

BIOLOGY

Biology Research Report

Part A: Write a report that includes information about the following:

1. *Distinguish between an infectious and non infectious disease and identify four examples of each.*

An infectious disease is one that is caused by an infecting organism and that can be transmitted from person to person or to organism to organism.¹ The transfer may be by an intermediary (called a vector), such as blood sucking-insects (mosquitoes) or the transfer may be direct, where the disease-causing organisms, such as bacteria or virus, are passed directly from person to person. Infectious diseases include chicken pox, herpes, colds, measles, HIV/AIDS, influenza and herpes.²

Non-infectious diseases are the ones that are not caused by disease-causing organisms and cannot be shared from one person to another or to one organism to another. They are due to an environmental factor not by a pathogen.³ Examples of non-infectious diseases include haemophilia, cancer, Down syndrome and also those that are related to environment and lifestyle choices such as skin cancer, heart attack, mental health problems and cardiovascular disease.⁴

¹ Dr. Wolfgang A. Renner, the late Prof. Dr. James E. Bailey, and Prof. Dr. Hans M. Eppenberger. October 29, 2002.

² YAHOO ANSWERS. Copyright © 2010 Yahoo! Inc.

³ Mr Jia Zhibang. 2006.

⁴ Eric Althoff. 03/23/10.

2. HIV/AIDS - (Human immunodeficiency virus)/(Acquired immunodeficiency syndrome)

Infectious Disease	HIV/AIDS
Cause	HIV is a lentivirus, and like all viruses of this type, it attacks the immune system by destroying specific blood cells, called CD4+ T cells, which are crucial to helping the body fight diseases in our immune system. ¹ The name 'lentivirus' literally means 'slow virus' because they take such a long time to produce any adverse effects in the body. ² AIDS is caused by HIV and occurs when the virus has destroyed so much of the body's defences that immune-cell counts fall to critical levels, life threatening infections or cancer development making it one of the most serious and deadly diseases in human history.
Transmission	The main ways HIV/AIDS can be transmitted is by the exchange of bodily fluids, usually blood to blood ³ , through close sexual contact and by exposure to HIV-infected needles (including the sharing of needles in intravenous drug use). Sexual transmission does require some damage to either skin or body cavity lining to allow the infected fluid to enter a person's bloodstream (unprotected sex). The virus can also be transferred from a pregnant woman to a foetus and also to an infant in breast milk. ^{4,5}
Host Response	Although a person with AIDS will not show symptoms till a later stage, during this period the virus is replicating and reproducing inside white blood cells (CD4) and in the process it kills the cells. The body can however replace these T-cells but eventually, in the absence of treatment, HIV depletes the T-cell numbers enough to reduce the effectiveness of the immune system. ⁶ Mild infections will take place and when T-cell numbers get very low, serious opportunistic infections and cancers take place – AIDS stage is reached and is critically fatal. ⁷
Major Symptoms	When a persons immune system is overwhelmed by AIDS, the symptoms can include: extreme weakness or fatigue, rapid weight loss, heavy sweating at night, chronic diarrhoea, enlarged lymph glands, skin rashes and mouth, genital and anal sores, frequent fevers that last for several weeks with no explanation, white spots in mouth or throat and trouble remembering things. ⁸ Also illnesses that also occur are pneumonia, meningitis and encephalitis; severe fungal and viral infections and cancers such as lymphomas and Kaposi's sarcoma. ⁹
Treatment	When AIDS had first surfaced no drugs were available to fight the immune deficiency and few treatments had existed for the resulting diseases. ¹⁰ However current drug treatment is unable to eliminate the virus, so it cannot effect a cure, however it is able to keep the virus as such low levels the person is well. Healthy people will have a CD4 cell count greater than 500/microlitre, treatment with antiretroviral therapy is offered to patients with symptoms with established HIV infection or those with a CD4 cell count below 200/microlitre. The drugs used fall into four classes: NNRTIs (Nonucleoside Reverse Transcriptase Inhibitors) such as such as nevirappine (Viramune), bind to and block the action of reverse transcriptase, a protein that HIV needs to reproduce. NRTIs (Nucleoside Reverse Transcriptase Inhibitors, such as stavudine (Zerit), are faulty versions of building blocks that HIV needs to make copies of itself, reproduction of the virus is stalled when HIV uses NRTI instead of a normal building block. Protease Inhibitors (PIs) such as lopinavir/ritonavir (Kaletra), disable protease, a protein that HIV needs to reproduce itself. Fusion Inhibitors, such as enfuvirtide (Fuzeon), the latest treatments that work by blocking HIV entry into cells. ¹¹ When a pregnant woman is HIV positive, treatment can reduce transmission of HIV to the baby from 25-30% down to less than 2%. Zidocudine is the drug usually used during pregnancy, and during the birth. A caesarean section is then done in place of a natural birth and the newborn is give zidocudine for six weeks after its birth. ¹²

Prevention	Despite significant efforts there is no effective vaccine against HIV. The only way to prevent infection by the virus is to avoid behaviours that put you at risk such as abstaining from sex - having limited appeal but it entirely protects against HIV transmission by this route as there is no way to know with certainty whether a sexual partner is infected, having sex with a single uninfected partner also eliminates the risk. ¹³ The use of condoms in other situations is advised as they offer some protection if always used and properly, however they may break or leak putting out a harmful risk. Do not share of inject illicit drugs, toothbrushes or razors, the minor prevention saves a huge risk. In working in a health-care field, follow all national guidelines for protecting yourself against needle sticks and exposure to contaminated fluids. If involved in risky behaviours, get tested immediately. ¹⁴ The risk of HIV transmission from a pregnant woman to her baby is reduced significantly if the mother takes medications during pregnancy, labour and delivery as well as the baby taking medications for the first six weeks after birth. The key is to get tested for HIV as early as possible.
Control	HIV/AIDS has now spread to every country in the world. Currently 40 million people (approximately) are living with HIV infection and an estimated 25 million have died from this disease. The rate of HIV has been particularly distorted in sub-Saharan Africa, but the infection rates in other countries remain high and on alert. ¹⁵ In order to keep the fatal infection from becoming a worse pandemic, national and international programs, research, preventions and awareness have been undertaken. On December 1 of each year World AIDS Day, ("Take Action, No Discrimination") is held to raise awareness of HIV/AIDS and to strengthen our support for those who are HIV positive and those affected by AIDS. ¹⁶ Such corporations as AIDS Trust of Australia specifically raise funds to provide funding for delivering awareness, education, prevention, support, care and social research programs in relation to HIV/AIDS. Also they have a vision and hope for all of Australia to be free of HIV transmission, where the rights of those whom are already affected are protected and their special needs are to be met. ¹⁷ There is a strong incentive to be tested as HIV can be managed with drugs, largely preventing the immune system damage that can become AIDS. Screening programs are taken place in order to manage the disease as it only involves taking a small sample of blood that is sent to a laboratory for processing. ¹⁸ All in which help control the harmful HIV/AIDS.

3. *Dr. Albuston has recently criticized his colleagues for over prescribing antibiotics to fight influenza during the winter months. Critically evaluate Dr. Albuston's point of view.*

I strongly agree with Dr. Albuston's point of view of criticizing his colleagues for over prescribing antibiotics to fight influenza during the winter months for the reasons of overuse, antibiotics resistance and harm to patients.

Influenza is not a bacterial infection; therefore the use of antibiotics to fight influenza would be useless and ineffective. Furthermore, by taking antibiotics when it is unnecessary leads to stronger strains of bacteria, helping them to become immune and resistant to the current antibiotics, therefore when the antibiotic is truly needed the body will already be immune to the antibiotic and it will not be able to fight against the infectious disease.

As influenza is a virus recommended treatment would be rest and cold medicines as these upper respiratory infections go away in their own, not by over prescription of antibiotics as foreseen by Dr. Albuston's colleagues.

Bibliography

Part A:

1.

- YAHOO ANSWERS. Copyright © 2010 Yahoo! Inc.
What is an example of an infectious disease? What are some non-infectious diseases?
<http://answers.yahoo.com/question/index?qid=20070707113951AAQwSxP> (accessed 25th September 2010)
- Dr. Wolfgang A. Renner, the late Prof. Dr. James E. Bailey, and Prof. Dr. Hans M. Eppenberger. October 29, 2002. *Glossary of Biological Terms*. <http://www.cytos.com/?id=197> (accessed 25th September 2010)
- Mr Jia Zhibang. 2006. *Glossary*. <http://www.inbar.int/publication/txt/tr10/glossary1.htm> (accessed 25th September 2010)
- Eric Althoff. 03/23/10. *Non-Infectious Diseases List*.
<http://www.livestrong.com/article/81963-noninfectious-diseases-list> (accessed 25th September 2010)
- "Diseases" 2001. *Health Issues Encyclopaedia*. Volume 1, Page 30-42. The editors of Salem Press Inc.

2.

Cause

- Rebirth Africa. Copyright Rebirth 2000. *The Causes of AIDS*.
http://www.rebirth.co.za/hiv_does_not_cause_aids.htm (accessed 25th September 2010)
- Steven Dowshen, MD. August 2009. *HIV and AIDS*.
http://kidshealth.org/teen/infections/stds/std_hiv.html# (accessed 25th September 2010)
- MaryAnn Tran, MD, Assistant Professor, Department of Medicine, Michigan State University College of Human Medicine; Mary Nettleman, MD, MS, MACP, Chair, Department of Medicine, Michigan State University College of Human Medicine. 7/21/2008. *HIV/AIDS*.
http://www.emedicinehealth.com/hivaids/article_em.htm (accessed 25th September 2010)
- <http://www.cdc.gov/hiv/resources/ga/definitions.htm> (accessed 25th September 2010)
- Lawrence K. Altman. July 3, 2001. "Recollections on the Age of AIDS". *The Doctors World*. Page 4.

Transmission

- AIDS: FACTS AND ISSUES. 2000. *The Transmission of Aids*.
<http://sites.unc.edu/daniel/11fall97/finals11/carraina/transmission.html> (accessed 25th September 2010)
- Kathleen Newell. Alberta Reappraising AIDS society. © Copyright February 5, 2010.
Transmission of HIV and AIDS. <http://www.aras.ab.ca/transmission-BF.html> (accessed 25th September 2010)
- JA Levy. *AIDS - Official Journal of the International AIDS Society*. June 1, 2010 - Volume 24 – Issue 9

Host Response

- AIDS.ORG. Copyright © 2010. *What is AIDS? What causes AIDS?* <http://www.aids.org/info/what-causes-aids.html> (accessed 25th September 2010)
- Bray, M. Dr K Kirke. Dr N Spurrier. 2009. *Screening for Good Health*. Victoria: Melbourne University Press. Page 226

Major Symptoms

- Steven Dowshen, MD. August 2009. *HIV and AIDS*. http://kidshealth.org/teen/infections/stds/std_hiv.html# (accessed 25th September 2010)
- Bray, M. Dr K Kirke. Dr N Spurrier. 2009. *Screening for Good Health*. Victoria: Melbourne University Press. Page 227

Treatment

- AIDS: FACTS AND ISSUES. 2000. *AIDS: Pathogens and Drugs*. <http://sites.unc.edu/daniel/11fall97/finals11/carraina/transmission.html> (accessed 25th September 2010)
- The HealthCentralNetwork. April 1, 2009. *Health Encyclopaedia - Diseases and Conditions*. <http://www.healthscout.com/ency/68/101/main.html> (accessed 26th September 2010)
- Somer, E. 2002. *Nutrition for a Healthy Pregnancy*. New York: Henry Holt and Company, LLC. Page 203-205

Prevention

- The HealthCentralNetwork. April 1, 2009. *Health Encyclopaedia - Diseases and Conditions*. <http://www.healthscout.com/ency/68/101/main.html> (accessed 26th September 2010)
- MaryAnn Tran, MD, Assistant Professor, Department of Medicine, Michigan State University College of Human Medicine; Mary Nettleman, MD, MS, MACP, Chair, Department of Medicine, Michigan State University College of Human Medicine. 7/21/2008. *HIV/AIDS*. http://www.emedicinehealth.com/hivaids/article_em.htm (accessed 25th September 2010)
- Centres for Disease Control and Prevention. November 6, 2006. *HIV/AIDS Basics*. <http://www.cdc.gov/hiv/resources/qa/definitions.htm> (accessed 26th September 2010)

Control

- MaryAnn Tran, MD, Assistant Professor, Department of Medicine, Michigan State University College of Human Medicine; Mary Nettleman, MD, MS, MACP, Chair, Department of Medicine, Michigan State University College of Human Medicine. 7/21/2008. *HIV/AIDS*. http://www.emedicinehealth.com/hivaids/article_em.htm (accessed 26th September 2010)
- World AIDS Day. 2010. *World AIDS Day* <http://www.worldaidsday.org.au/> (accessed 26th September 2010)
- AIDS Trust of Australia. 2010. *Living with HIV/AIDS* <http://www.aidstrust.com.au/index.html> (accessed 26th September 2010)

- Bray, M. Dr K Kirke. Dr N Spurrier. 2009. Screening for Good Health. Victoria: Melbourne University Press. Page 227.
- “Health” 2003. Encyclopaedia of Health. 3rd Edition Page 22-23. Brow Partworks Limited.

Part B:

1.

a)

- WordNet. May 4, 2010. *Definitions*. <http://wordnetweb.princeton.edu/perl/webwn?s=antibiotic> (accessed 27th May 2010)
- HowStuffWorks INC. Thursday, October 30, 2008. *How do antibiotics work?* <http://health.howstuffworks.com/health-illness/treatment/medicine/medications/question88.htm> (accessed 27th May 2010)
- Medical News Today. 20 Apr 2009. *What are antibiotics? How do they work?* <http://www.medicalnewstoday.com/articles/10278.php> (accessed 27th May 2010)
- Mudie, K. and Brotherton, J. 2004. Heinemann [second edition] Biology. Victoria: Heinemann. Page 353.
- Kate Gallagher, MSW. October 2, 2007. *Antibiotics for syphilis*. <http://health.yahoo.com/sexualhealth-medications/antibiotics-for-syphilis/healthwise--hw195771.html>. (accessed 27th May 2010)
- **Picture:** Aumantma. September 27, 2008. *Antibiotics and anti-bacterials*. <http://binalshah.wordpress.com/2008/09/27/antibiotics-and-anti-bacterials/>. (accessed 3rd June 2010)

b)

- MedicineNet. 2010. *The History of Antimicrobial (Drug) Resistance*. http://www.medicinenet.com/antibiotic_resistance/page3.htm (accessed 27th May 2010)
- American Academy of Family Physicians. October 2009. *Antibiotics: When they can and can't help*. <http://familydoctor.org/online/famdocen/home/common/infections/protect/680.html> (accessed 27th May 2010)
- Kate Gallagher, MSW. October 2, 2007. *Antibiotics for syphilis*. <http://health.yahoo.com/sexualhealth-medications/antibiotics-for-syphilis/healthwise--hw195771.html>. (accessed 27th May 2010)
- **Picture:** Georgia Pardom. 2005. *Antibiotic resistance of bacteria. An example of evolution in action?* <http://www.answersingenesis.org/articles/am/v2/n3/antibiotic-resistance-of-bacteria> (accessed 3rd June 2010)

c)

- Steven Dowshen, MD. November 2008. *The Danger of Antibiotic Overuse*. http://kidshealth.org/parent/h1n1_center/h1n1_center_treatment/antibiotic_overuse.html# (accessed 27th May 2010)

- Mayo Foundation for Medical Education and Research (MFMER). Feb, 6 2010. *Antibiotics: Misuse puts you and others at risk.* <http://www.mayoclinic.com/health/antibiotics/FL00075> (accessed 27th May 2010)
- University of Wisconsin, USA. May 1, 1997. *When the antibiotics quit working.* <http://whyfiles.org/038badbugs/> (accessed 27th May 2010)
- Michael A. Schmidt, PhD. 1994. Beyond Antibiotics (third edition). California: North Atlantic Books. Page 267-280
- "Health" 1996. Encyclopaedia of Life Sciences. Page 38-40. Marshall Carendiss Corporation.
- **Picture:** Antibiotics. November 27, 2008. *Bacterial Resistance.* <http://bioetopics.wordpress.com/2008/11/27/bacterial-resistance/> (accessed 3rd June 2010)

¹ Steven Dowshen, MD. August 2009.

² Centres for Disease Control and Prevention. November 6, 2006.

³ AIDS: FACTS AND ISSUES. 2000

⁴ MaryAnn Tran, MD, Assistant Professor, Department of Medicine, Michigan State University College of Human Medicine; Mary Nettleman, MD, MS, MACP, Chair, Department of Medicine, Michigan State University College of Human Medicine. 7/21/2008

⁵ Kathleen Newell. Alberta Reappraising AIDS society. © Copyright February 5, 2010.

⁶ AIDS.ORG. Copyright © 2010.

⁷ Bray, M. Dr K Kirke. Dr N Spurrier. 2009.

⁸ Steven Dowshen, MD. August 2009.

⁹ Bray, M. Dr K Kirke. Dr N Spurrier. 2009.

¹⁰ AIDS: FACTS AND ISSUES. 2000. *AIDS: Pathogens and Drugs.*

¹¹ The HealthCentralNetwork. April 1, 2009

¹² Somer, E. 2002

¹³ Centres for Disease Control and Prevention. November 6, 2006.

¹⁴ MaryAnn Tran, MD, Assistant Professor, Department of Medicine, Michigan State University College of Human Medicine; Mary Nettleman, MD, MS, MACP, Chair, Department of Medicine, Michigan State University College of Human Medicine. 7/21/2008

¹⁴ Kathleen Newell. Alberta Reappraising AIDS society. © Copyright February 5, 2010.

¹⁵ MaryAnn Tran, MD, Assistant Professor, Department of Medicine, Michigan State University College of Human Medicine; Mary Nettleman, MD, MS, MACP, Chair, Department of Medicine, Michigan State University College of Human Medicine. 7/21/2008.

¹⁶ World AIDS Day. 2010

¹⁷ AIDS Trust of Australia. 2010.

¹⁸ Bray, M. Dr K Kirke. Dr N Spurrier. 2009.

Footnotes

a)

¹ WordNet. May 4, 2010.

² HowStuffWorks INC. Thursday, October 30, 2008.

³ Medical News Today. 20 Apr 2009.

⁴ Mudie, K. and Brotherton, J. 2004

⁵ Kate Gallagher, MSW. October 2, 2007.

b)

¹ MedicineNet. 2010

² Kate Gallagher, MSW. October 2, 2007.

³ American Academy of Family Physicians. October 2009

c)

¹ Steven Dowshen, MD. November 2008

² Mayo Foundation for Medical Education and Research (MFMER). Feb, 6 2010

³ University of Wisconsin, USA. May 1, 1997.



