# Legacy of Pasteur

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# OUTLINE/Questions that will be answered

- My experience in Paris
- Pasteur's life
- Major Discoveries of Pasteur
- Foundations of microbiology
- Pasteur's Legacy
- Pasteur and BESS



## **Course in Paris**

- Pasteur laid the foundations of modern microbiology
- I had an opportunity to spend a week in Paris learning about microbiology and Pasteur's Legacy
- Since a big component of your internship is learning about biogas and bioethanol, the knowledge of the microbiology and microbial processes will benefit you.
- Pasteur's legacy is extensive and enlightening.

## Institute de Pasteur

- Inaugurated in 1888
- Lectures by leading researchers
  - Tuberculosis
  - Pertussis
- Significance Today
  - Carries on the seminal work produced by Pasteur
- What goes on there
  - Research
  - Teaching
  - Public Health
    - International network of 32 Institutes on 5 continents

# **Pasteur's Legacy**

- Some of the Nobel Prize winners at the Pasteur Institute
  - Jaques Monod & Andrei Lwoff
    - Nobel Prize in Physiology for work with respiratory viruses and enfluenza
  - Luc Montagnier
    - Isolated HIV and proved that AIDS is caused by HIV virus
  - Jules Bordet
    - Isolated Pertussis cultures and proved that the whooping cough is caused by bacteria
  - Marie Curie
    - Radium, first X-ray machine

## Who is Louis Pasteur

- Born on December 27, 1822
- Attended college of Arbois
- 1843 Matriculated at Ecole Normale Superieure, in Paris
- 1846 Discovers molecular assymmetry
- 1847 receives his doctorate degree
- 1854 becomes a professor of Chemistry at University of Lille
- 1855 begins studies of fermentation
- 1863 Studies on wine
- 1871 Studies on beer and fermentation
- 1880 begins studies on Rabies
- 1988 inauguration of Pasteur Institute
- 1895 dies on September 28

# Legacy and Major Discoveries

- His work enriched many fields:
  - Stereochemistry
    - Structure of chemical molecule
  - Disproved theory of spontaneous generation
    - Mechanism of fermentation
  - Revolutionized bacteriology, infectious disease
  - Immunology
    - Vaccine for rabies
  - Public Hygiene
    - Role played by microorganisms

## **1848 Discovery of Molecular** Chirality/enantioselectivity

- Became interested in crystallography
- Great dilemma of time: different forms of tartaric acid were identical in every way but polarized light differently
  - Paratartrate is optically inert
  - Tartrate right facets, turns bean of light to right

- Pasteur was convinced that optical activity was related to chemical structure
- Stereochemistry
  - Tartrate had "right handed crystal" facet on right side
  - Paratartrate consisted of crystals that had left and right facets – racemic mixture, optically inactive

## Fermentation

- Beer and wine industry suffered in France but Pasteur rescued
  - Showed that microorganisms in fermentation must be the right ones
- Begins to study the changes throughout the fermentation process
- Spoiled beer did not have round yeast cells
- Showed brewers how to culture right organisms

## Pasteurisation - 1865

- Showed winemakers that heating wine to 60 degrees Celsius will slow down the growth of bacteria and prevent wine from spoiling in cellars
- Applied the same process to milk
- Explained why meat spoils



#### **Spontaneous Generation vs. Germ Theory**

- Centuries dominated by theory of spontaneous generation of life from inanimate matter
- Demonstrated that fermentation is caused by microbial life
  - Swan neck flask experiment
  - Organic solutions where life was destroyed by heating and prevented from contact with air particles remained unspoiled

Dismantled the Theory of Spontaneous Generation



- Proved that microorganisms are responsible for the cycle of transformation of organic matter
- Pasteur realized that study of germs will lead to answers about plant and animal diseases



#### Saved the Silk Industry in Southern France

- 1857 becomes director of Scientific Studies at Ecole Normale
- Began to investigate disease that attacked silkworms
- Links germs and disease
- Led to establishment of sanitation practices in hospitals

- Separated diseased and healthy silkworms
- Proved that those fed by infected mulberry leaves got the disease
- Devised a way for the industry to maintain healthy worms

## **Rabies - 1880**

- Pioneered attenuated virus vaccine
- Rabies highly contagious and lethal disease attacks nervous system
- Transmitted by bite
- First tested on Joseph Meister, 9 years old
- Was successfully and unsuccessfully reproduced world wide

- Saliva from rabid dogs was used to infect rabbits.
  - Spinal cords of infected animals were desiccated then attenuated virus was drawn from spinal fluid for inoculation





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#### Why Pasteur is important to BESS

- Biodigestion
- Fermentation
- Dismantling of spontaneous generation
- Laid foundation for microbiology
- Why this lecture is helpful to you?
- Use science to benefit mankind!

#### **Questions? Lets discuss!**



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