Mechanical barrier against infection

Take Home Midterm

1.) One example of a mechanical barrier against infection would be the surface layer of our skin. The surface layer of human skin is acidic and very dry, thus making it difficult for pathogens to survive. In addition to this, the surface layer of human skin consists of dead epithelial cells, under which many viruses have difficulty replicating. Moreover, dead epithelial skin cells are frequently being replaced, and thus pathogens that are present on the skin often do not have a chance to cause infection. Therefore, the surface layer of human skin is a very important mechanical barrier against infections.

Sometimes they are circumstances under which the surface layer of our skin can be compromised, thus resulting in infection. Several breaches to the surface layer such as through bites, burns, cuts, or trauma can allow for bacteria to enter into the tissue, thus resulting in infection. One such example of an infection that can result from a breach of the skin is Rocky Mountain spotted fever. Rocky Mountain spotted fever is transmitted from a bite from an infected tick. Rocky Mountain spotted fever is caused from the bacterial organism Rickettsia rickettsii and may cause fever, nausea, abdominal pain, and joint pain. In addition to this, burns to the surface layer of the skin can destroy the protective layer and thus allow for many types of bacteria such as staphylococci to colonize and infect the individual. Thus, the surface layer of our skin is an extremely important mechanical barrier against infection and protects us from surface and environmental pathogens.

Church, Diedre, Owen Reid, and Brent Winston. “ Burn Wound Infections.” Clinical

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2.) In recent years, globalization has lead to many issues associated with food borne illnesses. Some of the factors related to this issue are an increase in the amount of food that is traded between countries, international travel and migration of individuals from different countries, and economic and technological advances that have changed the types of foods that individuals eat. In addition to this, the ways in which foods are prepared are changing, and the introduction of new foods to new regions are some of the factors affecting food borne illnesses. Furthermore, dietary habits of individuals are beginning to shift to a healthier diet and more and more individuals are starting to eat more organic and fresh food. To be able to meet these demands, the United States and other countries have to import certain foods on a seasonal basis. For example, according to the CDC, more than 75% of the fresh fruits and vegetables that are available in U. S. markets and restaurants are imported. It has been estimated that the increased demand for fruits and vegetables has nearly doubled the rates of food borne illnesses. Therefore, individuals are at a greater risk to acquire a food borne illness from contaminated food that is imported from other countries.

Currently, one of the largest consequences of globalization and international trading is that when food becomes contaminated it can spread all over the world. In year's past, food borne illnesses were thought to be local events and it was easier to ascertain the cause of the illness. However, this is no longer the case and takes much longer now that globalization has occurred. One example of a food borne illness that spread to different countries was an outbreak of shigellosis in eight restaurants caused by a common strain of Shigella sonnei that occurred in the United States and Canada between July and August in 1998. It was determined that the illness was associated from the ingestion of parsley. In each case the parsley was found to have been chopped and left at room temperature for several hours before being used. In addition to this, in 6 of the outbreaks it was found that the parsley was traced to a specific farm in Baja California, Mexico. Thus, it was likely that the parsley had been contaminated before shipment. Therefore, as seen from these examples, globalization has had a major impact on food borne illnesses and with changes in dietary habits, the increase in international travel and migration, and an increase in imported foods have been some of the main reasons associated with food borne illnesses relating to globalization.

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3). According to Dr. Nelson El-Amin’s lecture, vaccinations have had a large impact on infectious disease rates. One such disease that has seen a dramatic decrease in the number of individuals affected is Tetanus. According to the lecture, the number of individuals that had Tetanus in 1947 was about 560-570. Since vaccination for Tetanus has occurred in the United States, there has been a steady downward decrease in the number of individuals affected. In 2002, the number of individuals affected with Tetanus was about 10-20. In addition to this, another disease that has significantly decreased due to vaccination is the rates of individuals affected with Diphtheria. According to the lecture, in 1940, the number of individuals affected with Diphtheria was about 16, 000. Since vaccination for Diphtheria, the rates of those infected have significantly decreased. In 2000, the rate for those infected with Diphtheria was almost non-existent. And finally, another example that was presented in Dr. El-Amin’s lecture was disease rates for Polio. At one time, Polio was the most feared disease in United States and caused either paralysis or death. Before there was a vaccination for Polio, Polio affected more than 20, 000 individuals per year. In 1955, the first Polio vaccination was licensed and had a significant impact on the rates of those

affected with Polio. Today, there aren't any reported cases of Polio in the United States. Thus, as seen from the examples presented in Dr. El-Amin's lecture, vaccinations have had a significant impact in reducing the disease rates for many infectious diseases, and in some cases, such as Polio, vaccinations have just about completely eliminated Polio in the United States.

El Amin, Alvin N. " The Changing Epidemiology of Vaccine Preventable Diseases."

PM 527 Infectious Disease Epidemiology Class. Los Angeles. 11 Mar. 2010. Lecture.

4). In 1879, Robert Koch discovered the anthrax bacterium and developed the Koch's postulates for causation. There are 4 postulates that Koch believed must be satisfied in order to establish causation. The postulates state: the bacteria must be present in every case of the disease, the bacteria must be isolated from the host with the disease and grown in pure culture, the specific disease must be reproduced when a pure culture of the bacteria is inoculated into a healthy susceptible host, and that the bacteria must be recoverable from the experimentally infected host. One such example of an infectious disease that satisfies the Koch's postulates is Anthrax. Anthrax was the first infectious disease that was discovered by Koch, and it was this disease that gave birth to his 4 postulates.

On the contrary, there are exceptions of certain infectious diseases that do not satisfy all of the Koch's postulates. There are many infectious diseases in which infected carriers do not show the signs or symptoms of having the

disease. These individuals are thus asymptomatic. One example of this is from the Bartonella species of bacteria. Certain species that are infected with Bartonella do not show any signs of symptoms, whereas other infected species do. Therefore, in cases where the infected individual does not show any signs or symptoms, all the Koch's postulates are not satisfied. In addition to this, certain infectious diseases cannot be grown in pure culture, but rather can only reproduce in living cells. Thus, in cases such as these, the Koch's postulates are also not satisfied. Other examples of infectious diseases that do not satisfy all of the Koch's postulates are cholera, typhoid fever, and herpes simplex.

Jacomo, V., and P. J. Kelly. " Natural History of Bartonella Infections (an Exception to

Koch's Postulate)." Clinical and Diagnostic Laboratory Immunology 9. 1 (2002): 8-18. American Society of Microbiology. Web. 31 Mar. 2010. .

5). According to Dr. Nelson El-Amin's lecture, there are a few reasons why diseases such as measles and polio have not been completely eradicated even though there are vaccines to prevent these diseases. One of the reasons presented in the lecture for this is due to the fact that some individuals do not receive the vaccination against these diseases out of fear. There are cases of individuals that do not receive measles vaccinations due to concerns that vaccinations have caused certain ailments such as autism. This is evident from a cohort study conducted on unvaccinated children that have not received proper vaccination due to concerns of safety. However, according to the lecture, there is no scientific fact to support the beliefs that

autism is associated with the MMR vaccinations. Another reason why certain groups of individuals do not receive vaccinations is because it goes against their religious beliefs and they believe that they do not need to receive a vaccination in order to be protected against diseases.

Some of the characteristics for individuals that have not received proper vaccination are individuals that are young, individuals that do not know their vaccination status, and individuals that have migrated from other countries. According to the lecture, in cases in which individuals have not received vaccination, 76% of those individuals are less than 20 years old. In addition to this, 91% of unvaccinated individuals do not know their vaccination status. And furthermore, 89% of unvaccinated individuals are people that have migrated from other countries. Therefore, the evidence shows that the reasons why certain diseases such as polio and measles have not been completely eradicated are due to the fact that not everybody has received proper vaccination. This is either due from individuals refusing to receive vaccination out of fear or some other belief, certain individuals do not know that they have not received proper vaccination, or certain individuals have migrated from other countries and have not received all their vaccinations.

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6). According to Dr. Wohl’s lecture on HIV/AIDS, the distribution of AIDS diagnoses has changed amongst the different race/ethnic groups since the

beginning of the AIDS epidemic. For example, in 1985, about 60% of the total AIDS cases were amongst Caucasians, about 27% were amongst Black/African Americans, about 16% were amongst Hispanic/Latinos, about 1% were amongst Asians, and less than 1% were amongst American Indian/Alaska Native and Native Hawaiian/other Pacific Islander. As of 2007, these rates have changed amongst the different race/ethnic groups. For example, for Caucasians the rates have decreased to about 28% of the total AIDS cases. On the contrary, rates for Black/African Americans have increased to about 48% of the total AIDS cases. In addition to this, rates for Hispanic/Latinos have also increased to about 21% of the total AIDS cases. For Asians, the rates have remained constant at around 1% of the total cases, and the rates amongst American Indian/Alaska Native and Native Hawaiian/other Pacific Islander have also remained constant at around less than 1% of the total AIDS cases.

According to the lecture, SHAS examined time intervals between when a person first learned that they had HIV and when they were diagnosed with AIDS. As indicated by the findings, detection rates varied significantly between different racial/ethnic groups. The results showed that Caucasians were more likely than Black/African American or Hispanic/Latinos to have their HIV infection to be detected early (more than 5 years) before their onset of AIDS. Thus, many more Caucasians were more likely to fall into the “ early detection” group in comparison to other racial groups. In contrast to this, Hispanic/Latinos were much more likely than any other racial group to have their HIV infection detected very late (within a year) in their progress to AIDS diagnosis. Thus, Hispanic/Latinos were more likely to fall into the “ very

late detection” group in comparison to other racial groups. Black/African Americans were also very likely to have their HIV infections detected very late prior to coming down with an AIDS diagnosis, however, the rates of Black/African Americans in the “ very late detection” group was lower than that of Hispanic/Latinos. The rates between racial/ethnic groups for individuals that had their HIV infection detected between 13 and 60 months prior to AIDS diagnosis (“ late detection) was relatively equal between all of the racial/ethnic groups. In addition to these finding, according to the lecture, it was shown that in Los Angeles, individuals that were more likely to be late testers were found to be women, Black/African Americans, foreign born Latinos, U. S. born Latinos, those exposed to HIV via heterosexual contact, young individuals, and less educated individuals.

There are many implications associated with late detection of HIV. Individuals infected with HIV that are diagnosed later in life, are not able to receive proper antiretroviral therapy. And thus, those individuals are more likely to suffer from adverse effects in comparison to individuals that are diagnosed earlier in life who are able to receive the proper medication to help slow down their onset of AIDS. In addition to this, individuals that are detected of having HIV later in life are more likely to affect other individuals, thus spreading HIV to other unknowing individuals and further exacerbating the issue. Therefore, as shown from the lecture, there are many negative implications of late detection, and it has also been shown that the distribution of AIDS has changed significantly amongst racial/ethnic groups since the beginning of the AIDS epidemic.

Wohl, Amy R. “ HIV and AIDS: Worldwide, the U. S. and Los Angeles County.” PM 527

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