More than a billion people live at risk of chronic diseases caused by parasitic filarial nematodes. These diseases: lymphatic filariasis, onchocerciasis, and loiasis cause significant morbidity, degrading the health, quality of life, and economic productivity of those who suffer from them. Though treatable, there is no cure to rid those infected of adult parasites. They can modulate the immune system and live for 10-15 years. Testing of compounds against filarial nematodes is complicated due to a lack of an objective platform on which to analyze in-vitro treatments. There is no published, immunocompetent laboratory model for lymphatic filariasis. The work in this study addresses each of those areas. Imatinib mesylate is shown to have macrofilaricidal potential, killing adult male and female Brugia pahangi worms in-vitro. Histological analysis of rats infected with Brugia pahangi show the same lymphangiectasia and inflammatory cellular response seen in humans. The WiggleTron, a light scatter based detection system, can detect and quantify parasite motion; analysis of that motion can be correlated with worm health to study the in-vitro effects of potential anthelminthic drugs. Finally, this study will show the relative uniqueness of secreted microRNAs and discuss their potential as novel therapeutic agents.