The Biological Experimentation Behind an *In Silico* Simulation of Parasite Dynamics with *Trypanosoma cruzi* as a Model

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According to the World Health Organization, Chagas' disease is prevalent throughout 18 countries. There are 16-18 million cases worldwide and about 21,000 deaths a year. There are over 120 million people at risk of this deadly disease. Chagas' is caused by the parasite *Trypanosoma cruzi* (*T. cruzi*). The parasite is spread by a bug in the *Triatomina*e family. These bugs, known as "kissing bugs" because of their tendency to bite around the face and eyes, infect the human host by defecating the parasite on to the epidermis. The human allows the parasite entry through scratching it into the skin. The parasite then infects human cells with a preference for nervous and myocardial cells. Many other organs are infected also, and the damage done to the heart and digestive system are usually fatal.

Figure 1: *T. cruzi* parasite

There are drugs available for the late chronic phase of infection, but these drugs are highly toxic, and only attack the parasites in bloodstream, leaving those nested in the human cells already. Therefore, effective treatment by such drugs is rare. Because of the threat Chagas' disease poses, the ineffectiveness of existing treatments, and the recent contamination of the blood supply in Texas, [1] new strategies must be developed to combat the threat of the parasite *Trypanosoma cruzi*.
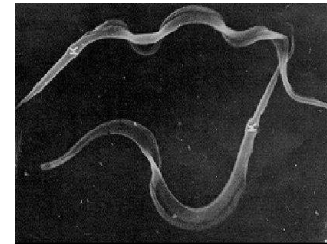
Due to its epidemic effects, the danger of Chagas' disease, and the little that is known about *T. cruzi*, as well as host-parasite interactions in general, we have decided to develop an *in silico* model of the *T. cruzi* parasite. This high performance computational model will provide a tool which can be used to develop effective strategies for combating the *T. cruzi* parasite, and potentially other host-parasite systems, too. The project is entitled the Virtual Parasite Project (VPP).

Addition background information about Chagas' Disease and *T. cruzi* can be found at The World Health Organization's website:
http://www.who.int/tdr/diseases/chagas/diseaseinfo.htm

1. American Red Cross http://chapters.redcross.org/ca/norcal/phys/transfus/tcruzi.htm