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# 19th Century Developments in Food Preservation

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## 19<sup>TH</sup> CENTURY DEVELOPMENTS IN FOOD PRESERVATION

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By Jessica Mitchell

The availability of food supplies plays a crucial role in the survival of a population. The Irish Potato Famine is a prime example of a disaster that ensues when a group of people lose a large portion of food normally used to sustain life. Though the famine could not have been prevented by food preservation methods, it still displays the importance of the developments in making food storage more practical, accessible, and durable. Through varying tactics, three European men in the 19<sup>th</sup> century contributed essential groundwork for the development of food preservation and safety to reach modern standards. Nicholas Appert, the pioneer who paved the path, Peter Durand, the developer who improved on Appert's base, and Louis Pasteur, the innovator who finalized a modern approach to the safety and conservation of perishables, redefined the ways that food was consumed and stored with their cultivation of procedures like sealing, canning, and pasteurizing.

Nicolas Appert was not the first nor the last person to discover a lasting way to combat food spoilage. Since ancient times, people have utilized the shielding qualities of cold, salt, smoke, and fermentation against the decay of perishable foods.<sup>1</sup> Though these methods have been used throughout the centuries, it was not until the early 1800s that Appert used the expertise of his background as a chef and confectioner to hone the skill of preserving food in glass vessels.<sup>2</sup> Appert's inspiration to experiment stemmed from his disdain for the typical

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<sup>1</sup> Socrates A. Kaloyereas, "On the History of Food Preservation." *The Scientific Monthly* 71, no. 6 (1950): 422-24. <http://www.jstor.org/stable/20208> (accessed April 10, 2018), 422.

<sup>2</sup> Sue Shepard, *Pickled, Potted, and Canned: How the Art and Science of Food Preserving Changed the World*, New York: Simon & Schuster Paperbacks, 2006, 226.

## *Tenor of Our Times*

issues associated with the original methods of preservation: “the drying took away the aroma, changed the taste of the juices, and hardened the fibers, making the food difficult to chew;” he also noted that “salt gave the food an unpleasant acerbity and made it tough and indigestible.”<sup>3</sup> For many years, he experimented alone to find a new procedure to keep food edible without diminishing its qualities and nutrition. When people began rioting in Paris in 1795 over the soaring price of sugar, Appert moved outside of the city and devoted even more of his time to investigating his methods of preserving food.<sup>4</sup>

The French army was so desperate to prevent scurvy among their men, the government even offered a reward of 12,000 francs to “anyone who could find a means of preserving the victuals of soldiers and sailors.”<sup>5</sup> Not only did Appert send several sealed glass jars to the French navy to collect the prize, but he also began selling his jars of food within his village. These jars were used in 1803 after months of storage when a fleet of French ships were blockaded by the British. The sailors were incredibly appreciative of Appert’s products because they sent back a positive report that “the broth in bottles was good, the broth with boiled beef in another bottle was very good as well but a little weak; the beef itself was very edible. The beans and green peas, both with and without meat, have all the freshness and flavor of freshly picked vegetables.”<sup>6</sup> His invention had excelled enough to earn him the prize money awarded by The Bureau Consultatif des Arts et Manufactures.<sup>7</sup> Benefitting financially from his success, Appert was able to convert his humble

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<sup>3</sup> Sue Shepard, *Pickled, Potted, and Canned: How the Art and Science of Food Preserving Changed the World*, 227.

<sup>4</sup> Shepard., 228.

<sup>5</sup> Toussaint-Samat, Maguelonne, *History of Food*, 1926; Reprint, Malden, MA: Blackwell Publishing Ltd., 2003, 737.

<sup>6</sup> Shepard, *Pickled, Potted, and Canned: How the Art and Science of Food Preserving Changed the World*, 228.

<sup>7</sup> Toussaint-Samat, Maguelonne, *History of Food*, 738.

## *19th Century Developments in Food Preservation*

workshop into a fully thriving industry. This establishment was “employing 25 to 40 women during the summer to prepare and bottle the vegetables, while a shop...sold them.”<sup>8</sup> In a book that he later published, he described not only his preservation method but his workspace as well. He depicted his shop as being a “laboratory” with “four apartments” that all housed a different portion of the process.<sup>9</sup> In the first apartment, all substances from animals to broth are properly prepared for preservation by a multitude of kitchen essentials. In the second apartment, substances like milk, cream, and whey are carefully prepared for their preservation. In the third apartment, after substances going into the jars has been readied, they were corked and put into bottles, vessels, and bags. Finally, in the fourth apartment, heat was applied with “three large copper boilers” in a “water-bath” fashion to the corked and bagged glass vessels.<sup>10</sup> His “milk and vegetables in his little bottles turned out to keep remarkably well” using this process, so it was approved by two committees in both 1804 and 1810.<sup>11</sup>

The press of the time was impressed by the work that Appert had managed to achieve as exhibited through their attention to his revolutionary method of food preservation. In February of 1809, *The Courier de l'Europe* stated that “M. Appert has found a way to fix the seasons; at his establishment, spring, summer and autumn live in

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<sup>8</sup> Ibid., 738.

<sup>9</sup> Nicolas Appert, *The Art of Preserving All Kinds of Animal and Vegetable Substances for Several Years: A Work Published by Order of the French Minister of the Interior, on the Report of the Board of Arts and Manufacturing*, Charleston: CreateSpace Independent Publishing Platform, 2015, 21.

<sup>10</sup> Appert, *The Art of Preserving All Kinds of Animal and Vegetable Substances for Several Years: A Work Published by Order of the French Minister of the Interior, on the Report of the Board of Arts and Manufacturing*, 21-22.

<sup>11</sup> Toussaint-Samat, Maguelonne, *History of Food*, 738.

## *Tenor of Our Times*

bottles.”<sup>12</sup> The spread of Appert’s influence did not stop with the media’s praises. In 1810, he published his own book outlining his preservation process called *The Art of Preserving: All Kinds of Animal and Vegetable Substances for Several Years*. He shared his methods “so that everyone could preserve food at home” without a patent.<sup>13</sup> This simple process of heating and sealing glass jars was summed up in a few chapters in the beginning of his book before he continued to describe the additions to the process necessary for specific substances like gravy or grape syrup.<sup>14</sup>

The same year that Appert’s book was published, an English merchant, Peter Durand, received a patent for his canning process that held a great deal of similarities to Appert’s. While Appert published his findings to the world for just the price of a book, Durand sold his patented method to engineers for a thousand pounds.<sup>15</sup> There remains a lot of controversy whether Durand’s idea was original or copied from Appert’s work. Also, there is some speculation to whether Durand and Appert were working together on these projects.<sup>16</sup> Regardless of the uncertainty, Peter Durand still managed to make his mark on history for his major contributions to the next phase of food preservation: canning.

Though using a similar method of preserving as Appert had with his glass jars, Durand investigated keeping food in tin cans. In an experiment, Durand convinced Captain George King to take some of Durand’s cans of food with him on his voyage from November of 1812 to July of 1813. Upon return, Captain King reported that the food was

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<sup>12</sup> Ibid., 738.

<sup>13</sup> Ibid., 738-739.

<sup>14</sup> Nicolas Appert, *The Art of Preserving All Kinds of Animal and Vegetable Substances for Several Years: A Work Published by Order of the French Minister of the Interior, on the Report of the Board of Arts and Manufacturing*, 11-13.

<sup>15</sup> Shepard, *Pickled, Potted, and Canned: How the Art and Science of Food Preserving Changed the World*, 233.

<sup>16</sup> Ibid., 233-238.

## *19th Century Developments in Food Preservation*

equally good throughout the trip; he even speculated that “I have no doubt [the cans] will keep in all climates.”<sup>17</sup>

In his patent, Durand described his method in detail that was comparable to Appert’s book. There were two main steps to Durand’s process. First, the substances intended for storage were enclosed in a vessel (mainly tin cans) and sealed by corking. Second, once the vessels were closed, they were wrapped in straw or cloth and placed in a boiler filled with water. Durand also mentioned that vegetables and meats should not be fully cooked when placed in the can because they will heat in the water-bath and cook further. Finally, he recommended the use of tin cans over any other type of jar because of the lack of fragility when traveling on the seas.<sup>18</sup>

Many years later, Louis Pasteur presented a different type of measure to preserve food in its safest state for consumption to France. Pasteur was a scientist who had a passion for experimentation; this drove him to become a leader in his field and contribute many discoveries to modern science.<sup>19</sup> Pertaining to food, Pasteur is most famous for the process that bears his name to this day: pasteurization.<sup>20</sup>

In order to eventually develop pasteurization, Pasteur had to do some preliminary work with fermentation to understand the root problem. Though it was contemporary scientific thought that the agents responsible for fermentation developed through “spontaneous generation,” Pasteur had conducted enough studies with droplets of wine

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<sup>17</sup> *Ibid.*, 242.

<sup>18</sup> "Specification of the Patent Granted to Peter Durand, of Hoxton-Square, Middlesex, Merchant; for a Method of Preserving Animal-Food, Vegetable-Food, and Other Perishable Articles, a Long Time from Perishing or Becoming Useless." *The Belfast Monthly Magazine* 7, no. 38 (1811): 219-20. <http://www.jstor.org/stable/30073956> (accessed February 13, 2018).

<sup>19</sup> Rene J. Dubos, *Louis Pasteur: Free Lance of Science*, Boston: Little, Brown and Company, 1950, 87.

<sup>20</sup> *Ibid.*, 23.

## *Tenor of Our Times*

under microscopes to pinpoint the difference in anaerobic and aerobic organisms.<sup>21</sup> Pasteur was also able to determine that “in ageing...wine sometimes deteriorates as if by the action of new fermentations...the new, unwanted fermentations were carried on the hands of grape-pickers (not to mention the feet of grape-crushers), and contaminated the [wine].”<sup>22</sup> Pasteur experimented with a number of chemicals to decontaminate the wine but finally decided that “heat as a sterilizing agent” held the most promise.<sup>23</sup> Many at the time thought that heating the wine would essentially take away its wine-like qualities, but Pasteur proved that “heating to a temperature of 53 degrees centigrade, followed by immediate and swift cooling, neutralized the unwanted pathogenic germs and did not spoil the flavor of the wine.”<sup>24</sup> Around this temperature, the heat was “sufficient to improve the keeping qualities of ordinary wine” and must be “applied only after the oxygen originally present in the bottle had become exhausted.”<sup>25</sup> From pasteurization’s conception in the wine industry, it moved to other areas with spoilage problems like dairy. Pasteur found that with milk, “it is only necessary to heat it to about 60°C.”<sup>26</sup>

Like Appert and Durand, Pasteur also had his findings published. In 1857, Pasteur “presented in his preliminary paper on lactic acid a precise statement of the laws and methodology of a new science devoted to microorganisms and to the role they play in the economy of

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<sup>21</sup> Toussaint-Samat, Maguelonne, *History of Food*, 740.

<sup>22</sup> *Ibid.*, 741.

<sup>23</sup> Rene J. Dubos, *Louis Pasteur: Free Lance of Science*, Boston: Little, Brown and Company, 1950, 151.

<sup>24</sup> Toussaint-Samat, Maguelonne, *History of Food*, 741.

<sup>25</sup> Dubos, *Louis Pasteur: Free Lance of Science*, 151.

## *19th Century Developments in Food Preservation*

matter.”<sup>26, 27, 28</sup> He followed by stating in 1861 that “fermentation is life without oxygen,” but he did not fully justify the claim until 1872.<sup>29, 30</sup>

Armed with his now tried-and-true method of pasteurization, Pasteur visited some of the largest beer breweries in London to share his knowledge in 1871. In one brewery, he found numerous foreign ferments in the beer and showed the shocked managers the lesser quality of yeast to which they had recently switched. Pasteur furthered his knowledge of the process of beer to aid in his experiments, and he even published a book, *Studies on Beer* after all of his discoveries. In France, the Congress of French Brewers “gave to Pasteur the credit for the great improvements which had been made in the brewing industry” due to his “‘pasteurizing’ beer and wine” in 1889.<sup>31</sup>

In conclusion, during the course of the 19<sup>th</sup> century, Europe produced some of the most prominent figures in the food preservation industry. Nicolas Appert, Peter Durand, and Louis Pasteur gave the world essential means of keeping food edible for long periods of time, allowing society to advance beyond having to collect food daily for subsistence. Nicolas Appert made the initial discovery of how heat could aid in preservation by sealing glass bottles and dropping them into a boiling water-bath. Peter Durand followed quickly with his discovery that, in addition to Appert’s process, tin cans were better equipped to make voyages across the seas and elsewhere because of their sturdy quality; this led to the method of canning as it is known today. Louis Pasteur settled the issue of early spoilage in wine, beer, and milk by developing the process of pasteurization that heated the substance at a

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<sup>26</sup> S.J. Holmes, *Louis Pasteur*, 1924; Reprint, New York: Dover Publications, Inc., 196, 65.

<sup>27</sup> *Ibid.*, 65.

<sup>28</sup> *Ibid.*, 360.

<sup>29</sup> *Ibid.*, 360-361.

<sup>30</sup> *Ibid.*, 90.

<sup>31</sup> S.J. Holmes, *Louis*, 90.



## *Tenor of Our Times*

relatively low temperature and then quickly cooled it off to kill any outside fermentation contaminants. From the ancient times when humans would use salt, smoke, and dehydration as ways of keeping food, to modern times when actually preserving food without compromising its qualities was made possible through the findings of the 19<sup>th</sup> century, the care and storage of food has come a long way.