

2023 PSBR High School Essay Contest
1st Place

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Biomedical Research and My Life

Before the defibrillator, an uneven heartbeat, or AFIB (atrial fibrillation), was quite dangerous. With the invention of the defibrillator, an instrument that restores a regularly paced heartbeat, it's a much less severe issue than it once was. About a year ago, my father had a heart attack that put him in the hospital for 2 weeks. He had a defibrillator implanted in his chest, which has helped to regulate many cardiac issues. The defibrillator has seen nearly 100 years of innovations, variations, and improvements. Some major innovations to the defibrillator and its development couldn't have been possible without the help of animal testing.

The best place to begin is with a man who helped discover defibrillation itself, Bill Kouwenhoven. William Bennett Kouwenhoven was born in Brooklyn, New York City, in 1886. Curious about the ties between medicine and electricity, he wrote multiple papers on the topic and graduated with a doctorate in electrical engineering. He was hired as a teacher in Electrical Engineering at John Hopkins University. In 1928, neurologist Orthello Langworthy added Kouwenhoven to a team of men who were testing the effects of electrical shock to the heart. This team discovered that low voltages of electricity to the heart would cause ventricular fibrillation(VF). 5 years later, this team applied a countershock (a term coined by Kouwenhoven) to a dog experiencing VF. This shock restored a regular heart rhythm in the dog. This discovery opened a whole new world of cardiac care. Using the discoveries that the team found, Kouwenhoven eventually researched into the creation of a closed-chest defibrillator. After some time, his new team developed a prototype for the closed-chest defibrillator and tested it on a dog.

One person who utilized Kouwenhoven's invention to create their own was Frank Pantridge, the inventor of the fully portable defibrillator. Born in 1916, he was a medical officer in Ireland during WW2. He was known to keep himself calm during intense situations and was very selfless. He was captured by Singapore and was forced into slave labor for a few years. In one of the slave camps Pantridge suffered in, he had cardiac beriberi, which is a usually fatal heart disease. His survival of this disease may have sparked his interest in cardiology research. He survived the slave camps and moved to Michigan for his studies. Pantridge returned to Ireland in 1950. There, he developed an unusually small defibrillator. He utilized a fail-safe mechanism that wouldn't shock the recipient unless VF is present. He believed that a defibrillator was equally as important as CPR.

A second person who added onto Kouwenhoven's work was a man named Michel Mirowski. Mirowski invented and developed the first implanted defibrillator. He and his family were captured and imprisoned by the Nazis in 1939. He escaped his imprisonment and fled to Poland at the young age of 15. When he was able to return to Warsaw, he discovered that his entire family had been killed. Mirowski soon met his wife, and the couple moved to Israel. This was so he could practice his medical studies. In Israel, Mirowski was recommended to work with a pediatric cardiologist in Baltimore, which prompted him to move there. In 1968, Mirowski developed a miniature defibrillator that was entirely automatic. Thus, the implanted defibrillator was born. His invention got him into the National Inventors Hall of Fame in 2002.

Innovations to the defibrillator aren't exclusively in the distant past. In 2005, Li-Kuan Cheng, Yu-An Chiou, and Shien-Fong Lin determined the effects of various wavelengths on the process of defibrillation. For their experiments, they used 6 rat's hearts. Each rat underwent VF via electrical induction using 4 different frequencies, 125Hz, 250 Hz, 500Hz, and 1000Hz. This testing revealed that the higher the wavelength, the more efficient the defibrillation is. 1000Hz, for example, had a 100% success rate, whereas 125Hz had a 16% success rate.

Over history, the use of animal testing in the advancement and creation of defibrillation has been prominent, whether it be Kouwenhoven's testing on dogs or the more modern scientists conducting tests on rat hearts. Without the usage of animal testing, the field of biomedical science would likely not be as advanced as it is. My father can thank the scientists who conducted the research to create the treatment for fibrillation. Their work has helped my dad to stay as healthy as he can. Hopefully, in the future, this field continues to advance and become more beneficial to those suffering from AFIB.

Works Cited

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