Easing Disease:

The Communication of Louis Pasteur's Revolutionary Discoveries that Facilitated the Understanding of Germ Theory

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Group Website

Student-Composed Words: 1197

Multimedia Time: 2:55 minutes

Bibliography

Primary Sources

Anti-Spitting Poster. 1919-1929. Image. Accessed January 29, 2021. https://www.loc.gov/resource/anrc.13865/.

This is an image of an anti-spitting poster that was published in the 1900s. Spitting was once a widely done act, and this visual demonstrates the effects of public health that occurred because of Louis Pasteur's contributions to Germ Theory and the way that society's understanding of disease changed to later prohibiting this act (which often spread disease to others near them).

Bain News Service, N.Y.C. Women's Fashions: Paris, Apr. 1913. April 1913. Photograph. Accessed February 3, 2021. https://www.loc.gov/item/2004682018/.

A photograph from 1913 that exemplifies the trends in women's fashion. It reveals that skirts/dresses were typically shorter in length during the 1900s, or a change in the length of skirts on womens´ dresses, which was caused by society's acceptance that microorganisms can be transported wherever the bottom seams of the dress touched the ground.

Bastian, H. Charlton. "Remarks on a New Attempt to Establish the Truth of the Germ-Theory." *The British Medical Journal* 1, no. 788 (February 5, 1876): 157-59. Accessed January 31, 2021. https://www.jstor.org/stable/25242726.

The JSTOR database provided us with many journal articles, including this journal written by Dr. Bastian and published by *The British Medical Journal.* This source was used in the "Spontaneous Generation Debates" section to demonstrate, through journals, that Pasteur actively communicated with other scientists who disagreed with his viewpoints.

Bastian, H. Charlton. "Further Observations on the Temperature at Which Bacteria, Vibriones, and Their Supposed Germs Are Killed When Exposed to Heat in a Moist State; And on the Causes of Putrefaction and Fermentation." *Proceedings of the Royal Society of London* 21 (1872-1873): 325-38. https://www.jstor.org/stable/113052.

A journal published by one of Louis Pasteur´s most notorious opponents, Dr. Charlton Bastian. This journal was used in the ¨Fermentation Discoveries¨ section in which Dr. Bastian claimed that Pasteur's experiment results were invalid because Pasteur had been using faulty methods of experimentation.

Berghaus, Albert, and Carrie Syphax Watson. *Corticelli. "How Corticelli silk is made." An illustration of the mode of producing silk / Berghaus.* 1878-1880. Image. Accessed February 5, 2021. https://www.loc.gov/item/2017646674/.

An image describing the improved process of harvesting and cultivating silk from silkworms. It provided us with information on how the process had been conducted following Louis Pasteur's research on diseases affecting silkworms in the silk industry.

Bulletin of the History of Medicine. *An Inoculation for Hydrophobia*. December 19, 1885. Image. Accessed February 1, 2021. https://www.jstor.org/stable/44446035.

This source was used for an image in the ¨Developments in Vaccinations¨ sections. It indicates Joseph Mister receiving the first rabies vaccine which was created by Louis Pasteur (who can be seen spectating the vaccination on the left behind the boy).

Chicago Anti-Spitting Campaign. Image. A History of Public Health in Illinois. Chicago, IL. Accessed February 2, 2021. http://www.idph.state.il.us/timeline/1900tb.htm

This source features a quote from William A. Evans, Chicago´s Commissioner of Health during the 1900s. The quote was used in the ¨Short-Term Effects¨ section to demonstrate that public health standards began to change after Germ Theory was accepted.

Conn, H.W. "Louis Pasteur." *Science New Series* 2, no. 45 (November 8, 1895): 601-10. Accessed January 28, 2021. https://www.jstor.org/stable/1624392.

An academic journal that was published in the 1800s by an American bacteriologist who reflected on Louis Pasteur´s process in his contributions to society. Quotes from this journal were used to provide historical context in ¨Events Occurring in France,¨ and in the ¨Developments in Vaccination,¨ section to describe his anthrax vaccine efforts. This source provided us with an understanding of how and why Pasteur conducted his research.

Daye, Nana. *Take Matters into Your Own Hands--Wash Them!, Support the Vulnerable, Keep Your Distance, Flatten the Curve*. Illustration. 2020. Accessed February 2, 2021. https://www.loc.gov/resource/ppss.01116/.

This is a digital poster that was released in 2020 during the COVID-19 pandemic. It features a man who advocates a few, simple steps to stay safe and it was used to demonstrate that Louis Pasteur still influences scientific fields like the field of epidemiology which implement ways to prevent disease from spreading.

"Edwin Chadwick: Report on Sanitary Conditions (1842)." In World History: The Modern Era, ABC-CLIO, 2020. Accessed November 23, 2020. https://worldhistory.abc-clio.com/Search/Display/354551.

On behalf of the Poor Law Commissioners, Edwin Chadwick, an English social reformer, issued this report that attempted to improve sanitation in Great Britain. It was used as a quote on the "Worldwide Context" page to describe the horrible living conditions in Great Britain.

Fleming, George. *Pasteur and His Work: From an Agricultural and Veterinary Point of View*. London, England: William Clowes, 1886. https://wellcomecollection.org/works/dsm3nzv7.

This is a book written from the perspective of a Scottish veterinary surgeon who reflects on the causes that prompted Pasteur to study silkworms as well as the short-term impacts that Pasteur had during the 1800s. Quotes were taken from this book that were used in the "Events Occurring in France" section, the "Developments of Vaccinations," and the "Long-Term Impacts" section.

Godkin, E. L. "Newspapers Here and Abroad." *The North American Review* 150, no. 399 (February 1890): 197-204. https://www.jstor.org/stable/25101936.

A quote from a journal that was used in the ¨Newspapers: Role in Communication¨ section. This journal highlights the significance of newspapers in the mid-1800s and explains that an increase in the amount of individuals reading newspapers was caused by more efforts to educate ordinary citizens in education systems. It provided comparisons of the readership of newspapers in the United States and other European countries like England.

Halstead, A.S., and G.L. Angeny. Memorandum, "Department of the Navy: Precautions Against Influenza," February 3, 1920. https://www.archives.gov/news/topics/flu-pandemic-1918.

The United States Navy issued a list of tips that detailed actions that should be avoided, especially in the context of the Spanish Flu. This document indicates that society (in this case, American society) was starting to accept germ theory. It was used on the "Short-Term Impacts" part of the website.

Hearings Before The Conference for Food Protection (2014) (statement of Dangers of Raw Milk Products for Human Consumption). Accessed January 28, 2021.

http://www.foodprotect.org/media/biennialmeeting/Sample%20of%20Letter%20to%20Senate%20on%20Unpasteurized%20Milk.pdf.

This letter to the United States Senate on the topic of raw milk sales was used in the ¨Pasteur´s Legacy¨ section of our website. It provides statistics on food borne illnesses relating to milk products.

Heath, William. *A Woman Dropping Her Tea-cup in Horror upon Discovering the Monstrous Contents of a Magnified Drop of Thames Water Revealing the Impurity of London Drinking Water*. 1828. Illustration. Accessed January 17, 2021. https://www.wdl.org/en/item/3956/.

This source was used in the ¨Worldwide Context¨ section as an image. It provided us with context on the filthy living conditions in London that often carried harmful germs which affected the water quality.

Influenza Vaccine Doses Distributed in the United States, by Season. Chart. Centers for Disease Control and Prevention, 2020. Accessed January 29, 2021. https://www.cdc.gov/flu/prevent/vaccine-supply-historical.htm.

A graph that shows a trend in the rise in the number of people in the United States who receive flu (influenza) vaccines. It was used in the ¨Pasteur´s Legacy¨ section of the website.

Keith, Davey. *Keep Your Distance & Prolong Existence*. Illustration. 2020. https://www.loc.gov/resource/ppss.01126/.

This source is a digital poster that depicts a woman staring out of her window towards *novel coronavirus* cells (shown in green) floating outside her home. It provided context on the COVID-19 pandemic, specifically in epidemiology fields, with the safe practice of staying home to prevent the spread of disease.

Krause, Erik Hans. *Keep Clean*. January 5, 1939. Image. https://lccn.loc.gov/98516190.
This is a poster advocating for Americans to wash their hands to prevent disease, which indicated that society was gradually accepting germ theory. It was used in the "Short-Term Impact" page of the website.

Lancet. "The Progress of Diptheria." *The Preston Chronicle and Lancashire Advertiser* (Preston, Lancashire, England), May 21, 1859. https://www.newspapers.com/image/392928462/?terms=diptheria&match=1.

A newspaper published in the 1850s that highlighted a disease known as Diphtheria. It was used in the ¨Worldwide Context¨ section of the website as an image.

Leech, John. "A Court for King Cholera Political Cartoon (Punch, 1852)." In World History: The Modern Era, ABC-CLIO, 2020. Image. Accessed November 24, 2020. https://worldhistory.abc-clio.com/Search/Display/2250738.

A political cartoon that was published in 1852 in Punch Magazine portrays the filthy conditions in London. The image references London's frequent outbreaks of cholera due to the unsanitary living conditions and lack of effective sewage systems.

Library of Congress. *Outside of the Galleries of the House of Representatives during the Passage of the Civil Rights Bill Paris Fashions for April, 1866.* 1866. Illustration. Accessed January 31, 2021. https://www.loc.gov/item/2010652199/.

An image that shows women´s fashion during the 1800s. It was used in the ¨Short-Term Effects¨ part of our website to show womens´ fashion before Germ Theory was recognized as a factual scientific idea.

[Louis Pasteur, bust, full portrait]. Photograph. Accessed October 17, 2020. https://www.loc.gov/item/2018654031/.

This is a photograph of Louis Pasteur from the Library of Congress. We used this image in our "Thesis" section.

Meyer, H. Louis Pasteur, Head and Shoulders; Mother and Child in the Foreground, Allegorical Figure in the Background. Lithograph by H. Meyer, 13 October 1895. October 13, 1895. Photograph. https://wellcomecollection.org/works/dzm578x7.

Louis Pasteur passed away in 1895. This lithograph was published one month following his death, as it depicts him surrounded by angels and venerated for his contributions to the field of science that save thousands of lives. It was used in the "Long-Term Impacts" section of the website.

Missouri Novel Coronavirus Information Hotline. *Help Stop COVID-19*. Image. *Missouri Department of Health and Senior Services*. Accessed February 1, 2021. https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/toolkit.php.

A digital banner educating society on safe practices during the COVID-19 pandemic. It was utilized in the ¨Pasteur´s Legacy¨ sections to exemplify his contributions to health fields such as epidemiology.

Monsieur Pasteur's Experiments for the Cure of Hydrophobia. November 21, 1885. Image. https://wellcomecollection.org/works/jxdzwjnq.

This image was used as a visual on the ¨Developments in Vaccinations¨ section. It depicts Pasteur working with other scientists on a rabbit in order to find a cure for Hydrophobia (rabies).

Moses, Griffith. *Phaloena Mori or Silkworm in Its Various States*. 1819. Image. https://wellcomecollection.org/works/umw9ywpr.

This is an image of the development of a silkworm. It was used in the ¨Events Occurring in France¨ section to provide a visual of a silkworm in the different stages of its life.

Mouritz, Arthur Albert St. *The Flu: A Brief History of Influenza in U.S. America, Europe, Hawaii*. Honolulu, HI: Advertiser Publishing, 1921. http://resource.nlm.nih.gov/101283076.

This book which indicates the conditions of society during the 1900s, particularly in the context of the Spanish Flu, was used in the ¨Short-Term Impacts¨ section of our website. It describes the severity of the disease that many suffered from during this time of the Spanish Flu, explains the history of diseases (in areas including the United States and Hawaii) and suggests sanitary precautions that can be taken against it.

New York. *Quarterly Report of Ladies' Fashions*. c. 1875. Illustration. Accessed February 3, 2021. https://www.loc.gov/item/2018695570/.

An illustration that shows the trends of long skirts during the 1800s. It was used in the ¨Short-Term Effects¨ section to display the fashion trends in the time period before Germ Theory was widely accepted.

Ochmann, Sophie, and Hannah Behrens. "Year of the Last Reported Rinderpest Case." Chart. Our World in Data. September 2018. Accessed January 28, 2021. https://ourworldindata.org/how-rinderpest-was-eradicated.

This was a chart that was used in the ¨Pasteur´s Legacy¨ section of our website. It was used to show a visual representation of the gradual elimination, or eradication, of Rinderpest--an action that may have been nearly impossible to execute without the concept of vaccinations that Louis Pasteur helped to develop.

Opper, Frederick Burr. *Another Patient for Pasteur*. December 16, 1885. Illustration. https://www.loc.gov/resource/ppmsca.28152/.

A political cartoon that was featured in Puck Magazine that denounced Pasteur´s newly developed rabies vaccine. It was used in the "Developments of Vaccinations" sections and provided a critical perspective of those who did not support his work, even despite the proven facts and evidence to support his claims.

Osler, William. "The Evolution of Modern Medicine." Lecture presented at Yale University, New Haven, CT, April 1913. *Project Gutenberg*. Last modified February 4, 2013. Accessed April 5, 2021. https://www.gutenberg.org/files/1566/1566-h/1566-h.htm.

A series of lectures that William Osler delivered at Yale University where he referenced Pasteur's accomplishments, in comparison to the time period that preceded Pasteur. It was used in the "Legacy" section to show the positive impacts that Pasteur's discoveries have on society.

Outside of the Galleries of the House of Representatives during the Passage of the Civil Rights Bill Paris Fashions for April, 1866. 1866. Image. Accessed February 1, 2021. https://www.loc.gov/item/2010652199/.

This is an image of women wearing the latest fashion trends during 1866. It was used in the ¨Short-Term Effects¨ section of the website as a visual for fashion standards before Germ Theory had been accepted.

Pasteur, Louis. *Recherches sur les generations dites spontanees / N. Remond, imp. r. Vieille-Estrapade, Paris.* 1861. Illustration. Accessed November 10, 2020. https://www.loc.gov/item/92517516/.

This image contains a diagram of Pasteur's experiment that explains, visually, the procedures of his fermentation experiment. It was used as an image in the "Spontaneous Generation Debates" section.

Pasteur, Louis. *Vibrations de la flacherie*. Image. https://wellcomecollection.org/works/twnasexf.

This image was used in the ¨Short-Term Effects¨ section. It was used to provide a visual for the diseases that Pasteur discovered within the silkworm industries during the time that he investigated infected silkworms under a microscope.

Pasteur, Louis. "On Changes in the Urine: Being a Comment in a Communication by Dr. Bastian." *The British Medical Journal* 2, no. 816 (August 19, 1876): 235-36. https://www.jstor.org/stable/25237778.

Within the JSTOR database, we accessed a journal that Pasteur had written in response to Dr. Bastian´s critical comments. It was used in the ¨Spontaneous Generation Debates,¨ to exemplify the communication between two groups of scientists who held opposing ideas.

Pasteur, Louis. *Studies on Fermentation: The Diseases of Beer, Their Causes, and the Means of Preventing Them*. Translated by Frank Faulkner and David Constable Robb. Macmillan Publishing, 1879. Accessed April 4, 2021. https://wellcomecollection.org/works/ct8nha3q

This is a translated typescript of Louis Pasteur´s The Physiological Theory Of Fermentation, originally written in French. It was used in the "Events Occurring in France" section as it includes quotes that contextualizes the reasons that Pasteur sought practical solutions in the French wine and beer industries as well as in the section ¨Fermentation Discoveries¨ in which Pasteur replied to Justus von Liebig, a scientist who disproved Pasteur's fermentation arguments and experiments. It showed the communication between scientists who did not agree with Pasteur and Pasteur´s reply to them.

Pasteur, Louis. "Louis Pasteur: Speech on Germ Theory." Speech presented at Académie des Sciences, Paris, France, April 29, 1878. https://worldhistory.abc-clio.com/Search/Display/354657?sTypeId=2.

Louis Pasteur had delivered a speech to the Académie des Sciences. Parts of this speech was used in the form of a quote on the "Spontaneous Generation Debates" page. Pasteur disproves the theory of spontaneous generation; instead, he promotes Germ Theory and its applications to other scientific fields.

Pasteur, Louis, M. "On Chicken Cholera: Study of the Conditions of Non-Recidivation and of Some Other Characteristics of This Disease." *Science* 2, no. 32 (February 5, 1881): 55-57. https://www.jstor.org/stable/2900374.

In this journal published by the American Association for the Advancement of Science, Louis Pasteur explains the process of his chicken cholera experiments. Additionally, he mentions limitations of this new vaccine technology. These quotes can be found in the ¨Development in Vaccination¨ sections.

The Pasteur Boom--High Times for Hydrophobists. December 23, 1885. Illustration. Accessed November 26, 2020. https://digital.sciencehistory.org/works/x0sn5hu.

This political cartoon used satire to criticize Pasteur following his findings that he had developed a rabies vaccine. It was used in the "Development of Vaccinations" section to support the point that at first, when Pasteur communicated his discoveries, many people were dismissive towards his new scientific ideas.

Petit, Pierre. *Louis Pasteur. Lithograph after P. Petit.* Image. https://wellcomecollection.org/works/axxx2dkj.

It is a lithograph of Louis Pasteur, taken as a portrait. This image was used in the "Legacy" section to accompany his quote that briefly discussed the future of science.

Protect the Public from Disease Poster, 1917. c. 1917. Image. Accessed January 29, 2021. https://digitallibrary.hsp.org/index.php/Detail/objects/11273.

This source was used as an image on the ¨Short-Term Impacts¨ section. It demonstrates a change in society´s practices where people advocate for the covering of mouth and nose when an individual sneezes or coughs.

Regulations under Certain Other Acts Administered by the Food and Drug Administration, 21 C.F.R. § 1240.61 (2020). Accessed January 29, 2021. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=1240.61.

This is an updated version of United States regulation regarding dairy pasteurization processes. It was used in the ¨Pasteur´s Legacy¨ section of the website because it demonstrates how pasteurization is still used in today´s society during the sale of milk and other products.

Republican Banner (Nashville, TN). "Yellow Fever at Mobile." Unsigned review. September 1839. Accessed January 20, 2021. https://www.newspapers.com/image/603669148/?terms=yellow%20fever&match=1.

This is a newspaper article that we used as an image on the ¨Worldwide Context¨ page. It provided us with statistics during the mid-1880s when yellow fever outbreaks frequently occurred and infected or even killed many people.

Roll-Hansen, Nils. "Experimental Method and Spontaneous Generation: The Controversy between Pasteur and Pouchet, 1859–64." *Journal of the History of Medicine and Allied Sciences* 34, no. 3 (July 1979): 273-92. https://www.jstor.org/stable/24625803.

This source is a quote that was used in the ¨Fermentation Discoveries¨ section. A supporter of abiogenesis attacked Pasteur for not having enough credible evidence to argue that spontaneous generation is an incorrect theory.

Roux, Pierre Paul Émile, M. "The Croonian Lecture on Preventive Inoculation." *The British Medical Journal* 1, no. 1484 (June 8, 1899): 1269-74. https://www.jstor.org/stable/20219907.

In this journal, M. Roux speaks on Louis Pasteur´s behalf on the progress of vaccines that they have collaboratively developed together, especially relating to chicken cholera and anthrax. This source provided information on the methods that they used to develop the vaccines as well as the beneficial effects of vaccinating sheep on farms. It showed that communication even occurred between Pasteur and his own supporters in order to share and collaborate on the new data that they found.

Schwarcz, Joe. "Will the Virus Have the Last Word?" *McGill Office for Science and Society*. Last modified May 29, 2020. Accessed February 1, 2021. https://www.mcgill.ca/oss/article/covid-19-history/will-virus-have-last-word.

An article published in 2020 that discussed the importance of Louis Pasteur's vaccinations was referenced as a quote in the ¨Pasteur´s Legacy¨ section. It provided information on the methods in which Pasteur's invention of the vaccine is currently being utilized to combat the coronavirus.

Seymour, Robert. *Cholera "Tramples the Victors & the Vanquished Both."* October 1, 1831. Illustration. https://collections.nlm.nih.gov/catalog/nlm:nlmuid-101393375-img.

One of the deadliest diseases of the nineteenth century was Cholera. This illustration shows that Cholera ravaged through communities and continued to spread. It was used in the "Worldwide Context" section.

The Standard (London, Greater London, England). "The Cholera." January 24, 1849. Accessed January 28, 2021. https://www.newspapers.com/image/401596785/?terms=the%20cholera&match=1.

This newspaper source provided us with context on Cholera, one of the most prominent ongoing diseases during the mid 1800s. It was used in the ¨Worldwide Context¨ section for its statistics on Cholera cases and deaths.

The Sunday Oregonian (Eugene, OR), January 12, 1919. https://oregonnews.uoregon.edu/lccn/sn83045782/1919-01-12/ed-1/seq-23/.

Local newspapers across the country published public health service announcements to promote Americans to wear masks as protection during the Spanish Flu. This newspaper published by *The Sunday Oregonian* was used in the "Short-Term Impacts" section of the website.

Thompson, Paul. *To Prevent Influenza!* 1918. Image. http://resource.nlm.nih.gov/101580385.

During the 1918 Influenza Pandemic (Spanish Flu), posters encouraged average American citizens to wear masks and to stay away from individuals who appeared to be doing actions that spread contagious disease. This poster from the *U.S. National Library of Medicine Digital Collections* was used in the "Short-Term Impacts" section. It shows a shift in society's hygienic practices which had greatly changed after Pasteur's efforts helped society to accept that germ theory was valid.

U.S. National Library of Medicine Digital Collections. *Hydrophobia-M. Pasteur's Experiments*. 1885. Illustration. Accessed February 3, 2021. http://resource.nlm.nih.gov/101425984.

This collection of images provided us with visuals that we used on the ¨Developments in Vaccinations¨ page. It depicts Louis Pasteur conducting his experiments on animals to test the effectiveness of his rabies vaccine.

The United States Gazette (Philadelphia, PA). "The Cholera." July 25, 1832. Digital file. Accessed January 21, 2021. https://www.newspapers.com/image/605066930/?terms=the%20cholera.&match=1.

This is a newspaper that published cases and death rates of Cholera. It was used in the ¨Worldwide Context¨ section of the website to provide historical context on diseases.

United States Shipping Board Emergency Fleet Corporation. *Halt the Epidemic!* 1918. Illustration. Accessed April 4, 2021. https://digital.library.temple.edu/digital/collection/p16002coll9/id/3157/.

This illustration (used in the "Short-Term Impact" section) displays a message that urges people to stop spitting--as it was a common way for disease to be transmitted from one person to another. It signals a shift in society's beliefs on disease where germ theory became widely accepted and influenced society's practices.

Weber, David J. and Rutala, William A. American Journal of Infection Control. *Assessing the Risk of Disease Transmission to Patients When There Is a Failure to Follow*

Recommended Disinfection and Sterilization Guidelines. Accessed February 5, 2021. https://www.ajicjournal.org/article/S0196-6553(13)00013-8/fulltext.

This is a research article that was published in 2013 and provided statistics and facts to support that sterilization during surgery decreases the risk of spreading disease. Applications of Germ Theory in the medical field today allows surgeons to prevent contamination and disease from spreading during surgical procedures.

Wellcome Library. *No. 7, Pheasant Court, Gray's Inn Lane–Second-Floor, Front Room*. Illustration. Accessed January 31, 2021. https://warwick.ac.uk/fac/arts/history/chm/outreach/migration/backgroundreading/disease/.

An image depicting the overcrowded living spaces during the 1800s. Because it provided us with insight on the living conditions before Germ Theory was accepted, it was used as a visual for the ¨Worldwide Context¨ page.

Wiley Online Library. "Statistics of the Newspaper and Periodical Press." *Journal of the Statistical Society of London* 44, no. 3 (September 1881). https://www.jstor.org/stable/23332044.

This is a journal we referenced for the ¨Newspapers: Role in Communication¨ part of the website. It gave an overview on the statistics of newspapers, such as how many newspapers existed in Europe (and in what cities and towns) as well as providing data that described the frequency that these newspapers were published, typically over the course of a week.

World Health Organization. "Our Mission." *Polio Global Eradication Initiative*. Accessed January 29, 2021. https://polioeradication.org/who-we-are/our-mission/.

This source includes a quote from the mission statement of the Polio Global Eradication Initiative. It was used in the section of our website ¨Pasteur´s Legacy¨ to demonstrate the ways that vaccination efforts are still being used to eradicate diseases such as polio.

World Health Organization. *Guiding Principles for Non-Breastfed Children 6-24 Months of Age*. Accessed February 3, 2021. https://www.who.int/nutrition/publications/guidingprin_nonbreastfed_child.pdf.

A source that includes quotes relating to the safe practice of pasteurization. The quote provided information on pasteurization for younger children and it was used in the ¨Pasteur´s Legacy¨ section.

World Health Organization. *Decontamination and Reprocessing of Medical Devices for Health-Care Facilities*. Accessed February 5, 2021. https://apps.who.int/iris/bitstream/handle/10665/250232/9789241549851-eng.pdf.

This source provided information on the improvement and maintaining of surgical practices to prevent disease from spreading. A quote was used in the ¨Pasteur´s Legacy" page.

World Health Organization Alberta Health Services. *Surgical Aseptic Technique and Sterile Field*. June 30, 2020. Accessed February 5, 2021. https://www.albertahealthservices.ca/assets/wf/eph/wf-eh-surgical-aseptic-technique-sterile-field.pdf.

It was used in the “Pasteur’s Legacy" page as a visual to demonstrate that surgical fields still utilize the ideas of Germ Theory when they apply common medical practices like cleaning their hands with soap and water. It provided information on the process that surgeons are expected to follow in order to effectively scrub their hands before surgery which will reduce the amount of germs that could spread to the patient.

"Your Home Is Not Complete without a Sanitary Unit, Recommended by the State Department of Public Health." Advertisement. *Library of Congress*. 1936-1941. Accessed January 29, 2021. https://www.loc.gov/item/98508956/.

An advertisement for sanitary units within households that was used in the “Short-Term Effects” section. This source provided us with information on the methods that the United States government attempted to improve public health of its citizens.

Secondary Sources

Allman, Toney. *The Importance of Germ Theory*. San Diego, CA: ReferencePoint Press, 2016. Accessed October 15, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=e862xna&AN=1718723&site=eds-live.

This electronic textbook contains information on the beliefs during outbreak of diseases in Europe during 1500 to 1800 and the profound prominence of Louis Pasteur's research that supported Germ Theory. It included historical context that highlights previous beliefs regarding the spread of disease in communities.

Anderson, Tim. "Louis Pasteur." *EBSCOhost*. Last modified August 1, 2017. Accessed November 23, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=b6h&AN=19632268&site=eds-live.

This article provided information on Pasteur's experiments relating to the process of fermentation, chickens sickened with cholera, and Germ Theory. This source helped us to understand the causes that influenced Louis Pasteur to begin his experimentation, such as a decline in the number of silkworms in the silkworm industry and spoiled wine products, and how these causes urged Pasteur to find/develop solutions to them which led to the long-term effects like pasteurization and vaccines to protect against disease.

Barnett, Richard. "Sanitation Movement, 19th Century." *World History: The Modern Era* ABC-CLIO, 2020. Accessed November 30, 2020. https://worldhistory.abc-clio.com/Search/Display/1956983.

An article about the public health and sanitation movements in the 1800s. It contains historical context on the ways that industrialization, during that time, led to poor living conditions that spread diseases in English towns. Edwin Chadwick was a public health reformer at the time who suggested that Great Britain provide cleaner water facilities and garbage disposal systems for their citizens.

Baxter, Alan G. "Science and Society: Louis Pasteur's Beer of Revenge." *Nature Reviews Immunology* 1, no. 3 (December 2001). Accessed November 28, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=aqh&AN=9061622&site=eds-live.

This article discusses the competitive rivalry between France and Germany after the end of the Franco-Prussian War that ended in a Germany victory. Due to the loss, French scientist Louis Pasteur felt obligated to bring honor to his nation by improving the shelf

life of French wine and beer, especially because Germany's beer industries were leading sales in Europe--a factor that France was not too fond of.

"Beginnings of Modern Medicine." *World History: The Modern Era*, ABC-CLIO, 2020. Accessed October 29, 2020. https://worldhistory.abc-clio.com/Topics/Display/1186203?cid=41&sid=1186203.

This article provided statistics of epidemics that occurred throughout the world during the 1800s. Various factors contributed to the spreading to disease: a lack of sewage systems, wars where soldiers were exposed to diseases from other countries, and the Industrial Revolution when people lived and worked closely together.

Berche, P. "Louis Pasteur, from Crystals of Life to Vaccination." *Clinical Microbiology and Infection: The Official Publication of the European Society of Clinical Microbiology and Infectious Diseases* 18 (August 6, 2012): 1-6. Accessed December 2, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=22882766&site=eds-live.

An article that contained information on the life of Pasteur and his experiments that disproved the idea of spontaneous generation. By observing plants and other organisms suffering from diseases, Pasteur used similar principles in his human studies that ultimately led to his confirmation of Germ Theory.

"Bert Hansen: How the Public Became Interested in Medical Science." MP4 video, 00:21. *Science History Institute*. December 14, 2017. Accessed April 6, 2021. https://www.sciencehistory.org/historical-profile/louis-pasteur.

We used this video in the "Newspapers: Role in Communication" section. This video explains that Louis Pasteur's impact spanned over fields beyond science, spreading to even journalism, a field that is not commonly thought to be associated with scientific discoveries.

Bramen, Lisa. "When Food Changed History: Louis Pasteur." *Smithsonian Magazine*. Last modified May 18, 2009. Accessed April 5, 2021. https://www.smithsonianmag.com/arts-culture/when-food-changed-history-louis-pasteur-58855064/#:~:text=The%20aide%20wrote%2C%20%22The%20Emperor,prevent%20spoilage%2C%20without%20destroying%20the.

With experimentation, Pasteur discovered the cause for beetroot alcohol spoiling faster than expected. It explains the impact that his pasteurization developments continue to have on food industries today. A quote was used from this source in the "Events Occurring in France" page of the website.

Bucchi, Massimiano. "The Public Science of Louis Pasteur: The Experiment on Anthrax Vaccine in the Popular Press of the Time." *History and Philosophy of the Life Sciences* 19, no. 2 (1997): 181-209. https://www.jstor.org/stable/23332044.

This journal detailed that means of publishing such as newspapers and pamphlets increased in order to inform the public of Pasteur's anthrax vaccination experiments and the effectiveness of them. It was used in the ¨Newspapers: Role in Communication¨ section.

Cannon, Byron. "Louis Pasteur." Edited by Gorman, Robert F. In *Great Lives from History: Inventors & Inventions*. Salem, 2008, Accessed November 23, 2020. https://online.salempress.com/articleDetails.do?bookId=276&articleName=GLI_1301&searchText=louis%20pasteur&searchOperators=exact&category=History.

This article goes into detail about Pasteur's work, specifically in the silkworm issue and pasteurization. It sheds light on the significance of his findings and we used them to understand how they laid the foundation for medical knowledge today (such as vaccines in the field of immunology and antisepsis in the surgical field).

Cassell, Dana K., and Cynthia A. Sanoski. "Antibacterials." In *The Encyclopedia of Pharmaceutical Drugs*. Facts On File, 2012. Accessed November 25, 2020. https://online.infobase.com/Auth/Index?aid=133769&itemid=WE48&articleId=381033.

During the time he was conducting research on anthrax, Pasteur found that specific types of bacteria from molds held the potential in being able to eliminate the anthrax pathogen. This article briefly covered the significance of events that occurred before his creation of the anthrax vaccine, which led to his ability to create the vaccine itself.

Chakraborty, Tirtha. "History of Vaccines." In *Dengue Fever and Other Hemorrhagic Viruses*. Facts on File, 2008. Accessed November 10, 2020. https://online.infobase.com/Auth/Index?aid=133769&itemid=WE48&articleId=117227.

Pasteur's contribution to the topic of vaccinations was gaining insight to the effectiveness of early vaccines. This source is an article that discusses Pasteur's experiment of immunizing a boy with a weakened strain of the rabies virus that helped the scientific community to finally understand the science behind vaccines.

Charles, Allan D. "Louis Pasteur." Edited by John Powell. In *Great Lives from History: The Nineteenth Century*. Salem, 2007. Accessed November 2, 2020. https://online.salempress.com.

Pasteur investigated beet juice and concluded that germs in the solution were causing fermentation to happen. This article details how he used experiments to develop his method of pasteurization.

Coleman, William. "Discovering Cholera." In *Cholera, Second Edition*. Chelsea House, 2008. Accessed October 29, 2020. https://online.infobase.com/Auth/Index?aid=133769&itemid=WE48&articleId=393819

The article provided us with context on the concept of miasmas. This theory was common especially in large cities where there was particularly strong fumes from ineffective sewer systems.

Cummings, Judy Dodge. *Epidemics and Pandemics : Real Tales of Deadly Diseases*. Mystery & Mayhem. North Mankato, Minnesota: Nomad Press, 2018. Accessed November 2, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=e862xna&AN=1692496&site=eds-live.

An electronic book on pandemics like Yellow Fever in 1700-1800 American history. It was used in the ¨Worldwide Context" section for beliefs that physicians had about miasma theory.

Curth, Louise. "Industrial Revolution." In *World History: The Modern Era*, ABC-CLIO, 2020. Accessed October 30, 2020. https://worldhistory.abc-clio.com/Search/Display/309367.

This article provided us with an understanding of the increasing population in Europe. It discusses harsh conditions of factory life that workers faced during the Industrial Revolution.

Decker, Janet, and Alan Hecht. "The Fifth Plague." In *Anthrax, Second Edition*. Chelsea House, 2008. Accessed November 2, 2020. https://online.infobase.com/Auth/Index?aid=13&itemid=&articleId=393968.

This article explained the numerous trials and tribulations that Pasteur faced in creating a chicken cholera vaccine, as well as describing his experiment. Also, this source provided how Pasteur publicly communicated the effectiveness of his cholera vaccine through a live demonstration of sheep in Paris.

Edelfelt, Albert. *Portrait of Louis Pasteur*. September 2018. Photograph. Accessed April 5, 2021. https://digitalcommons.rockefeller.edu/alfred-cohn-collection/41/.

This image shows Pasteur working in his laboratory. It was used on the "Home" page.

Ehrhart, Samuel D. *The Trailing Skirt: -Death Loves a Shining Mark*. August 8, 1900. Illustration. https://commons.wikimedia.org/wiki/File:The_Trailing_Skirt,_Death_Loves_a_Shining_Mark.jpg.

An illustration created during 1900 that presents a woman noticing that her skirt is accumulating germs and other diseases. It provided a visual image that indicated that societal views on microorganisms and disease were gradually shifting towards Pasteur´s support of Germ Theory.

Emmeluth, Donald. "Fighting Staphylococcus Aureus Infections." *Staphylococcus Aureus Infections.* 2005. Accessed October 29, 2020. https://online.infobase.com/Auth/Index?aid=13&itemid=&articleId=121178

This article source noted how Pasteur's experiments and findings that bacteria was the reason wine spoiled, contributed to support his idea of germ theory. The information provided details on how Pasteur was able to support his claim that living organisms were not created out of non-living matter.

England, Ross. "Louis Pasteur: A Light That Brightens More and More." *Objective Standard: A Journal of Culture & Politics* 8, no. 4, 2014: 49–68. Accessed November 19, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=pwh&AN=92605988&site=eds-live.

Pasteur's development of a rabies vaccine and fermentation opposed ideas popularly held by chemists and other scientists during the nineteenth century. A quote from this article was used on the "Legacy" page.

"Epidemiology, Preventive Medicine, and Public Health." In The *Encyclopedia of Health and Medicine, Second Edition*. Facts On File, 2016. Accessed October 30, 2020. https://online.infobase.com/Auth/Index?aid=13&itemid=&articleId=389789.

Pasteur's experiments produced some of the earliest vaccinations in science and continues to play a considerable role in contributing to the healthcare field, especially in the field of epidemiology. This article describes changes to society that established sewage systems and recommended sanitary practices like handwashing which were results of Pasteur's work that supported Germ Theory.

"Félix-Archimède Pouchet." *Britannica Student*. Accessed October 29, 2020. https://school.eb.com/levels/high/article/F%C3%A9lix-Archim%C3%A8de-Pouchet/61090.

In this biography about Félix-Archimède Pouchet, this source provided us with information that Pouchet was a supporter of the spontaneous generation (conflicting views with that of Pasteur). Also, it gave us an insight on the book he published a book *Hétérogénie* that sparked the debate between Pouchet and Pasteur regarding the theory of spontaneous generation.

Fürst, Paul. *Engraving of the Plague Doctor*. c. 1656. Image. Accessed February 1, 2021. https://www.nejm.org/doi/full/10.1056/NEJMp2011418.
This source provided us with a visual that represented the terrifying way that disease was perceived before the acceptance of Germ Theory. It was used in the ¨Worldwide Context¨ section of the website as an image.

Gilbert-Martin, Charles. *L'Ange de l'inoculation (M. Pasteur)*. March 13, 1886. Image. Accessed April 5, 2021.
https://artsandculture.google.com/culturalinstitute/beta/asset/the-angel-of-inoculation-mr-pasteur-charles-gilbert-martin/JwFj_BJ0g2_6YQ?hl=fr.
This is a political cartoon that positively depicts Pasteur as a scientist who saved many, especially with the development of his rabies vaccine. It was used in the "Development in Vaccinations" page.

Hawley, H. Bradford. "Anthrax." Edited by Jeffrey A. Knight. *Genetics & Inherited Conditions*. Salem, 2010. Accessed October 17, 2020. https://online.salempress.com/articleDetails.do?bookId=266&articleName=Genetics_1027&searchText=anthrax&searchOperators=exact&category=Health.

This article provided context on the anthrax disease that Pasteur was attempting to prevent and the importance of stopping this disease from further spreading during the 1800s. With his Anthrax vaccine, Pasteur proved his vaccinations were, in fact, effective in protecting sheep, the test subjects in his experiment.

Horowitz, Ilisa. "Louis Pasteur." In World History: The Modern Era, ABC-CLIO, 2020. Accessed October 31, 2020. https://worldhistory.abc-clio.com/Search/Display/315397.

This article is a biography detailing Pasteur's life. It described his three main experiments with fermentation, his anthrax and rabies vaccines, and pasteurization. Also, it includes the conclusions that he made from them, particularly that germs were the cause of disease and that weakened versions of those diseases could potentially be used to develop vaccines as a method of protection.

Kazaks, Alexandra. "Public Health." In World History: The Modern Era, ABC-CLIO, 2020. Accessed November 10, 2020. https://worldhistory.abc-clio.com/Search/Display/310954?terms=Kazaks%2c+Alexandra&sTypeId=2.

This article illustrates the development of public health systems in the United States throughout the 1900s (years following Pasteur's discoveries and developments) and Pasteur's legacy in today's society. His experiments that supported Germ Theory became accepted which resulted in more sanitation efforts being enforced to prevent disease from spreading.

Leone, Bruno. *Disease in History.* San Diego, CA: ReferencePoint Press, 2016. Accessed November 14, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=e862xna&AN=1718707&site=eds-live.

This electronic textbook included information on contagious diseases throughout history and the methods that people used to address it. It discussed Pasteur's success in fermentation and the main principle behind his vaccines. Additionally, this source was used in seeing the effects of Louis Pasteur's Germ Theory success such as the medical applications and importance of sanitation of hospitals.

"Louis Pasteur." *Encyclopaedia Britannica Online School Edition*. Accessed October 29, 2020. https://school.eb.com/levels/high/article/Louis-Pasteur/108485.

This article is a biography that covers Pasteur's accomplishments and major findings relating to Germ Theory. It highlighted the steps that Pasteur used for the process pasteurization, restoring the silkworm industry, and his live experimental demonstration of his anthrax vaccine at the Pouilly-le-Fort.

"Louis Pasteur & the Founding of Microbiology." Louis Pasteur & the Founding of Microbiology, January 2004, 1–37. Accessed November 2, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=b6h&AN=22972699&site=eds-live.

This electronic textbook is a biography of Pasteur's life and provides a timeline of his numerous discoveries that contributed to Germ Theory. The image of the swan-flasks that Pasteur used is in the first section of "Spontaneous Generation." In the "Short-Term Effects," section we used a picture showing Pasteur´s illustration of a healthy silkworm.

"mRNA Vaccines, Explained." MP4 video, 00:29. *Vox*. Posted by Kimberly Mas, February 2, 2021. https://www.vox.com/2021/2/2/22262226/covid-19-vaccines-mrna-adenovirus.

This source is a video that details vaccine technology that, in particular, highlights recent scientific developments regarding the COVID-19 vaccination. It was used in the "Legacy" section of the website to demonstrate that his discoveries which supported Germ Theory developed into technology that is still widely used by society and scientific fields today.

Nardo, Don. *How Vaccines Changed the World. How Science Changed the World.* San Diego, CA: ReferencePoint Press, 2019. Accessed November 14, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=e862xna&AN=1849571&site=eds-live.

This electronic textbook describes life during the 1600s-mid 1800s had terrible sanitary conditions which spread disease. Also, it highlighted vaccination developments still occurring today like Ebola, and more commonly, the influenza vaccine; the production of both of these diseases aim to protect people from deadly diseases.

Nat Geo Explores. "How Solving This Medical Mystery Saved Lives." MP4 video, 01:29. National Geographic. April 20, 2020. Accessed January 30, 2021. https://www.nationalgeographic.com/science/article/how-solving-this-medical-mystery-saved-lives.

This is a video published by National Geographic that briefly explained Louis Pasteur's experiments and the communication that he had with the general public through methods such as live demonstrations. A clip from this video was used in the "Developments in Vaccinations" section.

National Museum of American History. *Études sur la Bière (Studies on Beer) by Louis Pasteur, 1876*. 1876. Image. https://www.nlm.nih.gov/exhibition/fromdnatobeer/exhibition-interactive/louis-pasteur/louis-pasteur-alt.html.

This source provided us with a diagram showing the devices and techniques that Pasteur used while conducting his experiments on fermentation. It was used in the "Fermentation Discoveries" section of the website.

Pasteur, Louis. *Manufacture of Beer and Yeast*. July 22, 1873. Illustration. Accessed October 17, 2020. https://www.archives.gov/files/kansas-city/press/newsletter/2020-august.pdf?_ga=2.251072966.1976507242.1606340068-1719629138.1606340068.

This drawing was included in Pasteur's patent, which compares the bacteria of before and after going through his pasteurization process. In figure one it shows the absence of bacteria on the left and the thin rods of bacteria on the right, demonstrating that bacteria is present. The drawing was as an image in the "Fermentation Discoveries" section.

Poelmans, Eline, and Johan F.M. Swinnen. "A Brief Economic History of Beer." Chart. Research Gate. January 2012. Accessed February 10, 2021. https://www.researchgate.net/publication/268043355_A_Brief_Economic_History_of_Beer.

This graph shows the economic differences between European nations during the 1800s and 1900s. It was used to visually represent statistics, as it supported that Louis Pasteur was motivated to surpass Germany´s sales in the beer industry; he wanted to create a better way to preserve French beverages.

Roberts, William J. "Pasteur, Louis." *France*. August 2004. Accessed November 11, 2020. https://online.infobase.com/Auth/Index?aid=133769&itemid=WE53&articleId=249166

This textbook source provided a biography of Pasteur's life. It was used to give us an overview of his interest in the silkworm industry to investigate diseases and how similar principles could apply with other animals suffering from infectious diseases. To add on, this source helped us in establishing a chronological timeline that we used to organize our project.

Satin, Morton. "Pathogens in Dairy and Egg Products." *Food Alert!*, Second Edition. Facts On File, 1 September 2008. Accessed October 29, 2020. https://online.infobase.com/Auth/Index?aid=133769&itemid=WE48&articleId=102559.

This textbook source goes into detail about ways to preserve food in the 1800s, as well as previous problems that people dealt with due to consuming unpasteurized milk and oppositely, to see the large impact that pasteurization had globally. It gave us context on why Pasteur began to research Fermentation, which was widely due to the issue of spoilage in alcoholic beverages and
vinegar. This source allowed us to see the importance of Pasteur's process of pasteurization, due to the fact that it essentially changed how people worldwide utilized pasteurization to prevent food from spoiling too quickly.

Sfakianos, Jeffrey N. *History of Viruses and the Avian Influenza Virus*. Avian Flu. January 2006. Accessed October 23, 2020. https://online.infobase.com/Auth/Index?aid=133769&itemid=WE48&articleId=116258.

The book illustrated how Pasteur set up his experiment that ultimately disproved the theory of spontaneous generation. This source enabled us to understand the specific methods that Pasteur used when he conducted his experiment, as he was famously known for using swan neck glass flasks. It helped us to see the connection between Pasteur's experiment and how it aided him in proving the theory of spontaneous generation to be invalid.

Sinding, Christiane. "Claude Bernard and Louis Pasteur: Contrasting Images through Public Commemorations." *University of Chicago Press* 14 (1999): 61-85. https://www.jstor.org/stable/301961.

This source provided us with a quote that was used to illustrate the opposition that Pasteur faced from other respected scientists when communicating his discoveries. It was used in the "Fermentation Discoveries" page.

Steere-Williams, Jacob. "Great Stink of 1858." In World History: The Modern Era, ABC-CLIO, 2020. Accessed November 24, 2020. https://worldhistory.abc-clio.com/Search/Display/1967555.

An article about London's "Great Stink" of 1858. It provided us with historical context for the pollution and population growth that caused the spread of epidemic diseases like typhoid fever, cholera, and dysentery.

"3 People Who Probably Saved Your Life." MP4 video, 0:36. *Hot Stream*. Posted 2016. Accessed February 5, 2021. https://www.hotstream.org/6998/3-people-who-probably-saved-your-life/.

This video clip briefly explained the significance of Louis Pasteur's swan necked flask and the vital role that they played in confirming the Germ Theory of disease. It was used in the ¨Spontaneous Generation Debates¨ section of the website.

Trachtman, Paul. "Hero FOR OUR Time." *Smithsonian* 32, no. 10 (January 2002): 34. Accessed November 22, 2020. http://search.ebscohost.com/login.aspx?direct=true&db=khh&AN=5749827&site=eds-live.

After facing criticism from veterinarian Monsieur H. Rossignol, Pasteur had conducted public anthrax experiments in front of the public. This article was used to illustrate that most scientists during the 1800s disagreed with his theories and sometimes, outright challenged Pasteur to provide evidence for his support of Germ Theory