Legacy of Pasteur

Yelena Granovskaya
2008 Bioenergy Summer School Alumna
June 29, 2010

yelena@ufl.edu
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.
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
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 asymmetry
- 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
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
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.
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 worldwide
- 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
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? Let's discuss!


