

IMMUNOLOGY 2015™ in New Orleans, Louisiana, featured an exhibit chronicling notable developments in Louisiana's medical and public health history. Below is an expanded version of the text accompanying the exhibit.

Immunology at the Mouth of the Mighty Mississippi

Diseases and Institutions that Shaped Research in Louisiana

by John Emrich

Louisiana has endured centuries of epidemics, outbreaks, and endemic diseases, chiefly in its most populous city, New Orleans. The city is known worldwide for its revelry and rich culture—the pentimento for the various flags that have flown over her since the French first began colonizing the region in the late seventeenth century. In the early nineteenth century, the city became the third largest city in the United States and one of the wealthiest because its bustling port at the mouth of the Mississippi River was the intersection of trade between the nation's interior and the Caribbean, South America, Europe, and beyond. Here, we highlight diseases and institutions that have shaped the medical, public health, and social history of the state.

Diseases

Louisiana, because of its subtropical climate and home, near the mouth of the “Mighty Mississippi,” to the premier southeastern port in the United States, has been the site of many lethal and chronic communicable diseases, including yellow fever, malaria, hookworm, Hansen's disease, and bubonic plague. The presence of these diseases has channeled the current of biomedical research in the state.



Yellow fever patient in hospital
*Images from the History of Medicine,
National Library of Medicine*

deaths between 1817 and 1905.¹ An epidemic in 1878 began in the port of New Orleans and spread up the Mississippi River to the American Midwest, infecting more than 110,000 and killing at least 20,000.² An occurrence in 1905 marked the last yellow fever epidemic in the United States. By this time, the transmission cycle was understood, and public health campaigns, including mosquito prevention and eradication, limited spread of the disease before the first successful vaccine was developed in the 1930s.

Epidemics and Outbreaks

Yellow Fever. An acute infection caused by an RNA virus spread, primarily by the female *Aedes aegypti* mosquito, yellow fever was one of Louisiana's deadliest diseases before the early twentieth century. The mosquitoes carrying the disease typically hitchhiked to Louisiana aboard trading ships from their native Caribbean habitat. Mortality rates climbed as high as 60 percent during some epidemics, and in the New Orleans region, the disease was responsible for more than 41,000



Plague epidemic in New Orleans,
1913–1914
*Images from the History of Medicine,
National Library of Medicine*

Bubonic Plague. In late June 1914, a bubonic plague outbreak in New Orleans was caused by rats from a cargo ship at the New Orleans Stuyvesant Docks.³ In August, at the height of the outbreak, cases were reported at a rate of one every three days. A coordinated response by health officials, led by the U.S. Public Health Service, suppressed the outbreak by year's end through a combination of medical intervention and rat-reduction programs, which included “rat-proofing,” or destroying, hundreds of buildings

1. Infectious Disease Epidemiology Section, Louisiana Office of Public Health, “Yellow Fever,” *Epidemiology Annual Report*, 1934, http://www.dhh.state.la.us/assets/oph/Center-PHCH/Center-CH/infectious-epi/Annuals/LaIDAAnnual_YellowFever.pdf (accessed June 22, 2015).
2. “Louisiana Medical Saga: The New Orleans Trilogy,” Public Health Service Hospitals Historical Collection, 1895–1982, Box 8, Folder 7, National Library of Medicine, Bethesda, MD.
3. “Plague in New Orleans,” *Public Health Report* 28, no. 29 (1914): 1809.

and enacting new housing codes. The 1914–1915 outbreak resulted in 31 reported cases, of which 10 were fatal. New Orleans continued to have infections until the city was declared free of the disease in the late 1920s.⁴

Endemic Diseases

Malaria. Although malaria never reached epidemic levels, it was a constant presence in the state, with a peak rate of 57 cases per 100,000 in 1944.⁵ In 1947, the National Malaria Eradication Program began in the United States, focusing on 13 southeastern states. The program successfully eradicated the disease in the United States in 1951 through the reduction of mosquito-breeding sites and the application of insecticides.⁶ An important breakthrough in malaria research was made at Tulane University School of Medicine in 1911, when Charles C. Bass (AAI '16) successfully cultivated plasmodia in vitro, using human blood.⁷ Bass's technique allowed other researchers to better understand and devise new treatments for the disease.



“Malaria in the United States”
Images from the History of Medicine,
National Library of Medicine

Hookworm Infections. Bass was also responsible for calling attention to the impact of hookworm infections in Louisiana, especially in rural children with continuous infection. He recognized growth and developmental problems resulting from the infected children's loss of iron and protein.⁸ Through a series of studies in 1910 at Tulane, Bass,

who was previously a country doctor, determined that the high rate of infection in rural communities was attributable to the geology of central and northern Louisiana, specifically the sandy soil; poor access to privies; and the “habit among children...of going barefoot.”⁹ That same year, a Rockefeller Foundation report found that nearly 40 percent of the population in the South was infected with hookworms, validating Bass's assertions. Within a few years, a public health and education campaign eliminated these occurrences.¹⁰



Head of the hookworm *Necator americanus*
Centers for Disease Control and Prevention/
Dr. Mae Melvin

Hansen's Disease (Leprosy). This disease was well established in Louisiana, particularly in southern Louisiana. By the late 1880s, high incidence rates (4.5/100,000) in the state, especially in South “French” Louisiana, led to the creation of the Louisiana Leper Home in Carville to treat patients and research the disease. Infection rates continued to rise until the late 1920s (12/100,000), with the highest rates still observed in French Louisiana. Antibiotic treatments beginning in the 1940s successfully brought incidence in the state to near zero by the 1970s.¹¹



Hansen's disease research
Images from the History of Medicine,
National Library of Medicine

- Infectious Disease Epidemiology Section, Louisiana Office of Public Health, “Plague,” *Epidemiology Annual Report*, 2014, http://www.dhh.state.la.us/assets/oph/Center-PHCH/Center-CH/infectious-epi/Annuals/Plague_LaIDAnnual.pdf (accessed June 22, 2015).
- Infectious Disease Epidemiology Section, Louisiana Office of Public Health, “Malaria,” *Epidemiology Annual Report*, 2013, http://www.dhh.state.la.us/assets/oph/Center-PHCH/Center-CH/infectious-epi/Annuals/Malaria_LaIDAnnual.pdf (accessed June 22, 2015).
- Infectious Disease Epidemiology Section, Louisiana Office of Public Health, “Malaria,”
- For more information about Charles C. Bass, see “Country Doctor, Pioneering Parasitologist, and the Father of Preventative Dentistry: Charles C. Bass, M.D. (1875–1975),” *AAI Newsletter*, June 2015, 20–23; C. C. Bass, “A New Conception of Immunity: Its Application to the Cultivation of Protozoa and Bacteria from the Blood and to Therapeutic Measures,” *Journal of the American Medical Association* 57, no. 19 (1911): 1534–35; C. C. Bass and F. M. Johns, “The Cultivation of Malarial Plasmodia (*Plasmodium vivax* and *Plasmodium falciparum*) In Vitro,” *Journal of Experimental Medicine* 16, no. 4 (1912): 567–79.
- Most people infected with hookworms have no symptoms. Minor symptoms include gastrointestinal problems. In serious cases, there is blood loss, leading to anemia and protein deficiency.
- George Dock and Charles C. Bass, *Hookworm Disease: Etiology, Pathology, Diagnosis, Prognosis, Prophylaxis, and Treatment* (St. Louis, MO: C. V. Mosby Company, 1910).
- “Eradicating Hookworm,” The Rockefeller Foundation, <http://rockefeller100.org/exhibits/show/health/eradicating-hookworm> (accessed on June 9, 2015).
- Infectious Disease Epidemiology Section, Louisiana Office of Public Health, “Leprosy (Hansen's Disease),” *Epidemiology Annual Report*, 2008, http://www.dhh.state.la.us/assets/oph/Center-PHCH/Center-CH/infectious-epi/Annuals/LaIDAnnual_Leprosy.pdf (accessed June 22, 2015).

Institutions

Research institutions and medical schools in Louisiana were founded to address the public's vulnerability to a rare confluence of public health threats. Here, we highlight six of the oldest institutions. All have contributed to the growth of immunology research in the state.

Hospitals and Public Health Institutions

Recognizing the need for a public hospital in New Orleans to serve the poor, a French ship builder residing in the city bequeathed money for what would become the city's venerable **Charity Hospital**. The hospital was founded on May 10, 1739, and operated constantly until 2005, when Hurricane Katrina forced its closure. At that time, Charity Hospital was the second-oldest, continuously operating public hospital in the United States.¹ Charity also served as a teaching hospital for Tulane University and Louisiana State University (LSU) medical schools, where many AAI members held appointments.



Charity Hospital, c. 1939
National Archives and Records Administration

The **United States Marine Hospital** [later named the U.S. Public Health Service (USPHS) Hospital] in New Orleans was founded in 1801, three years after the creation of the U.S. Marine Hospital Service. The initial mission of these entities was to provide medical care to ill and disabled seamen, including those in the U.S. Merchant Marine and U.S. Coast Guard. The mission of the hospital and officers



U.S. Marine Hospital/U.S. Public Health Service Hospital, New Orleans, LA, ca. 1950

Images from the History of Medicine, National Library of Medicine

quickly expanded to assist the city as a leader in clinical research and public health, leading campaigns to control epidemics and outbreaks, especially for yellow fever and bubonic plague. The hospital was closed in 1981, following severe cuts in federal funding.²

The state opened the Louisiana Leper Home in Carville in 1894 and two years later, entered into a contract with the Daughters of Charity of St. Joseph, located in Emmitsburg, Maryland, to care for and treat its patients.³ In 1921, the USPHS took operational control of the institution and established it as the **National Leprosarium**, in accordance with a 1917 federal law mandating the founding of a hospital for leprosy patients.⁴ In addition to treating patients, the facility was updated to become a center for research into Hansen's disease (leprosy) transmission and treatment. Researchers at Carville demonstrated



National Leprosarium, ca. 1950

History of Medicine Division, National Library of Medicine

1. Bellevue Hospital in New York City is the oldest public hospital in the United States. It was founded March 31, 1736.
2. "Louisiana Medical Saga: The New Orleans Trilogy," Public Health Service Hospitals Historical Collection, 1895–1982, Box 8, Folder 7, National Library of Medicine, Bethesda, MD.
3. The Daughters of Charity, a society of apostolic life for women within the Catholic Church, was founded in the seventeenth century with vows of charity, poverty, obedience, and service to the poor. The state was financially responsible for the infrastructure and supplies, and the sisters, who attended to the physical, emotional, and spiritual needs of the community, received a very modest clothing stipend in lieu of a salary. When the sisters arrived at Carville, the resident physician had left—one would not return until National Leprosarium was founded—and because of budget constraints, a weekly doctor visit to Carville had to suffice. The Daughters of Charity officially ended its mission at Carville in 2006. For more information on the role of the Daughters of Charity at Carville, see Daniel Hannefin, "The Daughters of Charity at Carville: 1896–1981," *Vincentian Heritage Journal* 2, no. 1 (1981): 55–80.
4. The original, official name of the institution was United States Marine Hospital Number 66, the National Leprosarium of the United States. In 1917, a federal bill was signed into law "to provide for the care and treatment for those suffering" from Hansen's disease and prevent the spread of the disease. In 1920, the Louisiana Leper Home was selected for the new federal institution.

the efficacy of sulfa drugs (1940s)⁵ and pioneered the use of Rifampin (1970s)⁶ in treating the disease. They also developed the first animal model using armadillos (1971)⁷ for studying the disease. In 1998, the National Hansen's Disease Program was relocated to Baton Rouge, although patients were allowed to choose whether to remain at Carville, receive a lifetime medical stipend, or relocate with the program.



Alton Ochsner, ca. 1953
Images from the History of Medicine, National Library of Medicine

The Ochsner Clinic was opened in New Orleans in 1942, organized by Alton Ochsner and four other professors from Tulane. The clinic was modeled after the Mayo and Lahey Clinics, where specialists from different

disciplines collaborated to diagnose and treat serious medical problems, while also emphasizing physician education. The Ochsner was the first of its kind in the South and enjoyed such rapid success that it was expanded to include a hospital, research facilities, and academic programs. The Ochsner Medical Center remains a cutting-edge clinical and research facility that garners international acclaim.⁸

Medical Schools

Two of the state's oldest medical schools are located in New Orleans. **Tulane University School of Medicine** was founded in 1834 as the Medical College of Louisiana, with the purpose of leading "the advancement of science and the rational treatment of disease." Tulane issued Louisiana's first medical degree in 1835 and was one of two southern institutions identified as "excellently



Tulane University, c. 1900
Library of Congress Prints and Photographs Division

situated in respect to medical education" by the Flexner Report in 1910.⁹ **LSU School of Medicine** was established and opened for classes in 1931. It has expanded over the years and still includes its original building next to Charity Hospital. As the preeminent private and public medical schools in New Orleans, Tulane and LSU have been leaders in clinical and basic research for more than one-half of a century.

Today, Tulane, LSU, and Ochsner are joined by **Tulane National Primate Research Center, LSU Shreveport, Southeastern Louisiana University,** and other smaller research institutions contributing to growth of immunology research in Louisiana. ■



Louisiana State University Medical School, c. 1939
National Archives and Records Administration

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5. G. H. Faget, F. A. Johansen, and H. Ross, "Sulfanilamide in the Treatment of Leprosy," *Public Health Report* 57, no. 50 (1942): 1892-99; G.H. Faget et al., "The Promin Treatment of Leprosy," *Public Health Report* 58, no. 48 (1943): 1729-41; G. H. Faget, R. C. Pogge, and F. A. Johansen, "Promizole in the Treatment of Leprosy," *Public Health Report* 61, no. 26 (1946): 957-60; "Present Status of Diasone," *Public Health Report* 61, no. 26 (1946): 960-63.

6. R. R. Jacobson and R. C. Hastings, "Rifampin-Resistant Leprosy," *Lancet* 2, no. 7998 (1976): 1304-5.

7. W. F. Kirchheimer and E. E. Storrs, "Attempts to Establish the Armadillo (*Dasypus novemcinctus* Linn.) As a Model for the Study of Leprosy. I. Report of Lepromatoid Leprosy in an Experimentally Infected Armadillo," *International Journal of Leprosy and Other Mycobacterial Diseases* 39, no. 3 (1971): 693-702.

8. For more information on the founding and history of Ochsner's, see John Wilds, *Ochsner's: An Informal History of the South's Largest Private Medical Center* (Baton Rouge: Louisiana State University Press, 1985).

9. Abraham Flexner, *Medical Education in the United State and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching, Bulletin Number Four* (New York: Carnegie Foundation, 1910), 148; Vanderbilt University Medical Department (now Vanderbilt University School of Medicine) was the other southern institution identified in the Flexner Report. The Flexner Report brought national attention and scrutiny to the fact that few standards for admission and graduation existed for American medical schools. Shortly after the release of the report, medical schools were forced to raise their standards. Graduates of those schools that failed to conform to the new American Medical Association rating system, motivated by the Flexner Report, were denied medical licenses.