Benefits of biomedical research

Analyze biomedical research.
Analyze the benefits of biomedical research.

BCT (2005)
Contributions to human health

Aids research continues

Benefits to human health
Contributions to human health

- 1. Treatment for heart disease – heart-lung machine
- 2. Treatment for cancer
- 3. Treatment for diabetes
- 4. Bone marrow transplants
- 5. Early vaccines
- 6. Polio vaccine
- 7. Chicken pox (Varicella)
- 8. Hepatitis
- 9. Fluoride – many countries add to water to decrease tooth decay
- 10. Penicillin and other antibiotics
Treatment for heart disease—heart-lung machine
Contributions to human health

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Treatment for cancer

- New drugs to prevent spread
- Gene therapy
Contributions to human health

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Treatment for diabetes

- Genetic engineering creates insulin manufactured by bacteria
- Development of oral medications
- New sugar monitoring equipment
- Insulin pumps
- Transplantation of pig pancreas cells
Genetic engineering creates insulin manufactured by bacteria
A weakened strain E-coil is the 'factory' used in the genetic engineering of insulin
Insulin was first extracted from a cow’s pancreas and used to treat a 14 year old boy in 1922.

Now bacteria is used to make insulin.
Development of oral medications

- New sugar monitoring equipment:
  - LESS BLOOD
Today .......................... Tomorrow

An insulin pump can be worn discretely under clothing as it administers insulin to the diabetic.
Transplantation of pig pancreas cells

Embryonic Pig Cells Halt Rat Diabetes

Compatible donor: Cells from pigs hold promise for diabetes because studies suggest that they're not rejected by the human immune system.

Xenotransplant requires no immune suppression and could work in humans.
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Bone marrow transplants:

- Treatment for leukemia
- Use of stem cells/umbilical cord blood
Contributions to human health

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Human vaccines developed through biomedical research

- a. Edward Jenner – smallpox
- b. Louis Pasteur – cholera, anthrax and rabies
- c. Diptheria
Edward Jenner – smallpox
Louis Pasteur – cholera, anthrax and rabies

“Greatest biologist of all time”

- Contributed more to the saving of human lives than any other man
- Germ theory of disease
- Law of Biogenesis Disproved “spontaneous generation”
- “Pasteurization” of food
- Developed vaccines for: Rabies - Diphtheria - Anthrax and more
- Opposed Darwinism

“Here was a life, within the limits of humanity, well-nigh perfect. He worked incessantly. He went through poverty, bereavement, ill health and opposition. He lived to see his doctrines current over all the world. Yet here was a man whose spiritual life was no less admirable than his scientific life.”

— Stephen Paget, English surgeon

HOW ANTHRAX ATTACKS

Anthrax is a naturally occurring bacterium that plagues farm animals and, occasionally, agricultural workers. An airborne form of the disease, however, can be harnessed as a potent biological weapon.

1 Sneaking in Anthrax spores are inhaled and swept into the lungs.
2 Beating the defense White blood cells attack the spores, killing only a few.
3 Growing Spores collect in the lymph nodes and develop. The immune system of vaccinated people can defeat the infection at this point.
4 Striking Toxins released by the bacteria spread via the lymphatic system. The poison causes internal bleeding and severe damage to the tissue of major organs. Once the poison has circulated, antibiotics will not save the victim.


ADRIAN HOLOVATY/Missourian
Diphtheria

DIPHTHERIA STRIKES UNPROTECTED CHILDREN

PROTECT YOUR CHILD WITH TOXOID
TOXOID PREVENTS DIPHTHERIA
CHICAGO DEPARTMENT OF HEALTH
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Polio vaccine

- Jonas Salk in 1949 identified 3 strains of virus that cause polio and made vaccine from killed polio virus
Polio vaccine

- Albert Sabin – in 1954, worked on his own vaccine
- (1) Administered orally
- (2) Made from live virus that was attenuated (weak) but not killed
- (3) Stimulated an immune response (but not enough to get sick with the disease)
- (4) Administered on a sugar cube
How you get poliovirus: the stool of an infected person contaminates your food or water.

Symptoms:
After 4-35 days, illness begins with fever, fatigue, headaches, vomiting, constipation, stiffness in the neck, and pain in the limbs.

Once established in the intestines, poliovirus can enter the blood stream and invade the central nervous system. As it spreads, the virus destroys the nerve cells (motor neurons) which activate muscles and the affected muscles no longer function.

Polio success story

Scary because: it's very contagious, it causes irreversible crippling nerve damage, and it typically strikes children.

Less scary because: it may be eradicated soon.
Also known as infantile paralysis
Virus attacks spinal cord, destroying muscle nerve cells
Patients whose lungs affected often spent years in iron lungs
1952 – peak year, 58,000 cases, half were paralyzed
1961 – Sabin vaccine
Worldwide still a problem
Still have people in U.S. suffering effects of polio from 40 years ago

POST POLIO SCOLIOSIS
Polio success story

- (1) Also known as infantile paralysis
- (2) Virus attacks spinal cord, destroying muscle nerve cells
- (3) Patients whose lungs affected often spent years in iron lungs
- (4) 1952 – peak year, 58,000 cases, half were paralyzed
- (5) 1961 – Sabin vaccine
- (6) Worldwide still a problem
- (7) Still have people in U.S. suffering effects of polio from 40 years ago
Chicken pox (Varicella)

- a. Vaccine available in 1995
- b. Recommended for children 12 months and older who have not had the disease
Despite the availability of vaccines, not all children receive the vaccines, because the parents are not familiar with the diseases and have become complacent.
Hepatitis

- a. Hepatitis A and B, serious liver diseases, caused by related viruses
- b. Hepatitis B (1989) now given to babies
- c. Hepatitis A (1995) given to people traveling to developing countries and those at risk (people who work with blood products)
- d. Combined Hepatitis A/B vaccine approved in 2001
Hepatitis

**Risk factors:**
- people who share needles
- health workers who are exposed to infected blood

**Possible symptoms:**
- pain in the upper right quadrant of abdomen
- nausea and vomiting
- loss of appetite
- jaundice
- fatigue
- itching
Chemical and Pharmaceutical Treatments

- a. Fluoride – many countries add to water to decrease tooth decay
- b. Penicillin and other antibiotics
- c. Louis Pasteur developed vaccines against cholera, anthrax and rabies; and uncovered antibiotics
  the underlying principles of
- d. Alexander Fleming discovered penicillin
- e. Cyclosporin and other anti-rejection drugs
- f. Monoclonal antibodies
Fluoride
World’s Greatest Creation Scientists

1000
2000

LOUIS PASTEUR
1822 - 1895

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“Could I but know all, I would have the faith of a Breton peasant woman.”

“The more I study nature, the more I stand amazed at the work of the Creator.”

- Louis Pasteur
Dr. Alexander Fleming
Hospital 13, Wound Research Center

- Scottish Bacteriologist whose war service furthered interest in dealing with infections.
- Discoverer of lysozyme (1922) & penicillin (1928).
- Shared Nobel Prize for Medicine, 1945.
Cyclosporin: anti-rejection drugs
Monoclonal antibodies: Used to treat Ca and to suppress immune cells
Surgical Procedures & Treatments

- a. Pacemakers and other artificial devices
- b. Angioplasty
- c. Organ transplantation
Artificial devices & robotics
Angioplasty
Organ Transplant
AIDS research continues
(acquired immunodeficiency syndrome)

1. Began in early 1980s
2. Caused by a virus
3. HIV infection progresses to AIDS when immune system is impaired and individual becomes susceptible to opportunistic infection
4. Animals important part of AIDS research
5. Anti-HIV drugs available, however:
   a. Infected person must take lots of pills at different times of the day
   b. Medications expensive, not always covered by health insurance
   c. There are side effects
6. Number of possible vaccines have been developed and are being tested in humans
7. Common sense preventive measures best way to prevent AIDS
Multiple benefits to animal health