

GESINAS - ImmunoTools Award 2016



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Screening NET formation procedures upon stimulations of different cytokines, chemokines and alarmin

I am Jyaysi Desai, a Ph.D. student in the laboratory of Professor Dr. Hans-Joachim Anders at Medical clinic of University of Munich, Germany. My research interest lies in the field of innate immunity with a special focus on neutrophils and the molecular mechanisms involved in the formation of neutrophil extra-cellular traps (NETs).

Neutrophils are the first line of defense of the innate immune system. They are the first immune cells that reach the site of infection. They are known for their phagocytosis function for a long time. However, in 2004, it was observed that they behave in a peculiar way during bacterial infections. Upon contact with the bacterial/fungal infection, neutrophils release chromatin material to form a net like structures known as neutrophil extracellular traps (NETs). The main function of NETs is to trap and kill pathogens. NETs are decorated with granular enzymes like neutrophils elastase (NE), myeloperoxidase (MPO) as well as contain histones. Although neutrophils and NETs are beneficial during infections, they can be the cause of serious tissue injury during sterile inflammation e.g. diseases like gouty arthritis and autoimmune diseases like ANCA vasculitis etc. Therefore, studying neutrophils and the process of NET formation is of prime importance. Our lab is interested in understanding how does neutrophil form NETs?

As a part of my Ph.D. project, one of my major goals is to understand the molecular mechanisms of NET formation and the neutrophil cell death during NET formation, referred as NETosis. We have recently shown that phorbol myristate acetate (PMA) as well as monosodium urate crystals induced NET formation involves RIPK3- MLKL mediated neutrophil necroptosis in both humans as well as mice neutrophils (*Desai et. al, European journal of immunology, 2015*). This is the first ever report to describe a molecular mechanism involved in the NETosis. It is known that a wide range of stimuli induces NETosis e.g. bacterial pathogens (e.g. E.coli,

S.aureus etc.), fungal pathogens, lipopolysaccharide (LPS), a wide range of pro-inflammatory cytokines and chemokines etc. We hypothesize that each stimulus activates a distinct molecular pathway to induce NETosis. Being an innate immunity lab, our next goal is to understand the potential of different pro-inflammatory cytokines, chemokines as well as alarmins (pro-inflammatory cytokines with chemo attractant functions) etc. to induce NETosis and to dissect the different molecular mechanisms involved in these processes. The wide range of reagents offered by **ImmunoTools** can help us to screen potential NETs stimuli and to make a comparison amongst them. On the other hand, neutrophils also induce a strong inflammatory response during sterile as well as non-sterile inflammation. We are also interested in characterizing the inflammatory milieu upon activation of neutrophils by various stimuli. We would like to compare the cytokine secretion by activated neutrophils and neutrophils undergoing NETosis. Several ELISA kits offered by **ImmunoTools** (as requested below) can prove very useful for this purpose.

These studies are very important towards understanding how the different pro-inflammatory cytokines and, alarmins (as requested below) induce NETosis during various NET-related disease conditions. This knowledge may also facilitate to develop novel treatment strategies for such diseases.

Apart from spending my time in the laboratory, I am interested in education and in ideas to explain science in innovative and interesting ways. Recently, I participated and won the prize in chemistry category in the “Dance your Ph.D.” competition organized by Science journal. (<https://www.youtube.com/watch?v=SeX0YW1TxP4>). My video also received the People’s Choice award. I was also actively involved in organizing an interactive talk of the Nobel laureate Sir Herald Kroto (Chemistry Nobel prize 1996) at LMU Munich, as a member of Elite Network of Bavaria, Germany in 2013. **GESINAS ImmunoTools AWARD** is a great initiative to promote the inter-connection between the scientific arena and the social/educational responsibilities towards society. Believing in the similar views, I would like to be considered for the **GESINAS ImmunoTools AWARD** 2016.

GESINAS ImmunoTools AWARD for **Jyaysi Desai** includes 29 reagents

recombinant human cytokines: GM-CSF, IL-1alpha, IL-1beta, IL-1RA, IL-6, IL-8, IL-10, MCP-1 / CCL2, M-CSF, TGF-beta3, Biotin-rh IL-6

human ELISA-set for 96 wells: human IL-6, human IL-8, human TNF-a (each 3 reagents)

recombinant mouse cytokines: GRO-b/ CXCL2, IL-1alpha, IL-1beta, IL-6, IL-10, IL-33, MCP1 / CCL2, M-CSF, MIP-1b / CCL4

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