

CYSF Logbook 2024-2025

Dec 1st: I started to research on pulmonary fibrosis after encountering a person who had contracted it. Seeing it was terminal, and they had a late diagnosis, I wanted to see if it was possible to detect IPF early.

Dec 5th: I came across specific biomarkers in the breath of IPF patients, and many new biochemistry terms. I took some notes while watching videos of lung diseases and how they really affect the lungs.

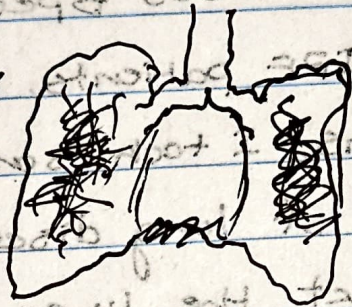
Dec 7th: I talked to my science teacher, Ms. Shoults, about my idea; it is a great one. I decide to research more when I get my proposal.

Dec 16th: After some days of research, I finally submit my proposal. It was approved, and I can start to work on my project.

Question: Could a simple chemical sensor be designed to assist in diagnosis for patients who may have idiopathic pulmonary fibrosis?

2024-12-22 (Y2F Logbook 2024-2025)

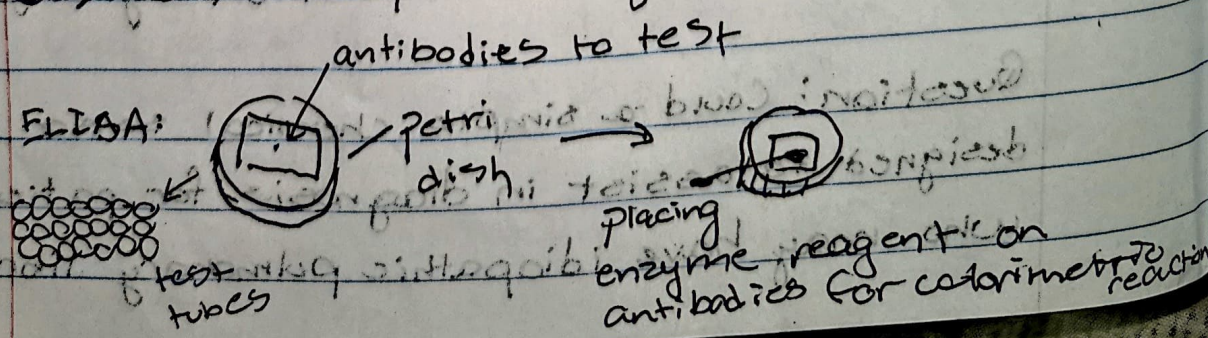
Dec 22nd: I have spent the two days before (Dec 20 and Dec 21) to plan what I would write about. I make my slides and start to make my first texts. These are the topic of what pulmonary fibrosis is, who it affects and how it affects the lungs.



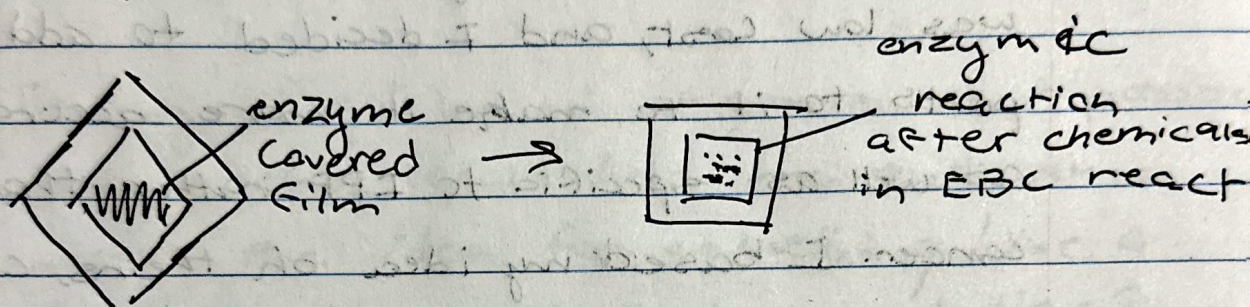
Scarring in the lungs looks like this in a CT scan

- [Drugdiscoverynews.com/reversing-lung-scarring](https://drugdiscoverynews.com/reversing-lung-scarring)
- Medscape Reference

Dec 24th - Today I started to learn more about organic chemistry, and explore the science that helps diagnose diseases through ELISA (Enzyme-linked Immunosorbent Assay) and GC/MS (Gas Spectrometry/Mass Chromatography).



Dec 27th: I start to come up with a design idea with the knowledge I had 3 days ago.... a sensor could be developed that produces a colorimetric reaction when the antibody is placed on the enzyme. Reverse ELISA



OR it could use an already existing EBC collection device and combine it with a miniature ELISA kit

Dec 28th: I also came up with a little more complex chemiresistor type of sensor. Since breath ~~collection~~ condensate can contain alkanes, which are a VOC

Dec 29th: Adding to my slides, coming
up with a design that could be used for
a chemiresistor, changing resistance on a
PCB. This idea was further developed by
looking at another person who made a
chemiresistor for lung cancer patients. It
was low cost, and I decided to add some
parts to it to make it more accurate,
as well as specific to IPF rather than lung
cancer. I based my idea on theirs, coming
up with another possible solution. I could
come up with a chemiresistor for IPF, not
lung cancer, improving it.

January 2nd: I contacted a UFC professor
and continued to research about my project,
wondering if I could add changes to my
design.

January 3rd: I wondered whether there were
some people that could help me, but the UFC
professor was the best option, so I decided to
add a little to the Chemistry part of the
project.

January 5th - It has been a month since I started creating and researching about my project, and I think I've done a little more than I should have currently, I still have to finish talking about how my design should work in a practical setting.

January 6th - I looked at some other possible designs that could help my audience across the idea for something like a COVID-19 rapid test. Would VOCs be present within the mouth of certain patients? Can they be swabbed from the mouth, like a saliva antigen test?

January 9th - I deemed that I would need some more resource in terms of being able to test my device, as well as assistance from people with expertise in the subject of chemistry and engineering.

Will it work? I hope so. I want to make some drawings of what I've designed and how it would work as well as give

January 12th - I began to work on my
Analysis, thinking about ways to overcome the
shortcomings that come with my design. So far,
the biggest failures I could think of are:

- ↳ Lack of testing of accuracy - validity
- ↳ Selectivity of biomarkers within the sensor
to prevent false positives
- ↳ Inconsistent functioning of the sensor
- ↳ Malfunction of mechanical parts, mostly within
the piezoelectric sensor

These problems require some solutions, and
the best way for me to test my design is to
simply build it. I want to try to make
it into CYSF, because otherwise my effort is useless.

January 14th - Today, I found a second biomarker
for IPF that is found in even more aberrant
lung functions. It is called, another VOC that is
part of a different pathway to the disease.

January 15th - I decided that I want to
make some drawings of what my design
could look like, as well as discuss how well

my design could really work. The other day, I got some tips from my science teacher on my presentation and what I could improve. I decided to make 2 versions of my slides for my teachers since the text is really small. I'll do that later, though.

January 17th - So today, one of my family friends came to my house. I asked him for some advice to help me with my designs. He said it's a great idea and that I could go further with the designs into things like PCBs and sensors that actually measure the correlation between δ -isoprostane and the

January 19th - I have finished my project and am submitting it soon, after getting it checked for a good video.

January 23rd - Recorded my video