Protective immune role of platelets during respiratory viral infection

Iluja Gautam[1]*, Chadwick Huss[1], Malik Sarsour[1], Saurabh Chattopadhyay, PhD[2], Leah Wuescher, PhD[2], Randall Worth, PhD[2]

[1]College of Medicine and Life Sciences, The University of Toledo, Toledo, Ohio 43614
[2]Department of Medical Microbiology and Immunology, The University of Toledo, Toledo, OH 43614

*Corresponding author: iluja.gautam@rockets.utoledo.edu

Keywords: Platelets, Respiratory Virus

Published: 22 May 2024

Background: Platelets are small, anucleate cells derived from megakaryocytes. Conventionally, they are known for an indispensable role in hemostasis. Additionally, research in the past decade has now established platelets as orchestrators of immune response. At a molecular level, platelets express receptors that allow them to interact with viruses leading to platelet activation. Activated platelets can directly affect viral replication and modulate leukocyte behavior. Interestingly, thrombocytopenia is commonly observed during viral infections and is associated with worse disease outcomes. Most studies on platelets and viral infections are focused on severe viremic infections. However, the role of platelets and their impact on pulmonary infections such as those caused by Respiratory Syncytial Virus (RSV) is not clear.

Methods: Sendai virus (SeV) was used as a model pathogen. Flow cytometry was used to show in vitro platelet activation (P-selectin expression – CD62P) and internalization of SeV. Survival experiments post intranasal SeV infections were conducted using a mouse model of platelet depletion developed in our laboratory. Tissue damage was assessed by histology and immunohistochemistry. Viral loads were measured using qRT-PCR.

Results: Upon intranasal challenge with virus, control mice with normal platelet counts exhibited mild symptoms with no mortality. However, platelet depleted mice were highly susceptible to infection, had severe weight loss and high mortality rates. Detailed analysis of infected lungs showed that platelets modulate neutrophil accumulation in the lungs without affecting viral loads significantly. Histological analysis also revealed high levels of myeloperoxidase positive cells and severe tissue damage post infection in absence of platelets.

Conclusion: This study identified a significant protective role of platelets in immune response against respiratory viruses. The outcome of this study reinforces platelets as a therapeutic target to combat severe pulmonary viral infection.

