

# The Development of an Inquiry-Based Laboratory Module Exploring the Pathophysiology of Diabetes

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Histotechnology is a commonly used tool in medical research, pathological testing, and pharmaceutical development. Given this, we designed an inquiry-based laboratory module that equips our students with knowledge of tissue sampling, processing and imaging so that they are ready for professional careers in the biomedical sciences. Treated rats were injected with streptozotocin (a known diabetagen that destroys pancreatic beta cells) while control rats were injected with buffer solution. Rats were sacrificed one week following treatment. Pre- and post-injection weights were compared following one week of treatment, as well as final blood samples for glucose analysis and insulin determinations using an enzyme-linked immunosorbent assay (ELISA). Additionally, pancreatic tissue was collected and fixed in Bouin's fixative. Paraffin embedded tissue was sectioned using a microtome, and hematoxylin/phloxine staining was performed by the students. The number of islet beta cells were compared between control and treated rats. Blood glucose measurements demonstrated that streptozotocin-treated rats had significantly higher blood glucose levels and lower beta cells numbers, while the ELISA tests indicated that treated rats had significantly lower blood insulin concentrations. Following this three-week laboratory module, students scored higher on competency tests and presented an individual poster with images and quantitative data analysis that included insulin concentrations, blood glucose levels, and histological images of pancreatic islets, in addition to beta cell quantification. Overall, students gained hands-on experience with hypothesis testing and an understanding of the pathology of diabetes.

**Keywords:** pathophysiology of diabetes, inquiry-based laboratory

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