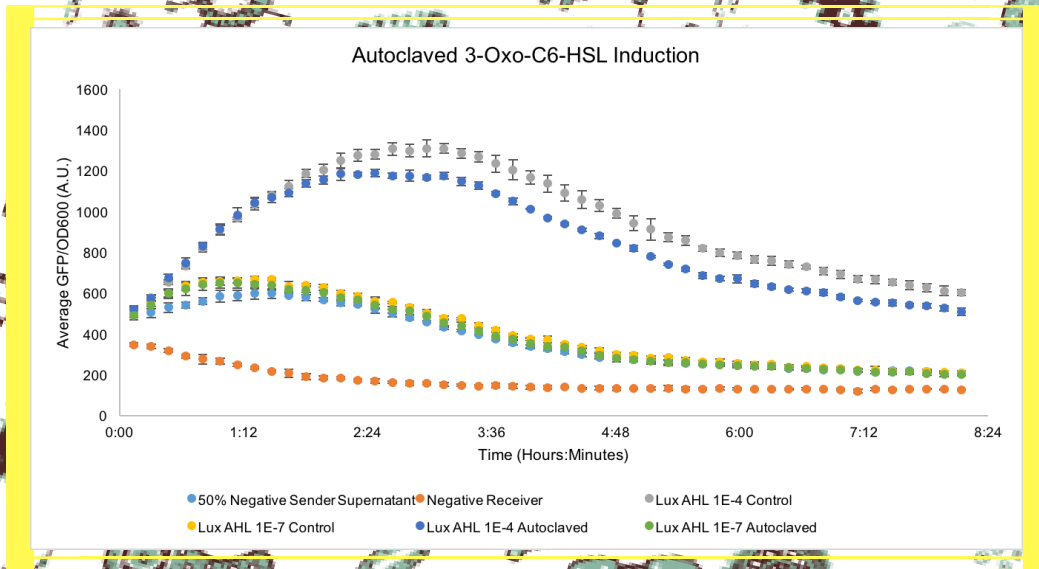
# Synthetic AHL DEGRADATION: 3-oxo C-12 HSL



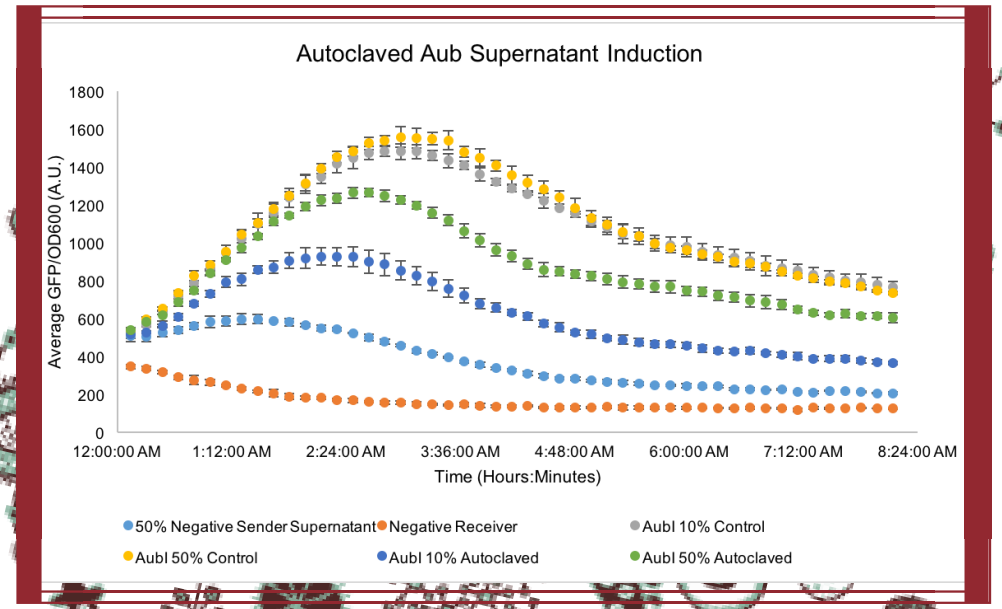
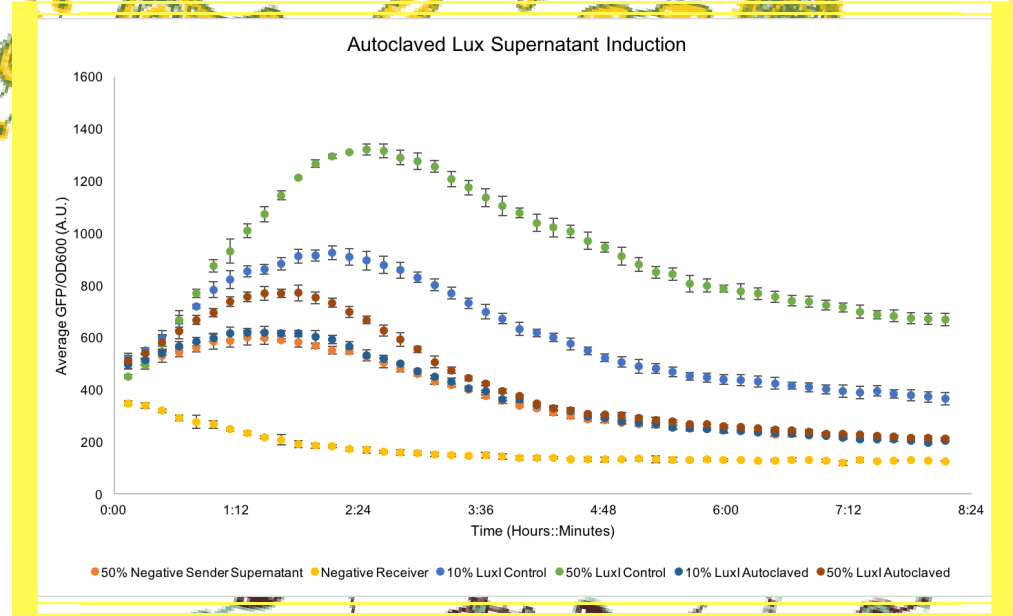
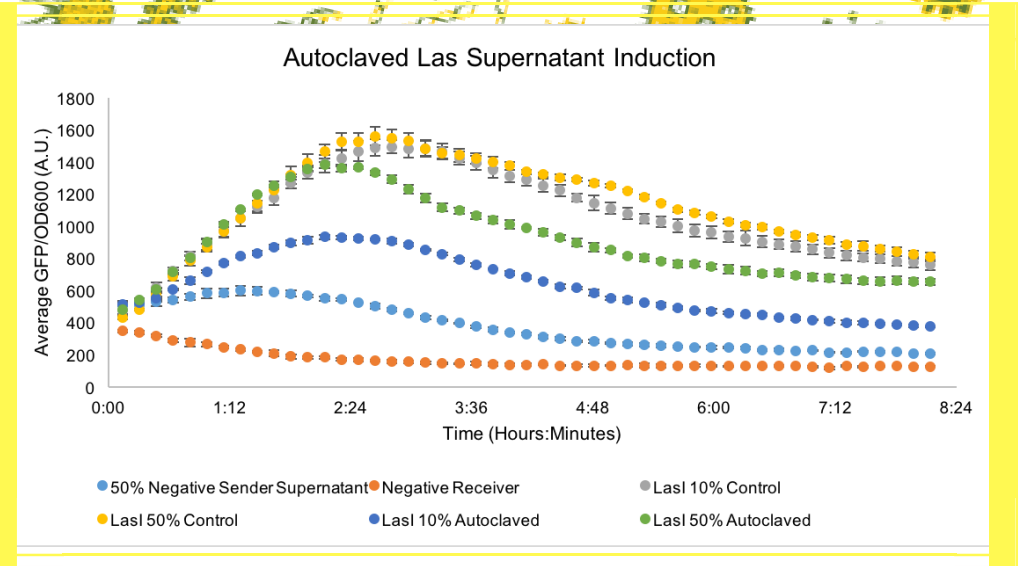
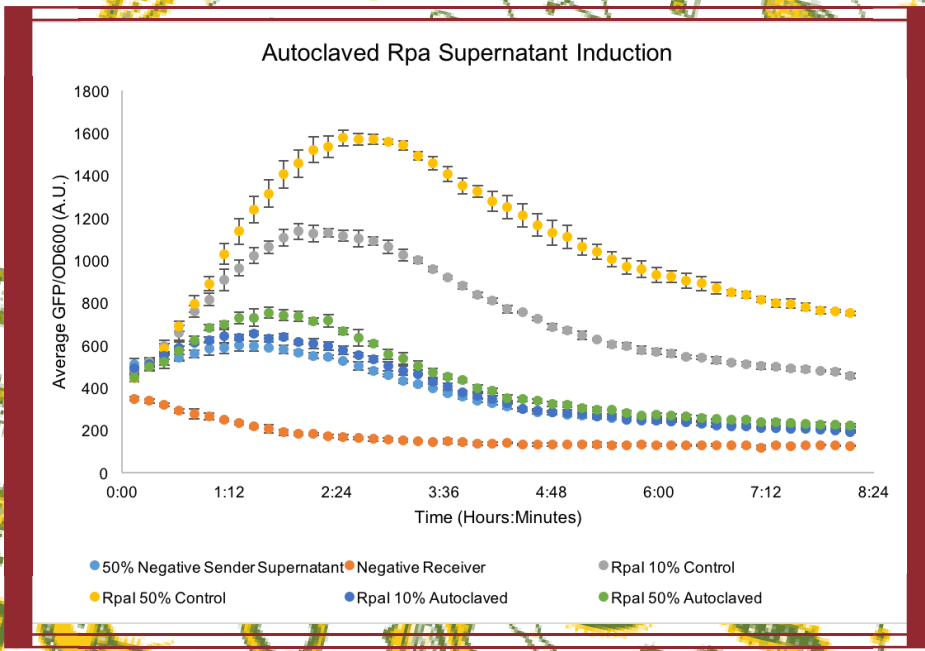
# Synthetic AHL DEGRADATION: p-coumaroyl-HSL



# Autoclaved AHL DEGRADATION









## What did we learn?

**Ahl's are not well studied in the context of Safety. This has motivated the team to partner with EH&S to develop new protocols that will allow for safer practices to be used by labs all around the world. 2017 iGEM's team was able to utilize this knowledge by taking all supernatants and synthetic AHL solutions and using the autoclave to degrade them as much as possible.**

**What will we do ?**

**How will things Change?**

**While this has shown in our results to still not be a full proof method for degradation for all of the AHL compounds it is the best option that we have currently. It has been suggested by the IBC at ASU to also experiment with the effects of NaOH or a strong base on table to further degrade the AHL compounds. The ability to integrate this information into our project has given the team an impactful experience in understanding how our research can have secondary and tertiary impacts. Moving forward we are excited to pioneer new practices that labs around the world can also adopt.**