

Odd experiments by 'America's first physiologist' shed light on digestion

April 24 2013

A fur trader who suffered an accidental gunshot wound in 1822 and the physician who saw this unfortunate incidence as an opportunity for research are key to much of our early knowledge about the workings of the digestive system, say speakers of an upcoming symposium.

These speakers—Jay Dean, Ph.D., of the University of South Florida, Richard Rogers, Ph.D., of Pennington Biomedical Research Center, Louisiana State University, and Patrick Lambert, Ph.D., of Creighton University—will give their symposium presentation entitled, "William Beaumont: America's First Physiologist and Pioneer of Gastrointestinal Research," at the Experimental Biology 2013 meeting, being held April 20-24, 2013 at the Boston Convention and Exhibition Center, Boston, Mass. The symposium is sponsored by the [American Physiological Society](#) (APS), a co-sponsor of the event.

Food on Strings

Dean, a physiologist who studies the [nerve cells](#) that control heart rate and breathing and an amateur historian, explains that army physician William Beaumont was stationed at Fort Mackinac on Mackinac Island in Michigan in the early 1820s. The army facility, established to protect the interests of the American Fur Company, became the refuge for a fur trader named Alexis St. Martin was accidentally shot in the abdomen at close range on June 6, 1822.

It was a serious wound—St. Martin's stomach was perforated, several of his ribs were broken, and the shot blew off several muscle fragments. Beaumont didn't expect St. Martin to survive, but the fur trader surprised him. Over the next year, St. Martin healed remarkably, but the skin around the wound fused to the hole in his stomach, leaving a permanent opening called a gastric fistula.

"As Beaumont tended to St. Martin over the next three years, he realized that this was really a serendipitous event," Dean says. "It dawned on him that there could be a research opportunity in this."

At the time, Dean explains, not much was known about digestion. To gain insight about this vital function, Beaumont performed a series of 238 experiments on St. Martin intermittently over an eight-year period. In all, experiments were conducted at four different rustic military outposts spanning the unsettled Great Lakes region to the East Coast. Twice, Beaumont had to convince the reluctant St. Martin to return from Canada to his frontier lab to continue the experiments. Many of these experiments involved inserting bits of different foods tied to strings through the hole in St. Martin's stomach, pulling them out periodically to observe digestion. Beaumont also removed gastric juice, examining it to better understand its nature.

Seizing the Opportunity

Beaumont's observations, published in 1833 in a lengthy book entitled "Experiments and Observations on the Gastric Juice and the Physiology of Digestion," form the basis of much of the early knowledge on digestion. Many of his observations have proven true with today's more sophisticated research techniques, Dean says.

For example, Beaumont discovered that hydrochloric acid is the main chemical responsible for breaking down food. He proposed the existence

of a second important digestive chemical, which scientists now know is the enzyme pepsin. His experiments "digesting" food in a cup with St. Martin's extracted gastric juices showed that digestion is a chemical process, not merely a mechanical one caused by stomach muscle movement. His work also provided insights on how emotions, temperature, and physical activity can affect digestion.

From performing such intensive investigation in America's early days, Beaumont is now recognized as America's first physiologist, Dean says. Today, numerous hospitals are named after this physician-scientist.

Despite St. Martin's unusual wound, which never healed, he ended up outliving Beaumont and fathering numerous children.

Much of Beaumont's success relied on seizing an unexpected break, Dean says. "St. Martin ended up becoming Beaumont's living laboratory," Dean adds. "He recognized an opportunity that hadn't been planned on and exploited it to gain important knowledge, something good scientists often do today."

Provided by American Physiological Society

Citation: Odd experiments by 'America's first physiologist' shed light on digestion (2013, April 24) retrieved 8 May 2024 from <https://medicalxpress.com/news/2013-04-odd-america-physiologist-digestion.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.