

DECOMPRESSION-INDUCED VASCULAR INJURIES CAUSED BY MICROPARTICLES

**S.R. Thom, M. Yang & T.N. Milovanova
Department of Emergency Medicine Institute for
Environmental Medicine
University of Pennsylvania**

Microparticles (MPs), or ‘cell dust’, are shed under normal physiological conditions. Release from platelets, leukocytes, erythrocytes and endothelial cells increases with thrombotic and inflammatory processes.

MPs cause pro- and anti- coagulation and inflammatory events. *Semin Thromb Hemost* 34, 683,’08

MPs elevated in humans subjected to simulated scuba diving. Unknown if they pose a health threat.

R. V. Vince *et al.*, *Eur J Appl Physiol* 105, 507, ‘09

L. A. Madden *et al.*, *Aviat Space Environ Med* 81, 41,’10

GOALS OF STUDY

1. EVALUATE INTRAVASCULAR & PERI-VASCULAR CHANGES IN MICE POST-DECOMPRESSION

Neutrophil activation & presence of MPs

Neutrophil and myeloperoxidase sequestration

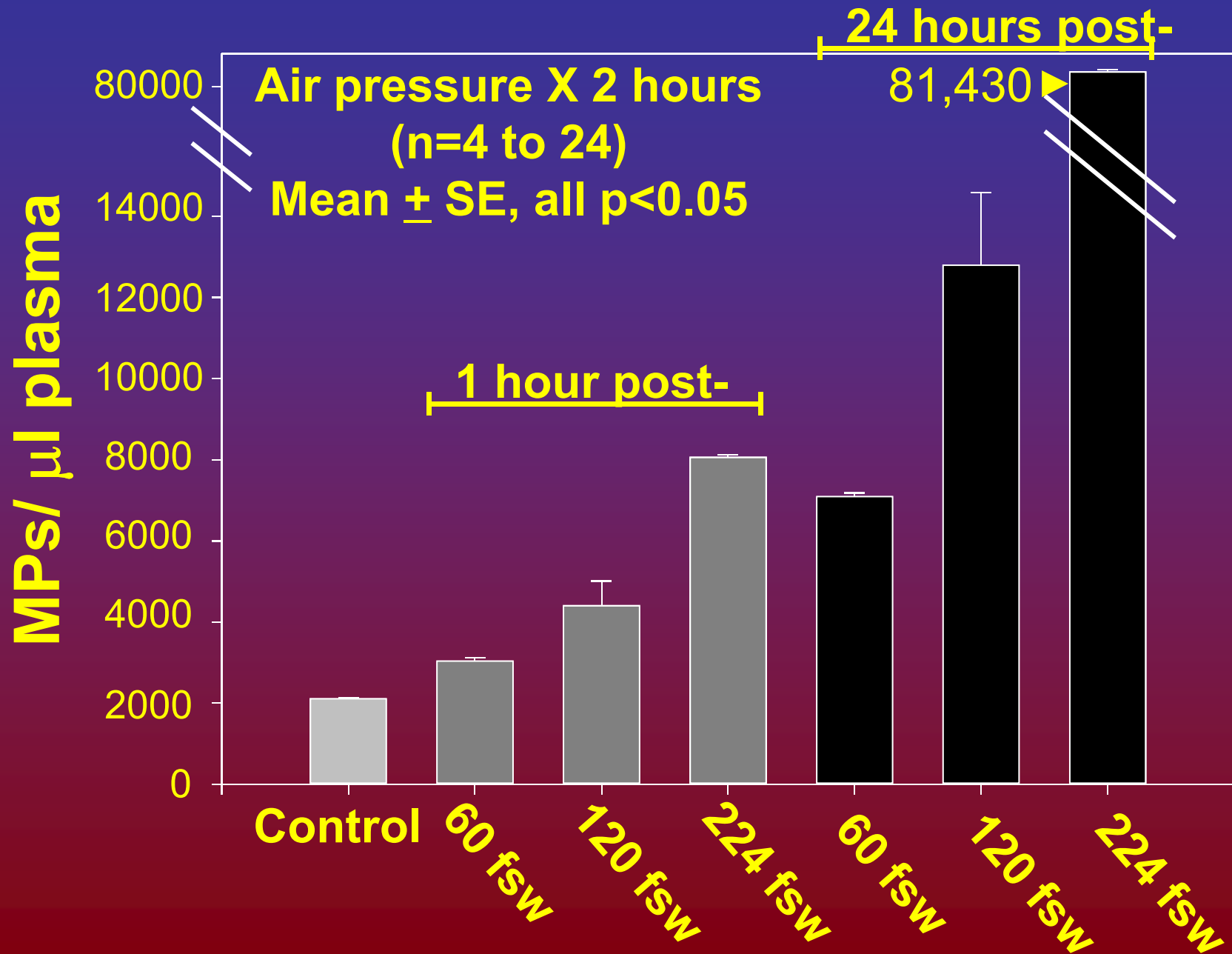
Vascular leak & activated caspase 3

2. IDENTIFY NOVEL TREATMENTS

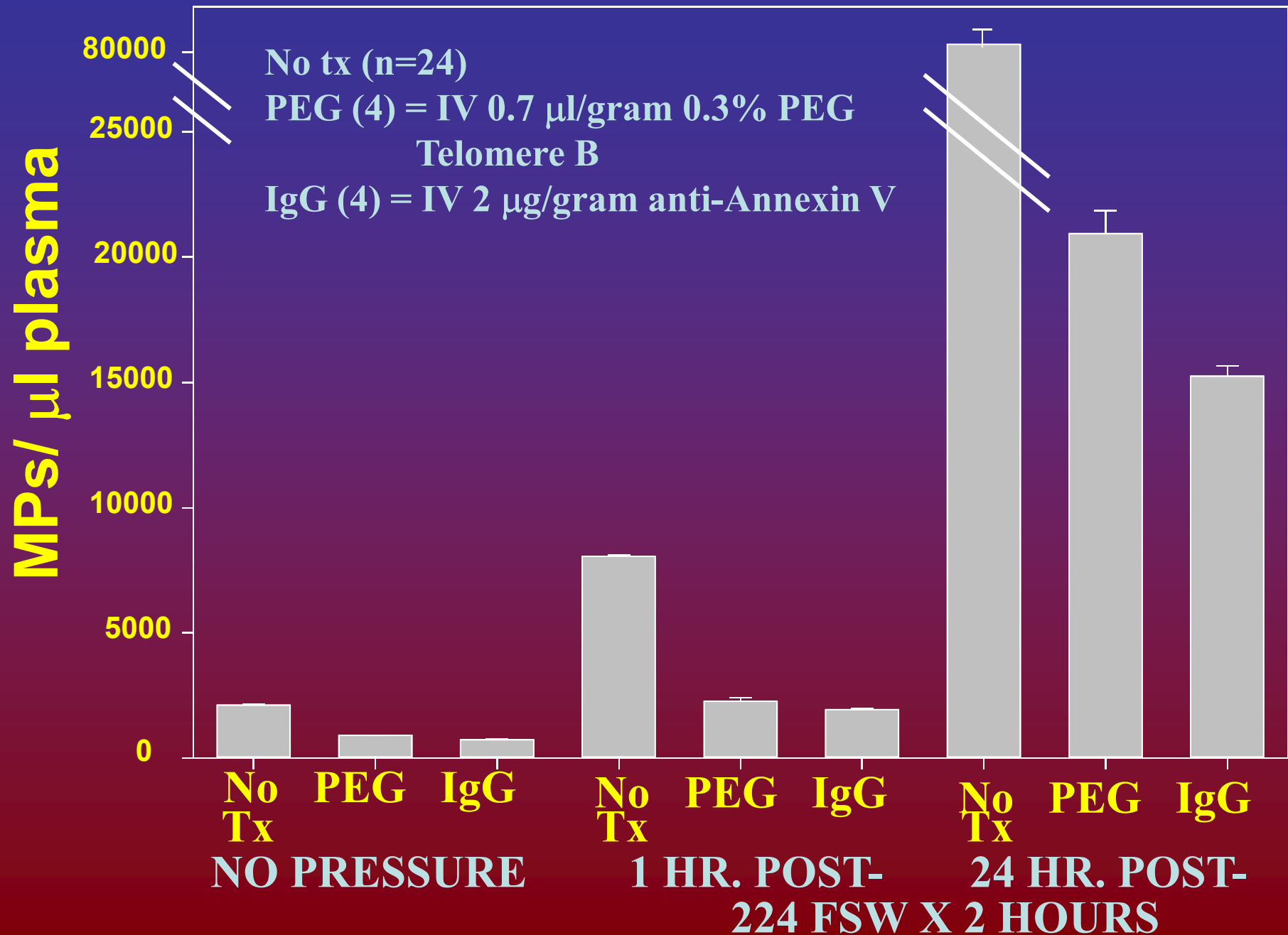
a. Surfactant causes MPs lysis & reduces decompression stresses.

b. Antibody to annexin V removes MPs from blood & reduces decompression stresses.

MICROPARTICLES IN PLASMA

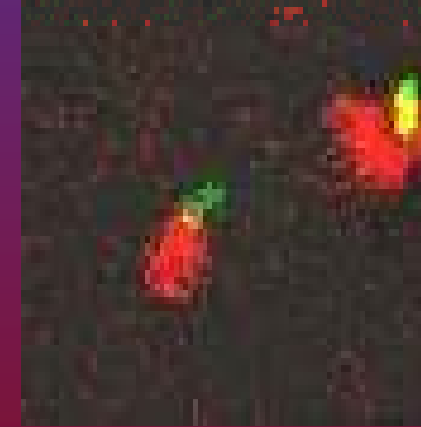
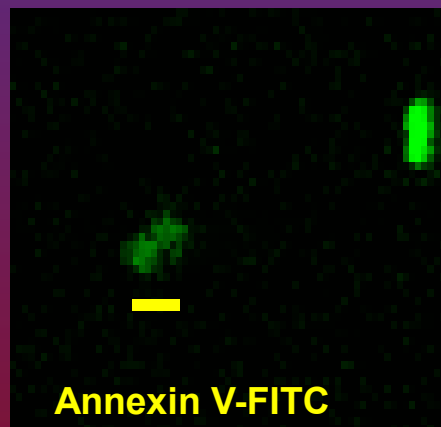
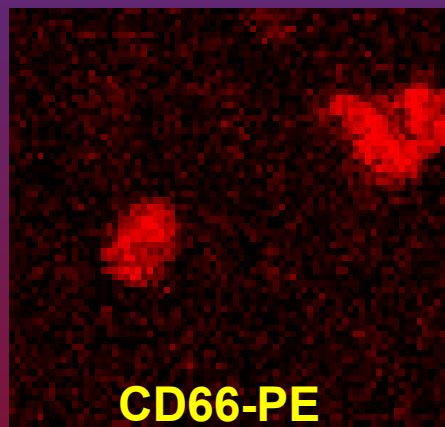
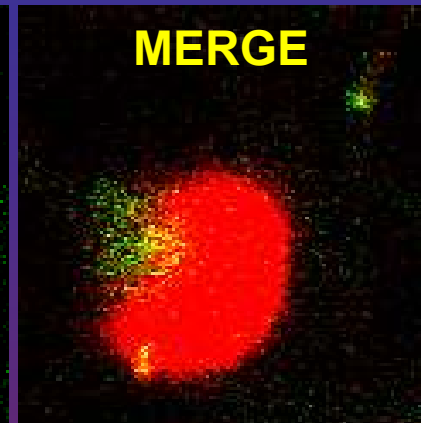
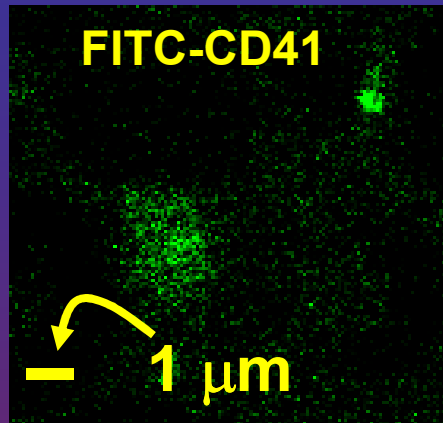
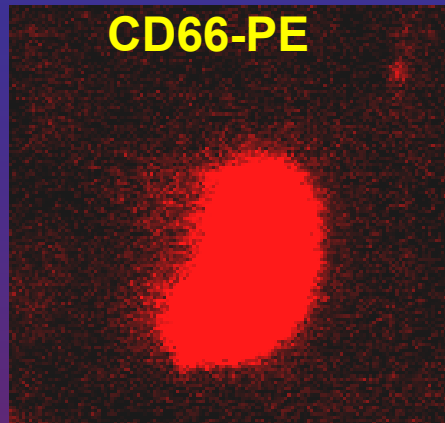


MPs ABATEMENT WORKS *in vivo*

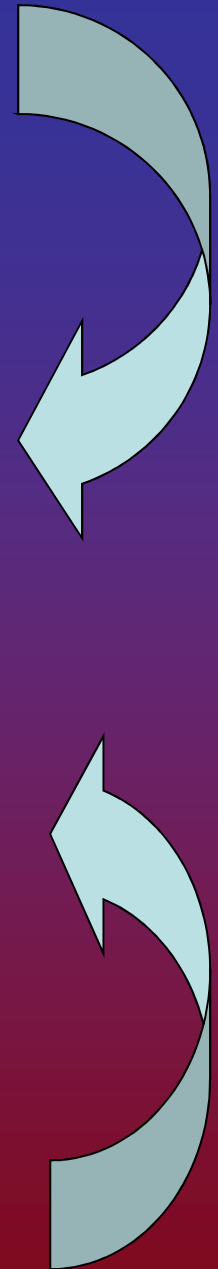


MPs interact with PMN

CD41-MPs
on PMN

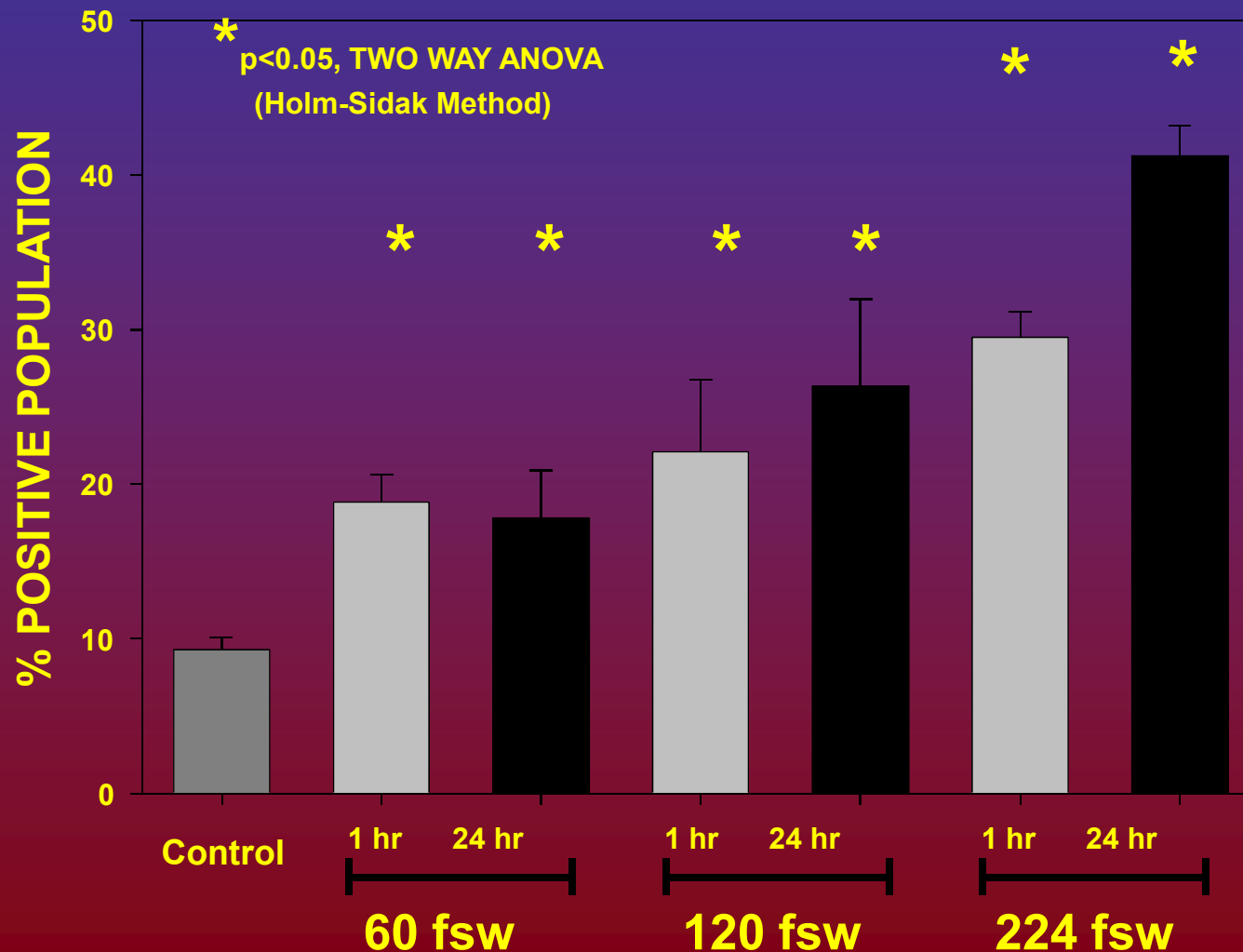


Annexin-V +
& PMN fragments



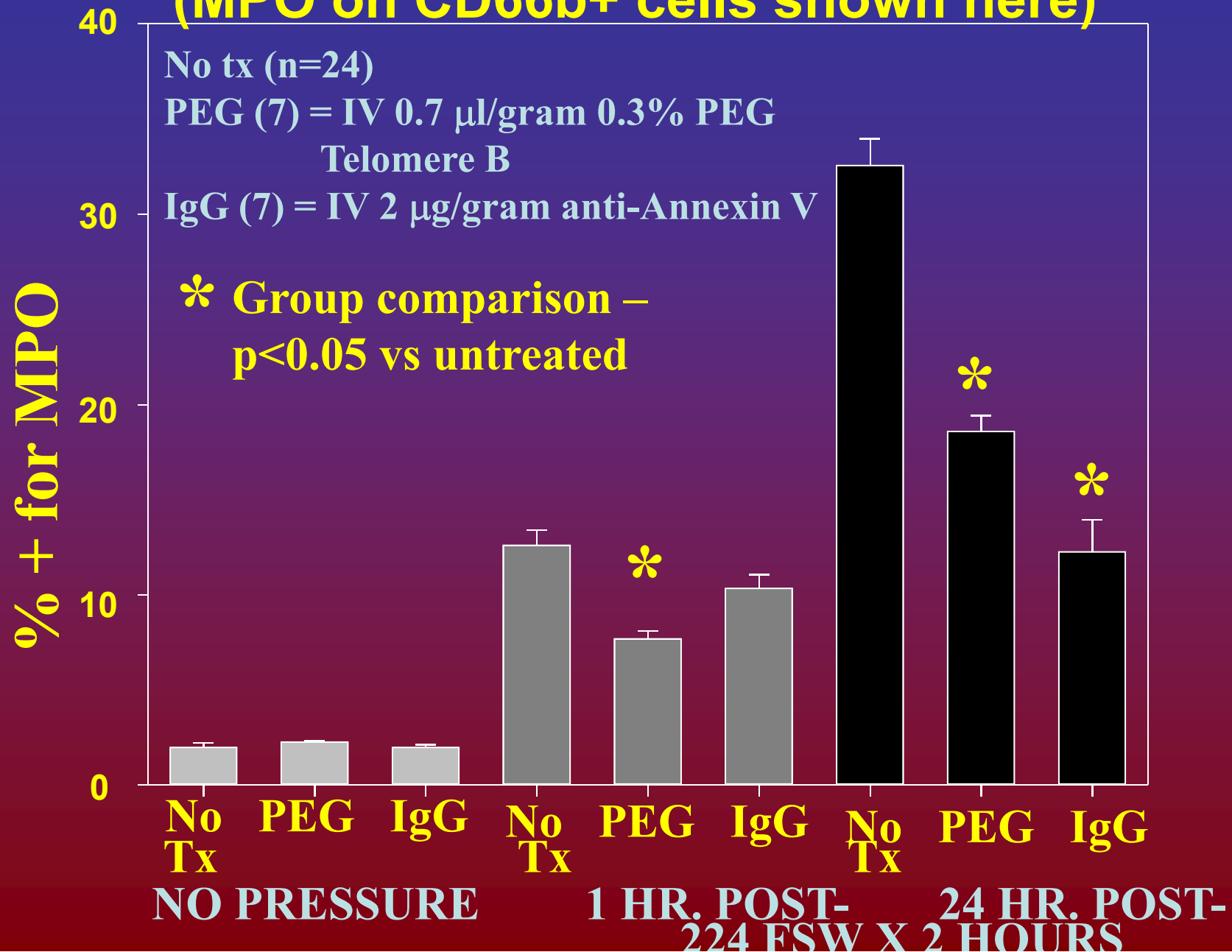
DECOMPRESSION CAUSES NEUTROPHIL ACTIVATION WITH INTERACTIONS INVOLVING PLATELETS

CD41 on CD66b+ cells



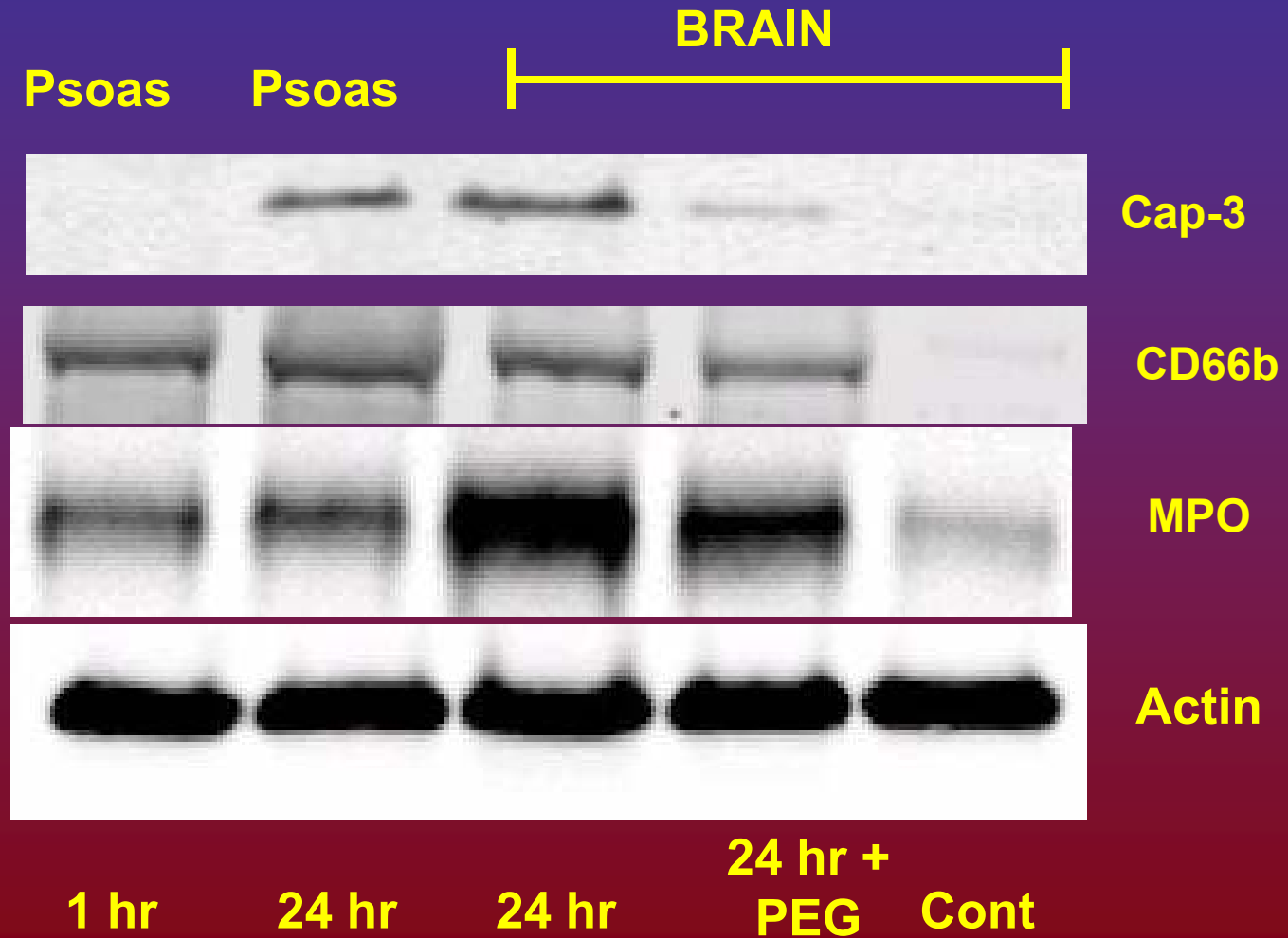
Similar pattern:
→ Increase CD18 (PMN activation)
-and-
→ Cell Surface Myeloperoxidase (PMN degranulation)

MPs ABATEMENT DECREASES PMN ACTIVATION (MPO on CD66b+ cells shown here)



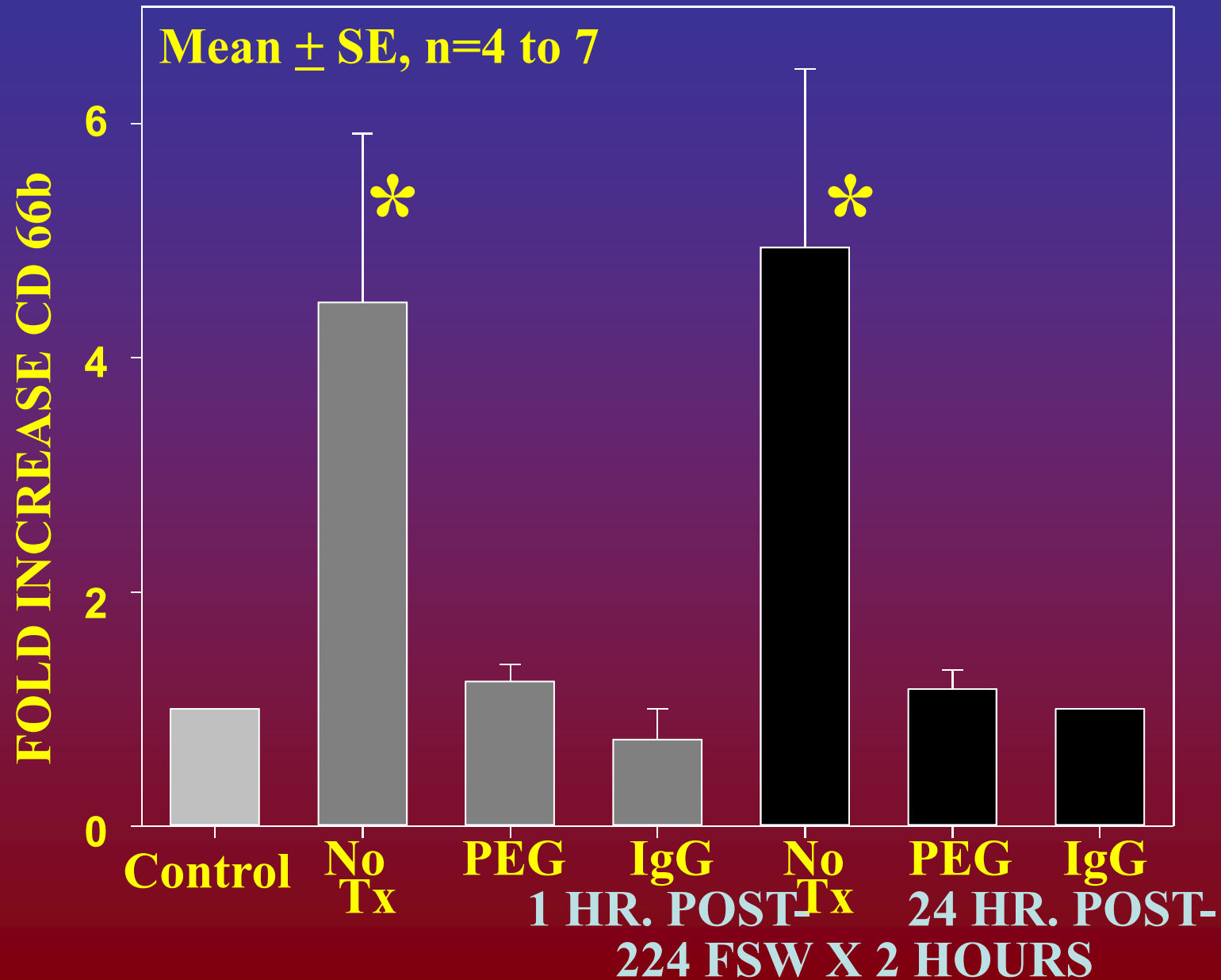
Endothelium isolated from various tissues – analyzed for PMN sequestration (CD66b), myeloperoxidase deposition and apoptosis.

Western blots – after 224 fsw for 2 hours:



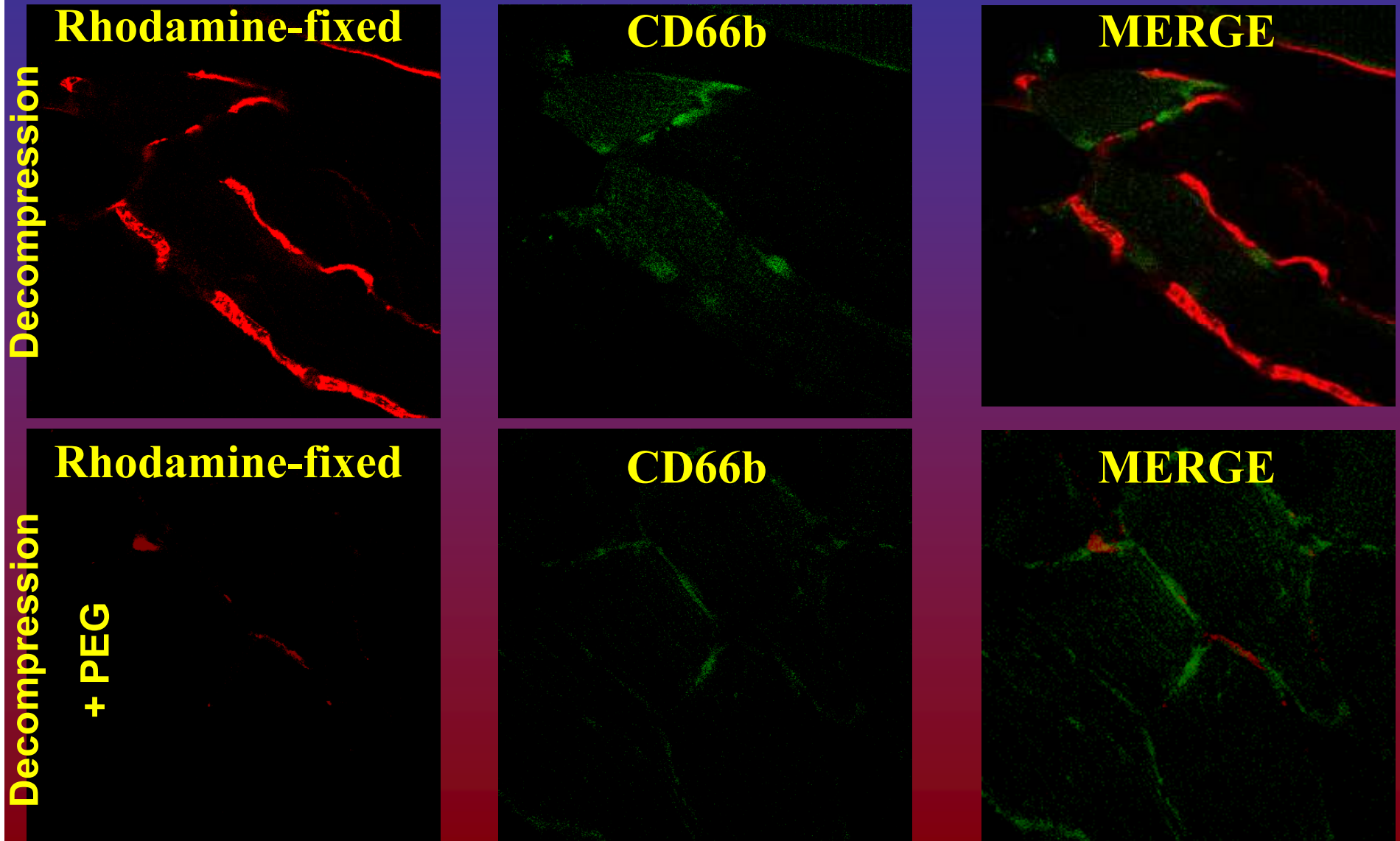
MPs ABATEMENT REDUCES TISSUE CHANGES

-CD66b OMENTUM DATA SHOWN HERE-



VASCULAR LEAK QUANTIFIED USING LYSINE-FIXABLE RHODAMINE-DEXTRAN (2,000,000 Da)

SKELETAL MUSCLE VASCULAR LEAK & PMN



CONCLUSIONS

INTRAVASCULAR & PERI-VASCULAR CHANGES IN MICE

Neutrophil activation & presence of MPs

Neutrophil and myeloperoxidase sequestration

Vascular leak & activated caspase 3

ROLE OF MPs – NOVEL TREATMENTS

Surfactants cause MPs lysis

PEG & Antibody to annexin V reduce MPs

Both interventions decrease PMN activation
& tissue changes

**This work was supported by
a grant from the ONR.
THANK YOU:**

