2017 PSBR High School Essay Contest
Grand Essayist

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I have so many fond memories of my grandfather, from spending Christmas at his house, to playing cornhole in the summer, to watching with fascination as he gave me a demonstration of what is both his passion and career: glassblowing. In his house as well as mine, beautiful glass vases, cups, and decorations occupy every free shelf. In 1983, however, he was diagnosed with Type 1 diabetes. Now, he owes his very existence to the cutting-edge biomedical research that developed the modern insulin pump.

Diabetes has quite a long history, with the earliest written record being an Egyptian papyrus written by the physician Hesy-Ra in 1552 B.C. Since then, numerous advancements have been made in the field, culminating in the groundbreaking, yet still improving, technology that exists today. In the first few millennia since Hesy-Ra's record, scientists explored a large variety of possible treatments, such as exercise, herbal remedies, and a starvation diet. None of those, however, proved to be particularly effective. Then, in 1889, Joseph von Mering and Oskar Minkowski made a revolutionary discovery. They removed the pancreases of dogs and observed that the dogs quickly developed the common symptoms of diabetes. By establishing the pancreas' role in diabetes, they paved the way for future discoveries, especially those made by Sir Frederick Grant Banting, Charles Herbert Best, and James Collop. In 1921, Banting and Best were able to reverse the symptoms of diabetes using dog pancreatic islets of Langerhans cells. Parts of the islets, called beta cells, produced insulin. This inspired the two, along with Collop, to purify insulin from cow pancreases. The next year, Leonard Thompson received the first successful insulin injection-- a huge step forward in biomedical diabetes research (Swidorski).

Eli Lilly and Company became the first to produce insulin commercially in 1923. Then, the very first wearable insulin pumps were created by Dean Kamen in 1976. The pumps used a plaster-fixed cannula to perform subcutaneous insulin infusions, allowing a constant rate of basal insulin delivery. These pumps were a major breakthrough in diabetes research because of their ability to both monitor glucose levels in the blood and add insulin at regular intervals.

Since then, insulin pumps have progressed rapidly; many modern ones have features like detailed data collection, alarms, a waterproof structure, and wireless data transmission (Palinski-Wade). A recently created insulin pump, the Medtronic 670G system, was the first hybrid closed-loop system to be approved by the FDA. The pump was able to automatically adjust the flow of basal insulin through an algorithm and the data measured by the continuous glucose monitor. The pump is not yet able to automate the regulation of bolus insulin flow, as it is a hybrid closed-loop system; however, its revolutionary technology has made great contributions to diabetes treatment. Currently, projects aspiring to create an artificial pancreas, which is considered to be the holy grail of biomedical diabetes research, are

underway. This advancement in biomedical research could not only allow my grandfather to pursue his passion worry-free, but it could also help millions of people worldwide to live without the burden of diabetes.

Throughout history, animal research was an essential element in biomedical research for diabetes. Without animal testing, Banting; Best; and Collop would have never purified insulin, and the insulin injections used prior to the 1980s, which contained pig and cow insulin, would never have saved thousands of lives. Even today, animal testing is used to determine the effectiveness of diabetes treatments without having to perform strenuous, time-consuming, and potentially dangerous human clinical trials. While critics argue that animal testing is cruel and harmful to animals, the testing is critical to developing technology with the potential to save many lives-- both animal and human.

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