

Lesson 16 Study Guide

1. The term 'antibiotic' was coined by Selman Waksman in 1942 to describe any substance produced by a microorganism that is antagonistic to the growth of other microorganisms in high dilution. Today, however, with increased knowledge of the causative agents of various infectious diseases, antibiotic(s) has come to denote a broader range of antimicrobial compounds, including antifungal and other compounds. There are many myths and misconceptions about antibiotics, their use, misuse and possible health consequences. Which of the following answers is true, while the others are common misunderstandings?

- (A) Antibiotics are effective treatments for the flu
- (B) Taking antibiotics can make you antibiotic resistant
- (C) Antibiotic resistant organisms, like MRSA, are found only in developing countries
- (D) Homeopathic treatments have been shown to be more effective than antibiotics for treatment of microbial infections
- (E) Antibiotics are effective when taken as prescribed, over their entire course of treatment for microbial infections, regardless of when a patient starts to feel better.

2. It takes about trillion cells to make a human; that human contains about 10 trillion bacterial cells. The human microbiome (or human microbiota) is the aggregate of microorganisms that reside on the surface and in deep layers of skin, in the saliva and oral mucosa, in the conjunctiva, and in the gastrointestinal tracts. Most of these microorganisms are benign and many are even beneficial. Some however can cause infection and/or disease in humans. Microbicides, such as germ-X, contain active ingredients- like benzalkonium chloride (0.13%) which

- (A) kill a broad spectrum of microbes
- (B) kill specifically only disease causing bacteria
- (C) have been shown to be ineffective on surface contaminants (like hands)
- (D) are less effective than alternative herbal treatments
- (E) have been shown to have no effects at all on bacterial growth

3. Antibiotic resistance in bacteria is reportedly on the rise. MRSA and drug resistant tuberculosis are examples. Antibiotic resistance in bacteria

- (A) are often the result of antibiotic overuse and/or misuse of antibiotics resulting in the selection of mutants that have arisen from randomly occurring mutations in the bacterial genome
- (B) occurs when bacteria struggle for their survival in the presence of these antibiotics
- (C) are not yet a concern for human health, but will be in the future
- (D) has no scientific basis and are likely the result of sinful behaviors practiced in some countries outside the US
- (E) are responsible for the flu and may someday cause a pandemic such as that depicted in the film Contagion

4. Can tissues from other organisms be used to treat humans? Xenotransplantation seeks to develop the technology to use animal organs as donor tissues for human recipients; that is, the transplantation of organs/tissues/cells across species lines. The first attempts at xenotransplantation were conducted using the bone from dog to repair the skull of a Russian aristocrat

- (A) 2005
- (B) 1992
- (C) 1628
- (D) 1967
- (E) 2008

5. Can cells and tissues be grown in test tubes for human therapy? The manipulation of cells *in vitro* (literally '*in glass*'- outside of the body in tissue or cell culture) in order to form replacement tissues/organs that can be transplanted into patient is called:

- (A) tissue engineering
- (B) cancer
- (C) transgenics
- (D) homeopathic medicine
- (E) xenotransplantation

6. Why have humans been involved with therapy/ Humans have been involved with medical biotechnology

- (A) since 1998 and the discovery of stem cells as cellular pharmaceuticals
- (B) to establish a eugenics program since the 1930s that is now actively in progress through the BGI in mainland China
- (C) for thousands of years to address a wide variety human health issues whenever intervention can be applied
- (D) since the cloning of the insulin gene in the 1980s
- (E) as a conspiracy with the American Medical Association (AMA) to increase health care costs

7. Induced Pluripotent stem Cells (iPCs) are made by the introduction of genes that cause the normal cell cycle to remain in the cell division mode, ensuring that they will divide in culture indefinitely. Two or more cloned genes are inserted into the genome of adult differentiated cells; these genes are similar to those involved with tumor genesis that override normal cell division. These cells can then be triggered to become any adult cell type, thereby obviating the controversy about using cells derived from human embryos. The process of inserting genes into cells is called:

- (A) eugenics
- (B) carcinogenics
- (C) transgenics
- (D) genomics
- (E) idiomics

8. Stem cell research in humans is still controversial, in part, because of the so-called 'slippery slope' argument. It is suggested that the same technology that is developed for hES stem cells and therapeutic cloning could easily be extended to

- (A) determining who can have children
- (B) reproductive cloning of humans
- (C) increased abortions
- (D) a policy of ethnic cleansing
- (E) the creation of bioweapons

9. There are cells in humans with regenerative characteristics. The defining characteristic(s) of adult stem cells are

- (A) they are pluripotent-they have a limited potential to differentiate to other cell types
- (B) all of these answers are appropriate
- (C) seen as a potential source of cell for therapeutic purposes that will not be controversial
- (D) unable divide indefinitely
- (E) can be genetically engineered to carry and express foreign genes

10. The use of adult stem cells are

- (A) Outlawed in every country in the world as part of a wide ban on cloning
- (B) from a small subpopulation of specialized stem cells present within some adult organs and capable of self renewal and limited capacity to differentiate.
- (C) An artifact that was famous as a hoax for being fraudulently reported
- (D) Unable to differentiate into any other cell type and while useful for research have not been shown to be useful therapeutically.
- (E) Unable to be genetically altered the way hES or iPSc cells are

11. Degenerative diseases that result in cell death or function, such as Parkinson's and Alzheimer's, injuries that may result in damages cells and tissues, such as spinal cord injuries, and the lack of available human donor organs for transplant has motivated scientists to investigate new ways to replace the functions of diseased organs. Promising approaches to these problems that have received considerable research are

- (A) xenotransplantation and tissue engineering
- (B) all of these approaches
- (C) gene therapy
- (D) creation of artificial biomedical devices
- (E) stem cells

12. Human Embryonic Stem Cells (hES Cells) are:

- (A) derived from adult bone marrow as leukemia treatments
- (B) derived from early (five day old) embryos (blastocysts)
- (C) outlawed in every country in the world
- (D) made with great ease at the Seoul National University in South Korea
- (E) were funded through vast amount of Federal dollars in the US from 2001-2008

13. The history behind the development and therapeutic applications for adult stem cells includes that they:

- (A) have been used to reproductively clone primates and in one case an adult human being**
- (B) have been derived from every tissue type in the human body and have been shown to have equal developmental plasticity compared with hES cells**
- (C) have been shown to be more useful than embryonic stem cells for any applications, demonstrating the importance of hES cells**
- (D) have been used to treat leukemia using bone marrow since 1956 and have been used successfully without controversy for many years**
- (E) in spite of their great promise, because of serious errors will never be successful in clinical trials to treat any disease and have resulted in many fatalities**

14. Many diseases are characterized by organ failure or cell loss. These types of disease are attractive candidates for stem cell therapy and include:

- (A) disease states that require gene therapy**
- (B) only degenerative disease of unknown etiology or autoimmune disease**
- (C) only age-related degenerative diseases, such as Parkinson's and Alzheimer's**
- (D) only cell or organ destruction due to genetic, environmental or infectious disease, such as diabetes.**
- (E) all of the disease states described in the other answers**

15. Stem cells give rise to specialized cells residing in organs. One of the hallmark characteristics of stem cells is a prolonged capacity for self-renewal. Another hallmark characteristic of stem cells is their

- (A) origin exclusively in embryos that are five days old**
- (B) developmental potential (their ability to differentiate in any cell type)**
- (C) inability to be genetically engineered**
- (D) inability to grow in culture**
- (E) ability to be cultured back to cloned human beings**

16. The production of human embryonic stem cells is controversial because

- (A) they have been used to clone President George W. Bush**
- (B) a three month old fetus must be aborted in order to produce them**
- (C) a blastocyst stage embryo usually must be 'dissociated' to recovery ICM (Inner Cell Mass) cells in order to produce them in culture**
- (D) these types of cells can be used only for reproductive cloning**
- (E) they have been shown to cause delusions in NIH researchers about the prospects of receiving federal funding for this important work**

17. Stem Cell Research

- (A) was banned from receiving federal funding in the US in August 2001 under the Bush Administration until recently but is still in contention by many public opponents**
- (B) has resulted in human cloning by a group in the Netherlands as reported on the internet**
- (C) is an established science since first applied to a dog skull bone in the 1600s**
- (D) has no scientific basis and because of this should not receive federal funding**
- (E) is a scientific ruse developed by a fraudulent researcher in South Korea named Dr. Woo Suk Wong**