Stimulating Bone Growth Using Piezoelectric Ultrasound Transducers on the Edentulous Jaw

Week 1 Report
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Over break and our first week, we met with several road blocks that delayed our design process. We have been having problems extracting teeth from the mice that we will be using to find the best ultrasound frequency for bone growth and also in creating a mold that will allow us to successfully make a Barium Titanate ultrasound transducer.

Our original plans involved starting our mouse experimentation soon after the new year, but when we started practicing the removal of mice teeth, we discovered that it would be much more difficult than originally expected (Fig. 1). In order to learn a procedure to aid in extracting the teeth, we contacted Dr. Sunil Wadhwa from the UConn Dental School, who agreed to meet

Figure 1: The mouse used to test the tooth removal procedure.
with us and have someone show us a good method for extraction. All of us met at the medical school in the beginning of January and one of the other doctors in Dr. Wadhwa's lab, named Chris, showed us how he would go about extracting the teeth. Chris is an orthodontist who has done some experiments with rats and mice. Unfortunately, he had never done live tooth extractions in mice. Most of his previous work had been with either deceased mice or jaw bones that had been removed from the mouth. It quickly became obvious that removing the teeth while keeping the mice alive was going to be very difficult, as they were hard to reach without cutting off the mouse's airway and even harder to physically pull out without injuring the cheeks and gums of the mouse. Eventually, we were able to pull out all three teeth on the lower right jaw of one mouse.

Chris helped us to devise a procedure for how we remove the teeth:

- First, we hold the mouse's mouth open with a bent metal wire support, which acts like a spring to keep it open (Fig. 2).

![Metal wire springs used to keep the mouse's mouth open while the teeth are extracted.](image)
• Once the mouth is secured open, a long pointed dental tool (Fig. 3) is used to poke around the tooth to help loosen it from the

Figure 3: A pointed dental tool used to loosen the gums around the tooth.

• A 1x2 "Rat Tooth" Tissue Forcep (Fig. 4) is then used to grasp the tooth and twist while pulling up lightly. This aids in further loosening the tooth. As it gets looser, the tooth slowly pulls out of the mouth. The "Rat Tooth" design is necessary, because any other forceps do not grip the tooth well enough to provide the necessary force to remove it.

• Once the tooth is loose enough, it will come right out.

Chris was able to provide us with a wire support to hold the mouse's mouth open while we extract the teeth, as well as telling us which tools would be the most useful for the removal of the teeth. Unfortunately, the ordering of these tools has been delayed by the secretary in charge of this in the Mechanical Engineering Department.

Figure 4: 1x2 "Rat Tooth" Tissue Forceps
Once we get the correct tools, we will be able to continue our experimentation, making it possible to find the correct frequency. Hopefully, we will get the tools soon, and will be able to move along.