

Adrenaline: what's in a name?

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The most famous member of the catecholamine family has two names--adrenaline and epinephrine. Its chemical father, the chemical messenger of the sympathetic nervous system, also has two names--noradrenaline and norepinephrine. Here is how this happened.

After the reports by Oliver and Schäfer in the late 1800s about the unexpected and profoundly powerful effects of injected extracts of the adrenal gland, researchers worldwide began attempts to identify the "active principle." One of these researchers was John Jacob Abel, of Johns Hopkins, who devoted about a decade of his life to this project. In 1897 he reported isolation of a benzoyl derivative of what he called epinephrine. This proved not to be epinephrine itself. The first person to isolate the active principle of the adrenal gland was Jokichi Takamine, who visited Abel in 1900. In a 1927 lecture, Abel recalled the visit and its consequences:

After I had completed the above described investigation and while I was still endeavoring to improve my processes, I was visited one day by the Japanese chemist, J. Takamine, who examined with great interest the various compounds and salts of epinephrine that were placed before him. He inquired particularly whether I did not think it possible that my salts of epinephrine could be prepared by a simpler process than mine, more especially without the trouble and in this case wasteful process of benzoylating extracts of an animal tissue. He remarked in this connection that he loved to plant a seed and see it grow in the technical field. I told Takamine that I was quite of his opinion and that the process could no doubt be improved and simplified. . . . Takamine prepared supra-renal extracts more concentrated than mine and without first attempting to separate the hormone from its numerous concomitants by benzoylating or otherwise, simply added ammonia--the reagent that I had so long employed--to his concentrated extracts, whereupon he immediately obtained the native base in the form of burr-like clusters of minute prisms in place of the amorphous base. I have often asked why I had not myself attempted to solve the problem in this very simple fashion.

Takamine had set up a laboratory in New York City, under the patronage of Parke, Davis & Company. After Takamine's visit with Abel, a chemist hired by Takamine successfully crystallized, and therefore isolated in pure form, what Takamine called adrenaline. In 1901, Takamine reported this first successful crystallization of a hormone. Almost simultaneously, Thomas Aldrich, a colleague of Takamine at Parke-Davis (and, probably not coincidentally, a former assistant of Abel at Johns Hopkins), correctly deduced its chemical structure. Since Abel never published the correct chemical structure, medical historians gave Takamine and Aldrich the credit for one of the most important medical scientific feats ever--the first chemical identification of a hormone. In 1904, Friedrich Stolz synthesized adrenaline entirely chemically; adrenaline therefore was also the first hormone to be produced artificially in a laboratory.

Takamine's royalties from the patent for Adrenalin (a word trademarked by Parke-Davis) enabled him to found three companies, including Sankyo Pharmaceutical

Company, which today is a large drug company in Japan. Takamine also funded the gift of cherry trees that grace the Tidal Basin in Washington, DC.

What about Abel? He continued to pursue his career goal of identifying, isolating, and purifying hormones. One of these was insulin, which he crystallized in 1926. Until his death in 1938 he ran a renowned laboratory and teaching program at Johns Hopkins. He helped found the American Society for Pharmacology and Experimental Therapeutics and served as editor of the society's official journal, the *Journal of Pharmacology and Experimental Therapeutics* (JPET), for 23 years. Abel never rivaled Takamine in monetary success, but he did acquire the wealth of a good name. Scientific reports in American journals, such as JPET, still use the word that Abel introduced, "epinephrine," whereas European journals use Takamine's "adrenaline."