

Summer Student Research Program  
Project Description

**FACULTY SPONSOR'S NAME AND DEGREE:** *Nikhat Parveen, Ph.D.*

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**PROJECT TITLE (200 Characters max):**

*Study of tick-borne diseases, syphilis, P. aeruginosa, and analysis of samples after treatment in vitro or recovered from mice*

**HYPOTHESIS:**

*One or more of the selected proteins will be differentially recognized by syphilis patients at different stages of infection*

**PROJECT DESCRIPTION** (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)

*All candidates will learn to prepare medium, buffers, autoclaing and learn techniques associated with Molecular Biology, Microbiology, pathogenesis, biochemistry and data analysis approaches. Microscopic examination of bacteria and parasite will also be used by the student. He/she will be responsible for analysis of samples by treatment with P. aeruginosa culture supernatant, enzymatic analysis, proteins resolution by SDS-PAGE and if successful, used for immunization of mice to generate specific polyclonal antibodies. If time permits, student will also learn serological techniques with sera generated and purify DNA from infected mice organs for real-time PCR for quantification etc.*

**SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:**

1. Chan, K., Nasereddin, T., Alter, L., Centurion-Lara, A., Giacani, G., and **N. Parveen**.\* 2016. "Treponema pallidum Lipoprotein TP0435 Expressed in *Borrelia burgdorferi* Produces Multiple Surface/Periplasmic Isoforms and mediates Adherence". Nature Scientific Reports 6:25593. doi:10.1038/srep25593.
2. Akoolo, L., Schlachter, S., Khan, K., Alter, L., Rojzman, A. D., Gedroic, K., Bhanot, P., and **N. Parveen**.\* 2017. A novel quantitative PCR detects Babesia infection in patients not identified by currently available non-nucleic acid amplification tests. BMC Microbiology 17:16-24. doi:10.1186/s12866-017-0929-2
3. Akoolo, L., Djokic, V., Rocha, S.C., and **N. Parveen**.\* 2021. Pathogenesis of *Borrelia burgdorferi* and *Babesia microti* in TLR4-Competent and TLR4-Deficient C3H Mice. Cellular Microbiology. 2;e13350.doi: 10.1111/cmi.13350.
4. Primus, S., Rocha, S.C., Giacani, L., and **N. Parveen**.\* 2020. Identification and functional assessment of the first placental adhesin of *Treponema pallidum* that may play critical role in congenital syphilis. Frontiers in Microbiology. 11:621654. doi: 10.3389/fmicb.2020.621654
5. Carcamo, C. P., Velasquez, C., Rocha, S. C., Centurion-Lara, A., Lopez-Torres, L., and **N. Parveen**.\* 2024. Sociodemographic and clinical characteristics associated with maternal and congenital syphilis - A prospective study in Peru. International Journal of Infectious Diseases, 143:107041. <https://doi.org/10.1016/j.ijid.2024.107041>
6. Rocha, S. C., Moustafa, M. A. M., Velásquez, C. V., Azuama, O. C., Zafar, K., Meyer, C., Araujo, M., Taylor, K., and **N. Parveen**.\* 2025. Long-term survival of *Babesia microti* and *Borrelia burgdorferi* in C3H/HeJ mice and their effect on Lyme arthritis and babesiosis manifestations. Microbiology Spectrum. Aug 12:e0025225. doi: 10.1128/spectrum.00252-25
7. Douglas S. Parker, Onyedikachi C. Azuama, Kashaf Zafar, Jon D. Goguen, John M. Leong, Nikhat Parveen. [Retrospective analysis of Pseudomonas aeruginosa clinical isolates for secreted PrpL protease: a key virulence factor associated with corneal tissue damage](https://doi.org/10.64898/2025.12.11.693724). bioRxiv 2025.12.11.693724; doi: <https://doi.org/10.64898/2025.12.11.693724>

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THIS PROJECT IS:     Clinical     Laboratory     Behavioral     Other

THIS PROJECT IS CANCER-RELATED  No  
Please explain Cancer relevance

THIS PROJECT IS HEART, LUNG & BLOOD- RELATED  No  
Please explain Heart, Lung, Blood relevance

THIS PROJECT INVOLVE RADIOISOTOPES?  No

THIS PROJECT INVOLVES THE USE OF ANIMALS  No  
PENDING     APPROVED     IACUC PROTOCOL #

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS?  No  
PENDING     APPROVED     IRB PROTOCOL # M

**THIS PROJECT IS SUITABLE FOR:**

UNDERGRADUATE STUDENTS     ENTERING FRESHMAN      
SOPHMORES        ALL STUDENTS   

THIS PROJECT IS WORK-STUDY:    Yes     or    No  Student without work-study  
will be accepted if resources are available.

THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR  
FOR INTERESTED VOLUNTEERS:    Yes     or    No

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?

*Student will get exposure to hypothesis-driven research. In addition to the scientific experience student will gain from the project described above, he/she will learn how to conduct research in an ethical manner in the laboratory, maintenance of proper records, attain experience in analyzing data and explaining results to scientific audience, and interaction with other researchers in the laboratory will help him/her to participate in scientific discussions.*