



# HOST-PATHOGEN INTERACTION (IMMUNOLOGY)

## PROF. HIMANSHU KUMAR

Department of Biological Sciences  
IISER Bhopal

**PRE-REQUISITES :** Should have Bachelor's degree in Biological Sciences with knowledge in Biochemistry, Molecular Biology, Animal Physiology

**INDUSTRY SUPPORT :** Biotechnology, Pharma, Vaccine, Medical diagnostic

### COURSE OUTLINE :

This course introduces about fundamental aspects of Host (mainly human and mouse) defense system and also discusses how our immune system develops immunity against foreign living and non-living entities. This course will be excellent for Bachelor, Master or Research level students from different disciplines of Biological Sciences, Biotechnology, Chemical Sciences and Medical Sciences to understand the basics of host defense system.

### ABOUT INSTRUCTOR :

Prof. Himanshu Kumar is an Associate Professor in the Department of Biological Sciences at the IISER Bhopal. He is working in Innate Immunobiology. His major focus is transcriptional and translational level regulation of antiviral innate immune responses during Flu or another virus infection. Prof. Kumar obtained his Bachelor and Master degree from Lucknow University. He obtained Ph.D. from Graduate School of Medicine, Osaka University, Japan (2008) and awarded as Excellent Ph.D. Student of Medical School. He obtained prestigious JSPS Post-doctoral fellowship of Japan for two years, after which he moved to IISER Bhopal in 2010 as Assistant Professor. Prof. Kumar is a recipient of the Ramanujan National Fellowship of the DST in 2010. He is also Adjunct Associate Professor of Immunology Frontier Research Center, a top Immunology Institution in the world. He is also working as "Editor-in-Chief" of "International Reviews of Immunology", a Taylor and Francis Journal.

### COURSE PLAN :

**Week 1:** History of development of Immunology field; Branches of Immunology & An Introduction of Immune System; Overall Introduction of Immune Organ.

**Week 2:** Immune organ: Thymus & Bone Marrow; Immune organ: Spleen, lymph node, MALT & GALT; Cells of Immune system - Hematopoiesis & Usage of early stem cells in transgenesis.

**Week 3:** Cells of Immune system - Development of transgenic animal for immunological studies; Cells of Immune system - Application of transgenic animal for immunological studies; Cells of Immune system - Various immune cells and its role in host defense and immunopathogenesis.

**Week 4:** Basics of cytokines and other immune mediators; Signature of inflammation & various Inflammatory mediators and other effector immune responses; Application of cytokines in therapies and research.

**Week 5:** Introduction of innate immunity and how innate immunity influence whole immunity; Innate Immunity-Physical, Biochemical, Microbial Barriers; Innate Immunity-Pattern-recognition receptors & TLRs.

**Week 6:** Innate Immunity-RLRs; Innate Immunity-NLRs; Innate Immunity-DNA Sensor.

**Week 7:** Innate Immunity-Humoral components (Introduction of Complements & classical pathway); Innate Immunity- (Alternative & Lectin pathway) and complements and diseases; Adaptive Immunity (Introduction).

**Week 8:** Antigen - A brief Introduction; B cells & Antibodies - A brief Introduction; T cells & T Cell response - A brief Introduction.

**Week 9:** Brief introduction on innate immune responses during virus infection and how virus invade innate immunity to establish infection (part-1); Brief introduction on innate immune responses during virus infection and how virus invade innate immunity to establish infection (part-2); Brief discussion on B and T cell-mediated immune responses during virus infection and how virus invade adaptive immunity to establish infection.

**Week 10:** Immunological responses during Influenza virus infection-(part-1); Immunological responses during Influenza virus infection-(part-2); Brief introduction of Arboviral infection.

**Week 11:** Brief discussion on immunology of bacterial infections including immune responses to extracellular and intracellular bacteria and evasion on antagonistic mechanisms devised by bacteria to evade such responses (part-1); Brief discussion on immunology of bacterial infections including immune responses to extracellular and intracellular bacteria and evasion on antagonistic mechanisms devised by bacteria to evade such responses (part-2) & Immunology of Tuberculosis (some part); Immunology of Tuberculosis (remaining part).

**Week 12:** Immune responses to parasite and fungal infection; Discussion about Malaria; Discussion about African Sleeping Sickness.