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My Chicken Egg Experiment

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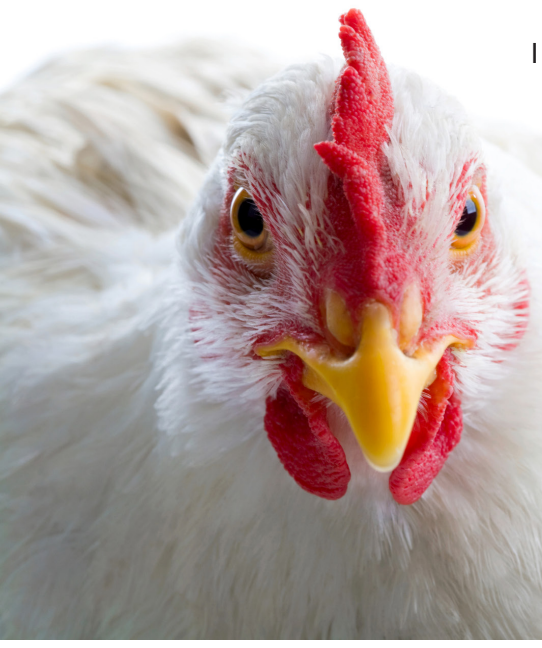
According to the journal of Biological Conservation, the Bird Life International organization, and their eight-year study from 2010 to 2018, deforestation has globally killed off a total of eight species of birds (Gibbens, 2018). Because of this, reintroducing as many endangered birds back into the wild is one of the many goals of sustaining the environment.

Conducted by Professor Tahara and the Japan Poultry Science Association, the shell-less egg incubation experiment was focused on finding ways to manipulate embryo development for better production of endangered bird specimens and improving the steps for regenerative medicine. Birds are important for the environment as part of the food chain, while also promoting plant reproduction as seed dispersers or pollinators. By creating a way to better produce endangered birds, the restoration of destroyed environments can be sped up, and the plants can keep the birds both fed and healthy.

For Professor Tahara's experiment, two groups of chicken eggs were incubated for three days, transferred into clear plastic wrap vessels, and placed back into an **incubator** until they hatched. The goal was to make the development of the chicken embryo visible, without harming it. When successful, this experiment allows researchers to witness the development of a chicken embryo through direct observation, something that is much more impactful than observing a regular chicken egg or an x-ray of development.

My goal was to replicate this experiment. This is a well-known experiment and process for studying in Japan but is not as common in the U.S. and the same equipment is not readily available. However, I was intrigued with the process and wanted to try it. I quickly realized that the process was extremely delicate. To start, it was difficult to find the materials as there are very few stores or websites that sell **fertilized chicken eggs**. I learned it is always a good idea to find a consistent source before conducting an experiment but I did not do that when I initiated my experiment. I was lucky enough to have acquaintances who let me use their eggs. However, finding the chemicals for the experiment was also a major hassle. **Benzalkonium chloride** was **diluted** to make a 0.01% solution, and **polymethylpentene wrap** was used to hold the egg content. The eggs are very fragile, especially when they are heated in the incubator. Transferring the egg content to the plastic wrap was like balancing a card pyramid, and the smallest mistake meant failure for the experiment.



I attempted this experiment twice and was unsuccessful both times in getting the egg from embryo to hatchling. Despite this setback, there were successes. In my second experiment the embryo was able to develop into a five-day old chicken embryo with a completely functioning and beating heart. I learned a lot about why my experiment did not work - this was mostly due to the eggs requiring more water in their plastic cups than in their shells as they lose humidity when not protected by shells.

Overall, this capstone course was an unforgettable experience that took lots of intense concentration and dedication. I also learned that it's good to not be afraid of making mistakes, as they are what helps us grow as people.

Words To Know

Incubator: An item that heats up eggs so they can hatch (it mimics the process of hens heating their eggs underneath)

Fertilized chicken eggs: Eggs that can hatch into chickens, usually found at farms (refrigerated eggs in grocery stores cannot hatch)

Benzalkonium chloride: A strong disinfectant that was used to get rid of the harmful bacteria in the vessels

Dilution: A process meaning to add water to another liquid (ex: adding water to grape juice increases the amount but it loses taste)

Polymethylpentene wrap: Special plastic wrap that allows oxygen to pass through but it is also heat resistant

Meet the Scientist

I always had an interest in interacting with animals, and it came from fun visits to many aquariums. Eventually I started volunteering for animal husbandry at The Maritime Aquarium. Other than school-based subjects, I enjoy playing video games and baking desserts. I was a senior at Fairchild Wheeler when I received second place at the 2019 Bridgeport District Science Fair for this project and first place at the Skills21 Expo Fest for a Capstone Project in Scientific Research.

Skills21 at EdAdvance, a Connecticut Regional Education Service Center, has worked with high school students completing Capstone projects for nearly a decade. Each year students compete in a statewide Student Innovation Exposition to share their work with other students, community members and judges. All students completing Capstone projects work with a mentor, conduct inquiry-based research, give an oral presentation and create a website to serve as a portfolio of their work. Each year several students engage in high quality scientific research and collaborate with research scientists to conduct their experiments. Munetsugu Kojima, a recent high school graduate from, completed his Capstone project in May 2020.

SKILLS & KNOWLEDGE

My project required knowledge on the anatomy of chicken eggs and knowledge of the materials used for the experiment. Knowing how to set up the vessel and the incubator was critical. Communication skills are extremely important, as it's always good to receive advice and support from others (one of my friends and some teachers were able to assist me with the procedure and materials). I specifically contacted Yutaka Tahara (the professor who conducted the original experiment) for tips.

For Students and Teachers Making Curriculum Connections, see the following:

Connecticut State Department of Education (CSDE) - Common Core State Standards (CCSS): Mathematics

- CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them
- CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others
- CCSS.Math.Practice.MP5 Use appropriate tools strategically

CSDE - Next Generation Science Standards: Scientific and Engineering Practices

- Asking questions and defining problems; developing and using models; planning and carrying out investigations; analyzing and interpreting data; using Mathematics and computational thinking; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information.

hyperlinks

Yutaka Tahara's Research Journal: https://www.jstage.jst.go.jp/article/jpsa/51/3/51_0130043/_pdft My capstone website (for more information): https://munetsugukojima.wixsite.com/shell-lesschickenegg