The obstacles to malaria vaccine biology essay

Science, Biology

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Data base 1: Science Direct

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Introduction:

What is Malaria and how does it affect humans? Malaria, caused by the human parasite Plasmodium falciparum, a disease transmitted via the Anopheles mosquito into the human blood, where is attaches to hemoglobin.

This parasite digests the hemoglobin that is present in the red blood cell whilst attaches to the walls of blood vessels, obstructing blood flow (WALTHER et al 2007)Is Malaria a common disease and how many deaths does it cause? Approximantly 300–500 million contract the human parasite P. falciparum every year with a very high rate of infection and death. Malaria can be directly linked to between 1-3 million deaths a year, however in recent years we have seen a low of around 800, 000 humans. (Jadhav 2012)Thesis statementThis essay will evaluate if there is a vaccine that can be developed to treat, or prevent, the malaria disease.

Topic 1 (Obstacles to Malaria Vaccine)

There is an extensive genetic diversity, due to the human immune and drugs system's attempt of eradicate the parasite, in the mosquito's diploid sexual reproduction as a result of mutation during mitotic reproduction during the haploid liver, blood stages and genetic recombination (Thera 2012)The natural immune responses against the parasite differs in each of their different stages, causing further difficulties due to the hindered ability to identify mayor structures and process that play a role in immunity. (Garcia-Basteiro, et al. 2012)As we are only currently able to target individual development stages of the parasite, treatment must be prompt. For example, within the first 48 hours after a bite from a mosquito, the parasite has gone through several stages of development. (Walther 2007)

Topic 2 (Current Vaccines)

Currently, there are vaccines that target different stages of Malaria cycle, these include Pre-Erythorocytic vaccines that targets the pre-erythrocytic

circumsporozoite protein, Blood-Stage vaccines that are based on antigens and Transmission-Blocking vaccines that aim to block transmission molecules (Thera et al 2012)The most successful malaria subunit vaccine is RTS, S, combination of immunogenic hepatitis B surface antigen (HBsAg) and CS (Circumsporozoite protein) (Schuldt 2012)A follow up report on the initial clinical trial of RTS, S found that protection continued for 18 months after immunisation, with an efficacy of 57. 7% (Heppner 2013)

Topic 3 (Are there alternatives if a vaccine cannot be produced?)

Chemotheraphy may be used for malaria infected patients dependant on the seriousness of the disease and drug susceptibility (Santos-Magalhaes et al 2010)Immunization is one of the most economical means of reducing infection and death from the malaria parasite, second only behind water sanitation (Walther et al 2007)Use of pesticides to kill mosquitoes and bed nets to prevent transmission via bites have been able to decrease Malaria cases world wide (Heppner 2013)

Topic 4 (Future Directions)

The Multi-Stage, Multi-Antigen approach has the greatest potential as it addresses all stages of the different development stages of the parasitic development, and is currently working on the delivery method of this vaccine (Thera et al 2012)Considerable progress has been made in the genetic development of parasites that are unable to develop beyond the liver stage, this being due to a loss of key gene(s). (Hill 2011)The alteration of the current vaccine, RTS, S, is now being adapted to become the first

recombinant Plasmodium falciparum vaccine, RTS, S/AS01 and is currently in Phase III of pediatric trails. (Heppner 2013)

Conclusion

While there have been many promising improvements over the past two decades, vaccines thus far have not been able to eradicate malaria due to its complex and quickly developing life spanCurrently, there are many multiple staged vaccines being developed, with predictions estimating that a suitable vaccine will be developed in the next decadePart BB WALTHER & M. WALTHER (2007). " What does it take to control malaria." Annals of Tropical Medicine & Parasitology 101(8): 657-672. Jadhav, P., et al. (2012). " Important advances in malaria vaccine research." Chronicles of Young Scientists 3(2): 111-121Garcia-Basteiro, A., et al. (2012). " Approaching the Target: the Path Towards an Effective Malaria Vaccine." Mediterranean Journal of Hematology and Infectious Diseases 4(1): 112-125. Thera, M. & C. Plowe (2012). " Vaccines for Malaria: How Close Are We?" National Institutes of Health 63: 345-357. Heppner, D. (2013). " The malaria vaccine." Travel Med Infect Dis. 11(1): 2-7. Schuldt, N. & A. Amalfitano (2012). " Malaria vaccines: focus on adenovirus based vectors." Vaccine 30(35): 5191-5198. Hill, A. (2011). " Vaccines against malaria." Philosophical Transactions of the Royal Society 366: 2806-2814.