We consulted with an engineer from Georgian College about an air exchange system being installed on the outside of the room, which would help obtain greater control of the drying environment, though his opinion was that the room itself was limited, and a whole new room built for this purpose would be the only way to achieve our drying needs. As the room we have available to us is still suspectable to outside environmental conditions, such as outside humidity, temperature, etc. After investigating the proposed air exchange system, we decided to put the idea on hold and just modify the current solution we had to achieve the best outcome possible.

The challenge we were left with was a duct system that worked well enough to lower the drying time by 1/3 but increased the humidity from below 50% to above 78% which required a dehumidifier to reduce. This in turn resulted in the drying process not only being inconsistent but requiring additional monitoring, as it could have large drops in humidity over time. If the balls drop below 0.3 grams it means the balls have become too hard which the nematode population within will start to decrease sharply.

246

What scientific or technological advancements did you achieve as a result of the work described in Line 244?? (*Maximum 350 words*)

We concluded this year that achieving a process that provides a controlled consistent drying time evenly across the entirety of a room is not possible in our current space. A specially designed, environmentally isolated room with an air exchange system is what would be needed to reduce drying below a 24-hour period, which is what we desire for manufacturing purposes. Technological advancement was partially achieved this year by successfully reducing the drying cycle by 24 hours. However, the introduction of a vast increase in humidity intensified the inconsistency in drying and required much more inspection to prevent loss of nematode populations as well as product as a whole. By year end we were still taking input from other drying experts in an attempt to find a solution for the interim.

242

What scientific or technological uncertainties ---could not be removed using standard practice? (*Maximum 350 words*)

The time it takes to dry our alginate balls was still our largest production bottleneck. It takes approximately 72 hours to dry our pearls after they are made. This was not only time consuming, but also imposed production restrictions, as we only operate during a five day work week, so are unable to produce balls Wednesday or Thursday as we will not be able to process the balls when they're at their optimal moisture levels. Therefore, this year decided to attempt to increase the drying time. Our established drying methods were to put the alginate balls onto sheets laid out in a single layer and placed on a rack three high to air dry. This worked for our laboratory needs when we first started down this path, and even in the early days of production. However, the larger our production needs the more the inconsistencies with the established process impacted us. Technological uncertainty was encountered when we consulted with engineers about building a room dedicated to drying the nematode alginate balls, as drying the balls equally in the room at a consistent rate was not plausible given the limited space and needed cost. We were not able to afford the elaborate system required to ensure tray moisture is removed equally, or to house a system capable of doing so. This uncertainty was established when we had engineers set up an elaborate air conditioning system in the room, complete with wind tunnels to direct the flow of air evenly around the room, and yet this made the drying even more inconsistent, and created problems with humidity in the room.

244

What work did you perform in the tax year to overcome the scientific or technological uncertainties described in Line 242?
(Summarize the systematic investigation or search) (*Maximum 700 words*)

There is a fundamental relationship to the moisture of our alginate balls and the health of the nematodes encapsulated within them. Over the past several years we have conducted numerous experiments to identify that the balls need to be precisely 27% moisture. If it is greater than 27% it can lead to the nematodes escaping from their suspension and causing the balls to deteriorate, as well as providing conditions that promote mold, bacterial, or fungal growth. Any less and the nematodes will start expiring which can create a chain reaction as the corpses decay. Having the ability to dry our balls consistently is critical to the longevity of our products, as they need to remain stable for six months minimum without the need for any specialized storage solutions. It is also the largest bottleneck in our production as it requires approximately three full days to achieve the desired moisture content.

We consulted with some air specialists about the challenge we were encountering, anticipating that it would be a reasonably straight forward problem to overcome, that would speed up our drying time. Given our limited resources and space we installed a way to simply move the air around more, we had five separate ducts installed to cycle the air around the room and create an updraft along the outside perimeter. This was immediately effective, as the speed at which the balls dried did increase by 24 hours. However, we encountered a problem with humidity buildup in the room, which exacerbated the challenges with consistent drying of the alginate balls. The humidity was physically building up and dripping from surfaces. A dehumidifier was added as a temporary solution to the humidity build up. However, the humidifier required us to keep the door to the room open to allow cool air into the room. The open created the potential for contamination of our alginate balls which we have struggled with in previous years.

WWA.

PROJECT #:10

PROJECT NAME

DRYING CELLULOSE NEMATODES