INTRODUCTION
Cancer is a debilitating disease that affects all cultures. Its diversity is amplified by the fact that there are so many different kinds of cancer that can vary in their malignancy. Causes of cancer are important in understanding its nature and thus its treatment. The efficacy of any given cancer treatment, such as chemotherapy, is invaluable to a patient's survival. More importantly, whether or not the cancer is being attacked successfully by chemotherapy in enough time to save a patient's life is one of the most important concerns of many doctors who treat cancer patients.

Magnetic resonance imaging has many practical applications and using its sensitivity in being able to detect and depict different particles has been employed in cancer imaging for some time. It is able to "characterize the difference between the magnetic relaxation properties of cancer and noncancer tissues." This said, one begins to wonder whether or not MR imaging can indeed help doctors diagnose or predict whether or not a patient's chemotherapy is successfully killing their cancerous cells. MR imaging can clearly tell a doctor when a patient has a certain cancer but that is when a tumor is already present. By employing MRI imaging techniques here at the NHMFL and using their powerful magnet, testing whether or not MR imaging is a good biomarker and predictor of the efficacy of cancer treatment will aid in cancer treatment research.

METHODS

The NHMFL's 900 MHz 21.1 T has many capabilities, one of which is MR imaging; because no other research facility has this tool available in its arsenal to scientists, this large magnet is letting my group gain data which is state-of-the-art. Also, this sort of imaging is unique in the way it was acquired because each imaging protocol had to be created specifically geared toward diffusion and sodium imaging. Thus, everything in this experiment is performed for the first time and still going on until early 2009.

Male Fisher rats were imaged using both the hydrogen and sodium probes; they were divided into groups of four which were all injected with 9L rat glioma cells. A few rats did not have the cancer cell implantations in order to test for the imaging protocols. The four groups in which the rats were divided into consisted of non-treated rats and three groups of treated rats with chemotherapy; the chemotherapy used in this case is Carbamate, or BCNU. The three groups which were treated with BCNU were started with the same concentration of the dosage of their chemotherapy. Also, the aggressiveness of each of the tumors in the groups of rats varied and thus so did how often they were imaged. Some tumors were more aggressive than others and so some rats did not survive long enough to reach the stage where they could be imaged.

How large a tumor is also affects the image produced from the magnet because one can manipulate how large and how clear the image obtained is. In manipulating how large the image is, one is changing the imaging protocol for the magnet. Although the exact physics theory behind MR imaging is beyond the scope of this presentation, imaging was made more accessible via these protocols. For every rat, certain tuning must be done and this is where the probe's flexibility comes in. Although these probes require some structural change in order to be more efficient in the imaging process, they allowed us to tune each rat differently within the probe for the magnet. This is important because each rat is different and so are the tumors within their bodies.

Throughout the imaging process, using the 900 MHz 21.1 T magnet required that the probes we used were inserted into the magnet horizontally which would mean that the rat in the probe had to be suspended inside of the magnet. Thus, we anesthetized each of the male rats so that they would maintain their tranquility. Using isoflurane as our anesthetic of choice, we were able to put the rats to sleep non-invasively through a mask which the rats were able to breathe without compromising them or the experiment.

Chemotherapy: BCNU (Carbamatone)
The remaining thirty-eight rats with the 9L rat glioma were not all treated with chemotherapy. This was done for various reasons. To begin, we encountered some complications with the growth of the 9L rat glioma cells within the rats. Some of the cells multiplied to such an extent where the growth of the tumors was too much for the rat to handle. Thus, some of the rats had to be euthanized far in advance in comparison to their group counterparts. As such, a total of thirteen rats were treated with chemotherapy as of 18.07.2008. The remaining groups will be treated differently and accordingly so as to fit their cancer treatment.

CONCLUSIONS
Further investigation is required in order to determine whether or not MR imaging is truly a good biomarker for cancer treatment. Pictures of great detail were collected from the 900 MHz 21.1 T magnet, but many more must be gathered in order to conclude if MR imaging will indeed predict successfully if chemotherapy is going to work for a patient's brain cancer. Here, 9L rat glioma was used as the model for brain cancer in humans, and as such, more images will be needed before MR imaging can be depended on in aiding a doctor's diagnosis and potential treatment of a patient's brain cancer; bearing in mind that this is not the end of this experiment and that more trials are going to be made in the near future.

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