

# THE CASEIN ALLERGY SENSOR BY MOO'D

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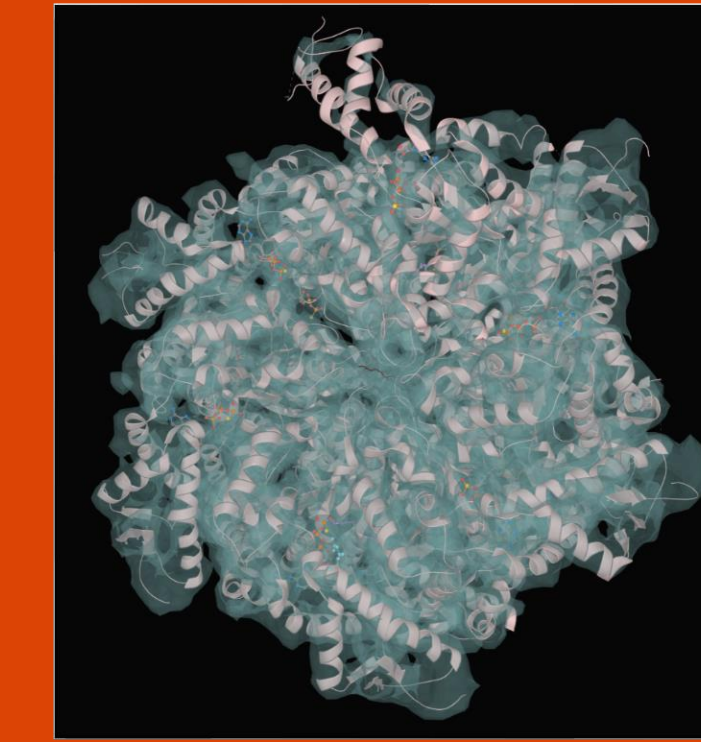


Figure 1: The Moo'D Casein Allergy Sensor. Main device housing to the left, casein separation canister to the right.



Figure 2: Inside of the device showing the UV light source and UV sensor testing. Holding the sensor almost directly on the light output an analog value of 218.

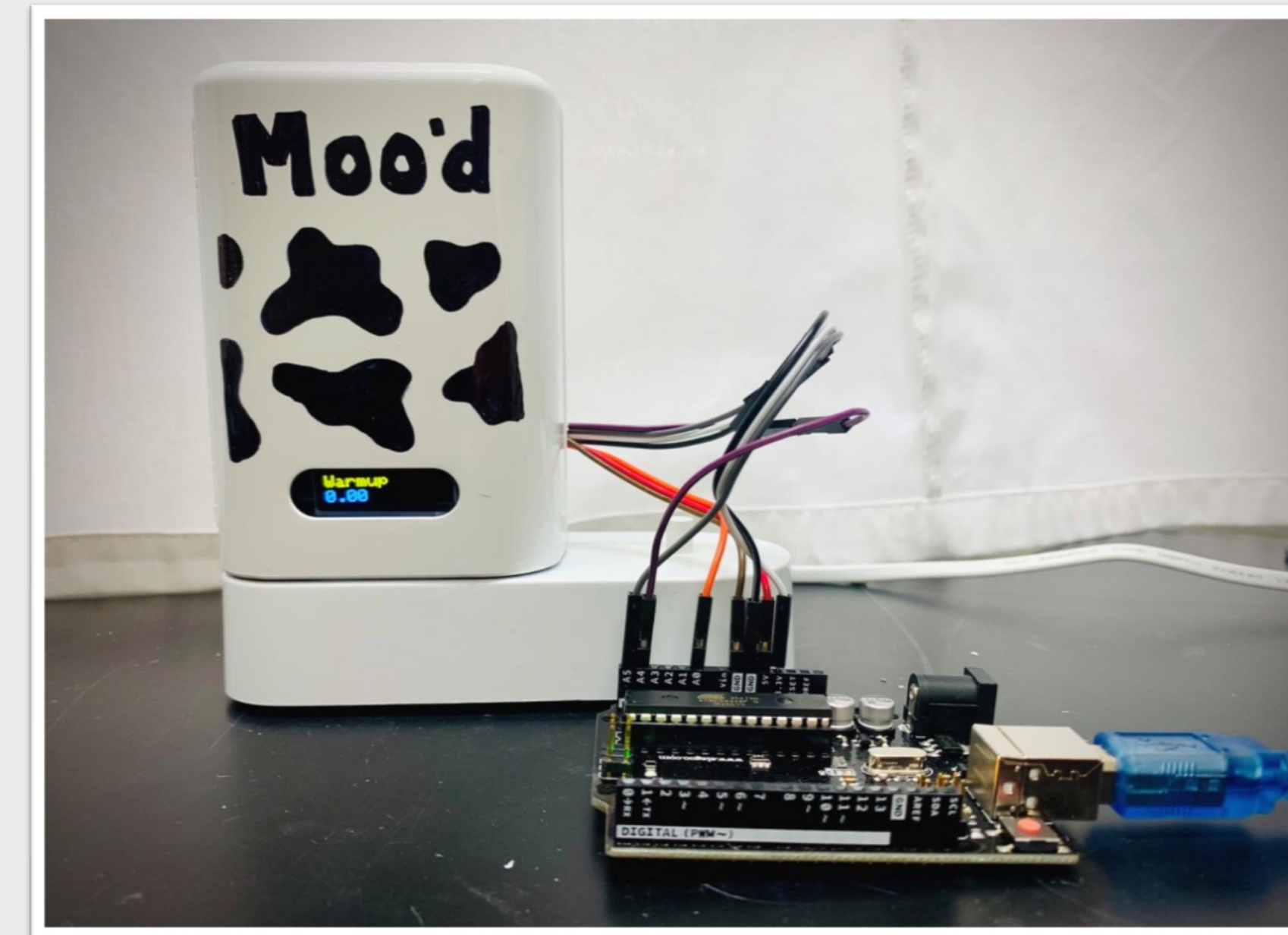


Figure 3: Completed prototype with the display screen showing the warmup mode of the device and sensor. The Arduino would be placed inside of the device shown in Figure 1.

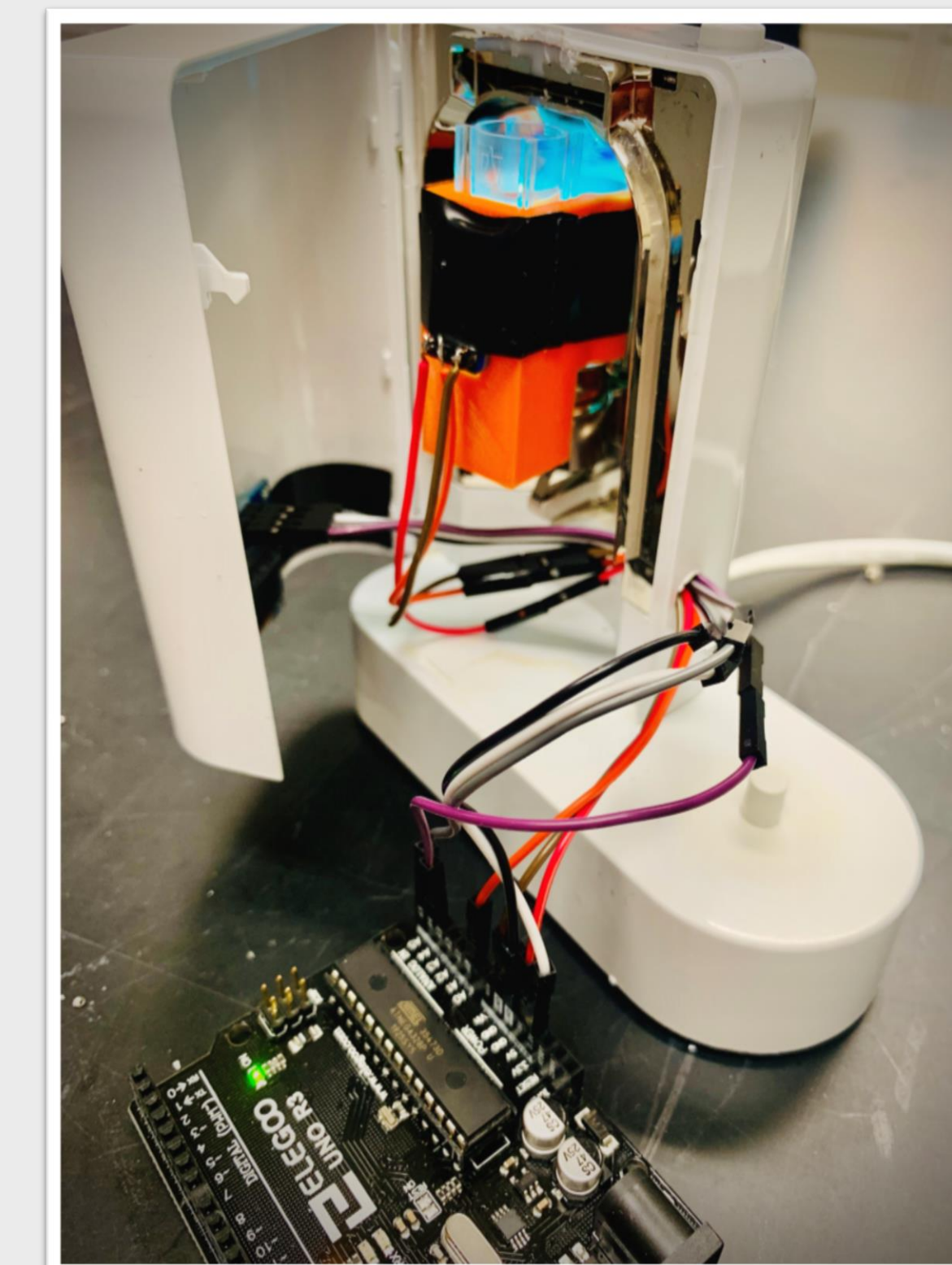


Figure 4: Inside of the device displaying the Arduino control system, cuvette holder, UV cuvette, and light source.

## OPPORTUNITY

Hundreds of thousands of people in the United States alone seek emergency medical care every year due to allergic reactions. While many people place heavy concern on peanut allergies, Casein allergies are actually one of the most prevalent, especially in young children. Casein is the protein in milk products that causes an allergic reaction.

Currently, there are no preventative treatments to anaphylaxis shock, only methods of treatment after an event has occurred which often times includes a trip to the hospital or emergency room. The goal for the Moo'd allergen sensor is to rapidly detect the Casein protein in food products before they are consumed. This product is designed to be portable for use of pre-packaged or restaurant foods.

## UV SENSING TECHNOLOGY

- The Casein Allergy Sensor (CAS) uses UV technology consisting of an Arduino circuit board and a UV light source. The prototyped product uses a toothbrush sanitizer housing.
- The Arduino has a code connected to a UV sensor which determines how much UV light is being absorbed through the solution in the cuvette. This can then be used to determine presence or absence of Casein in a sample.
- The solution tested by the UV cuvette has been processed using the Casein isolation steps presented below.
- The final device is portable and operable without additional parts to the system.
- A sample is processed by first completing the Casein isolation chemistry in the designed capsule.
- The isolated sample is then placed into the sensing portion of the device that will deliver a positive or negative output for Casein protein.

## FINAL PROTOTYPE

## CASEIN ISOLATION

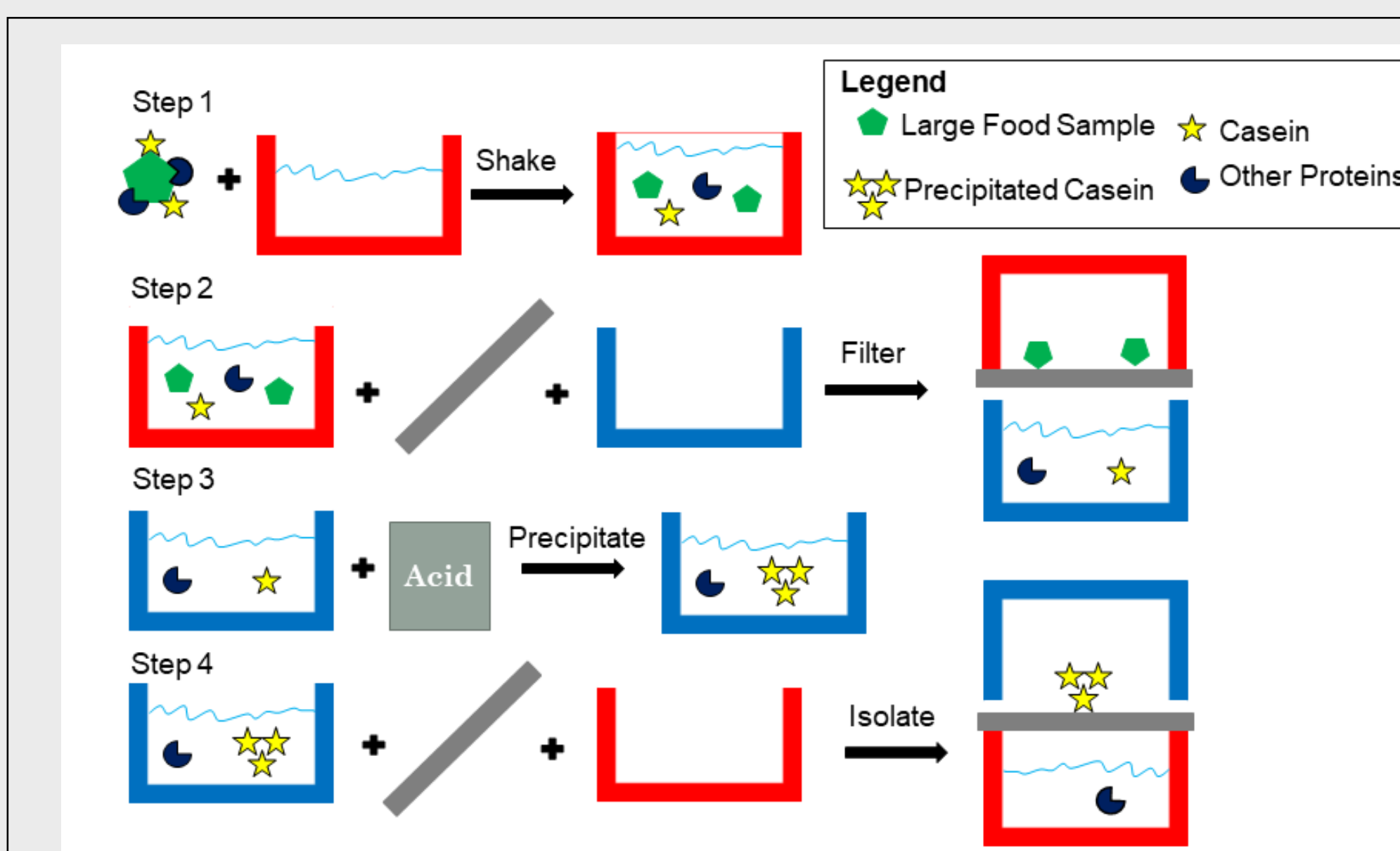


Figure 5: Process flow diagram for the general procedure of casein isolation

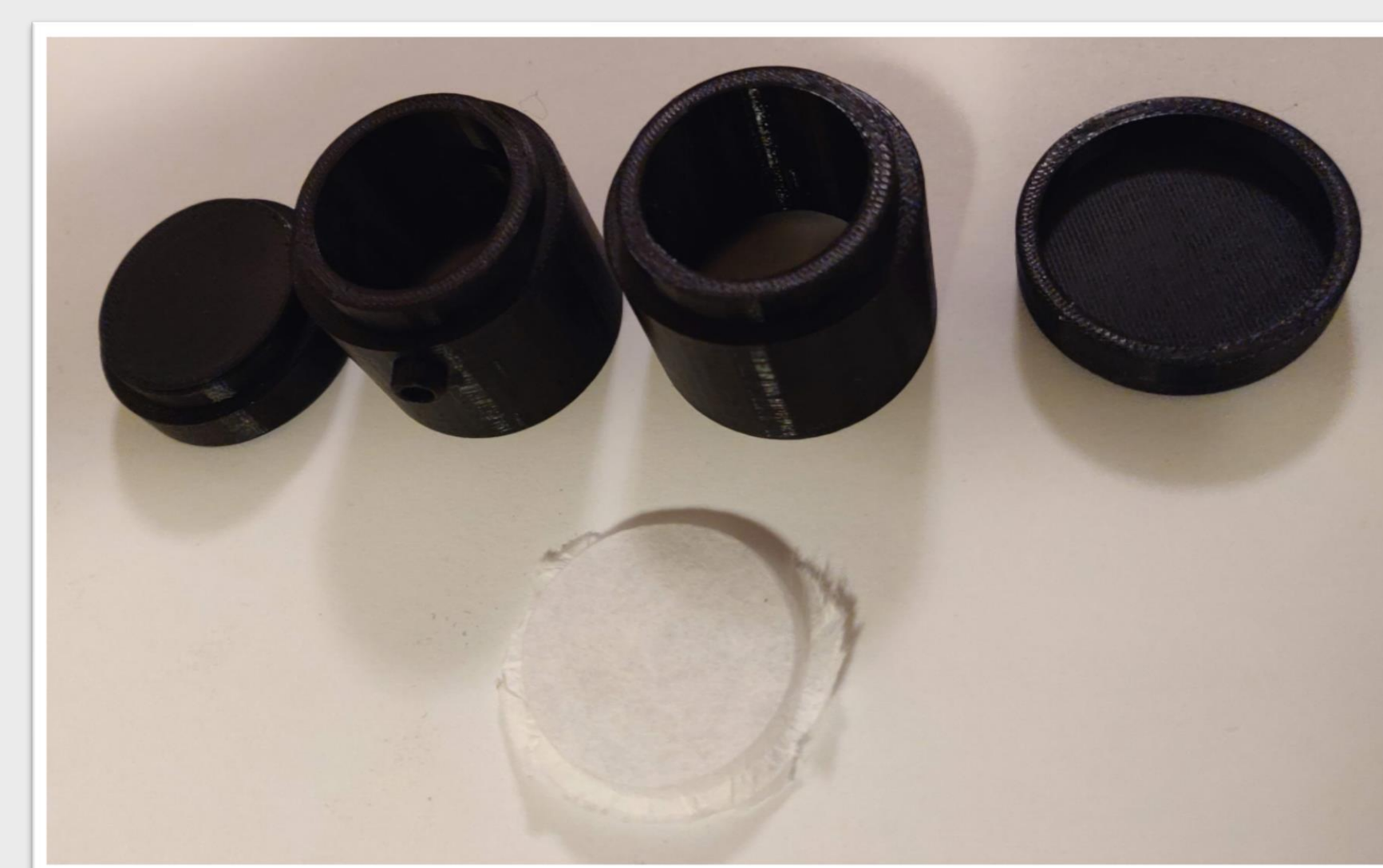


Figure 6: Casein chemistry capsule designed to house the food sample and subsequent reactions.



Figure 7: Precipitated casein after the addition of 4-5 drops of 10% acetic acid. The casein is now visible and can be filtered out.

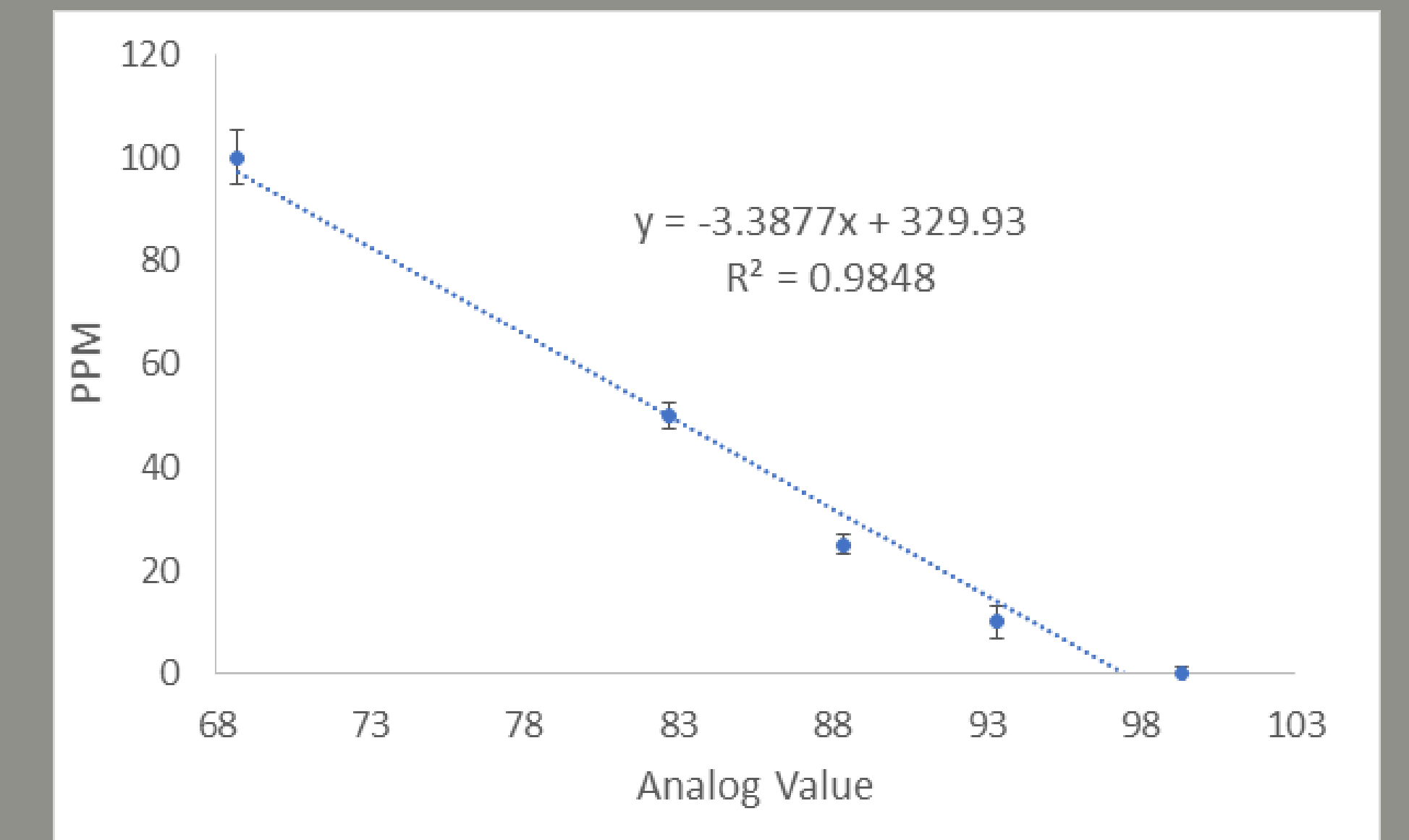


Figure 8: Standard curve relating known concentrations of casein to an analog value from the device Arduino sensor.

## DISCUSSION

- Device is capable of detecting casein down to 10 ppm (Figure 8).
- Isolation method works for many foods, but does display some false positives.
- Live display shows user if casein is present or not.

## CONCLUSION

While there were difficulties in prototyping the product, the final working prototype displays promising output if a fully developed product were to be made. Overall, the product can detect down to levels equivalent with other testing methods. In order to stay in budget, pre-made parts were used, but a fully developed product would have a revised design. This product is competitive with current testing methods as it can detect Casein protein concentrations more rapidly and the projected cost of the product is lower than standard test kits.

## FUTURE WORK

- Include a buffered solution to further simplify casein isolation.
- Include diethyl ether/ethanol for better casein separation from similar proteins like whey.
- Include positive test for system calibration and to ensure device is working properly before a sample measurement is taken.

## ACKNOWLEDGMENTS

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