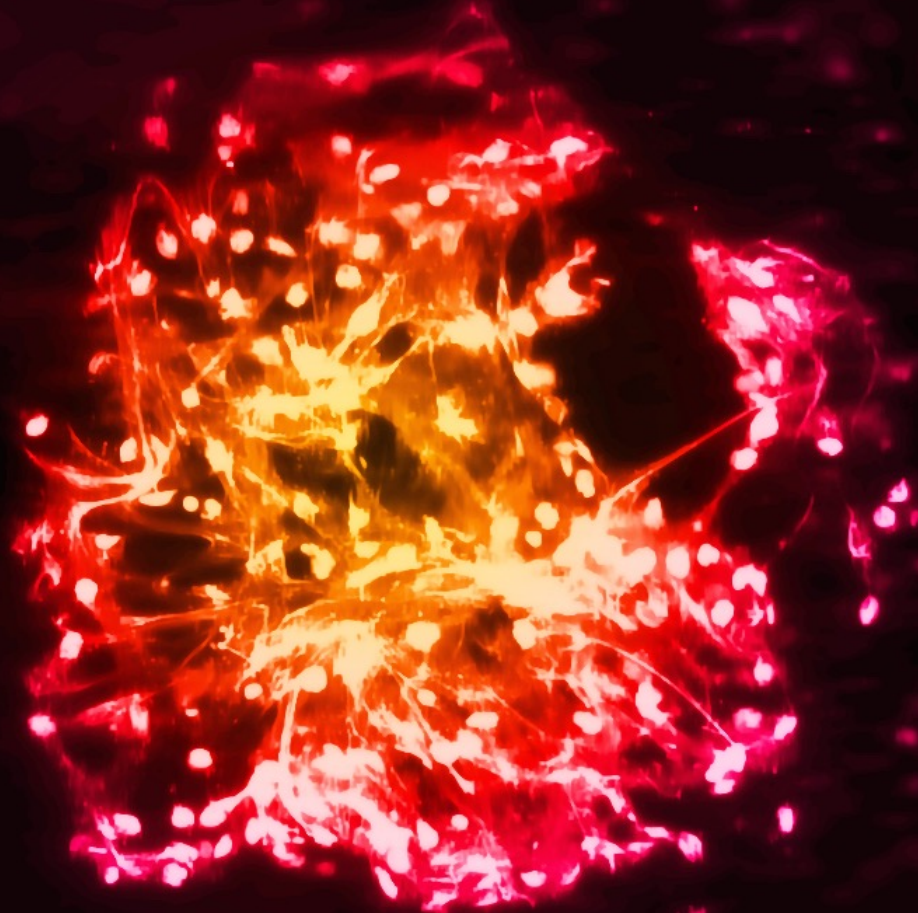


Pathological role of neutrophil extracellular traps-associated DNA in sterile inflammation



FACULTY OF MEDICINE
Comenius University
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Michal Pastorek
michal.pastorek@fmed.uniba.sk

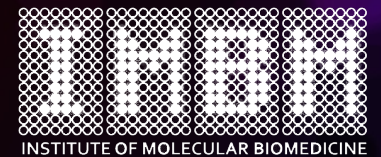
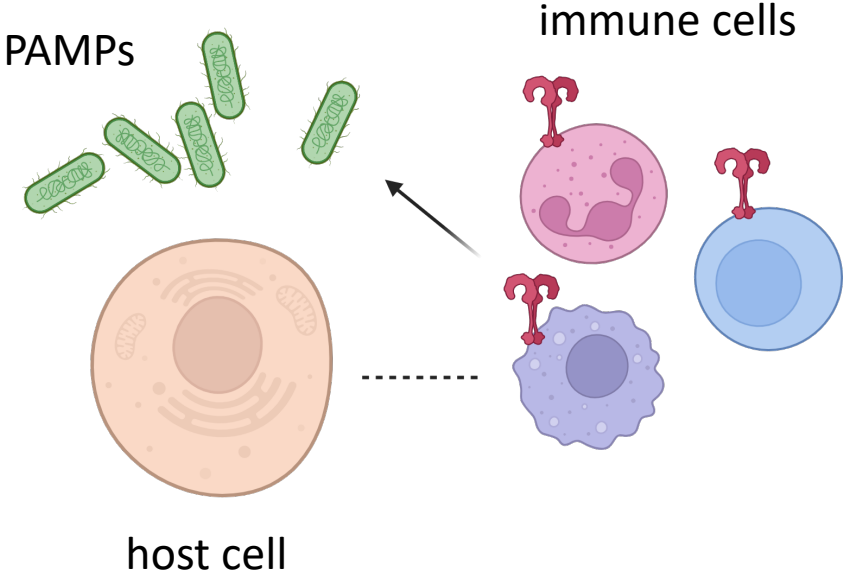


Photo by: Jakub Janko
Edited by: Taha Torabpour

self vs. non-self



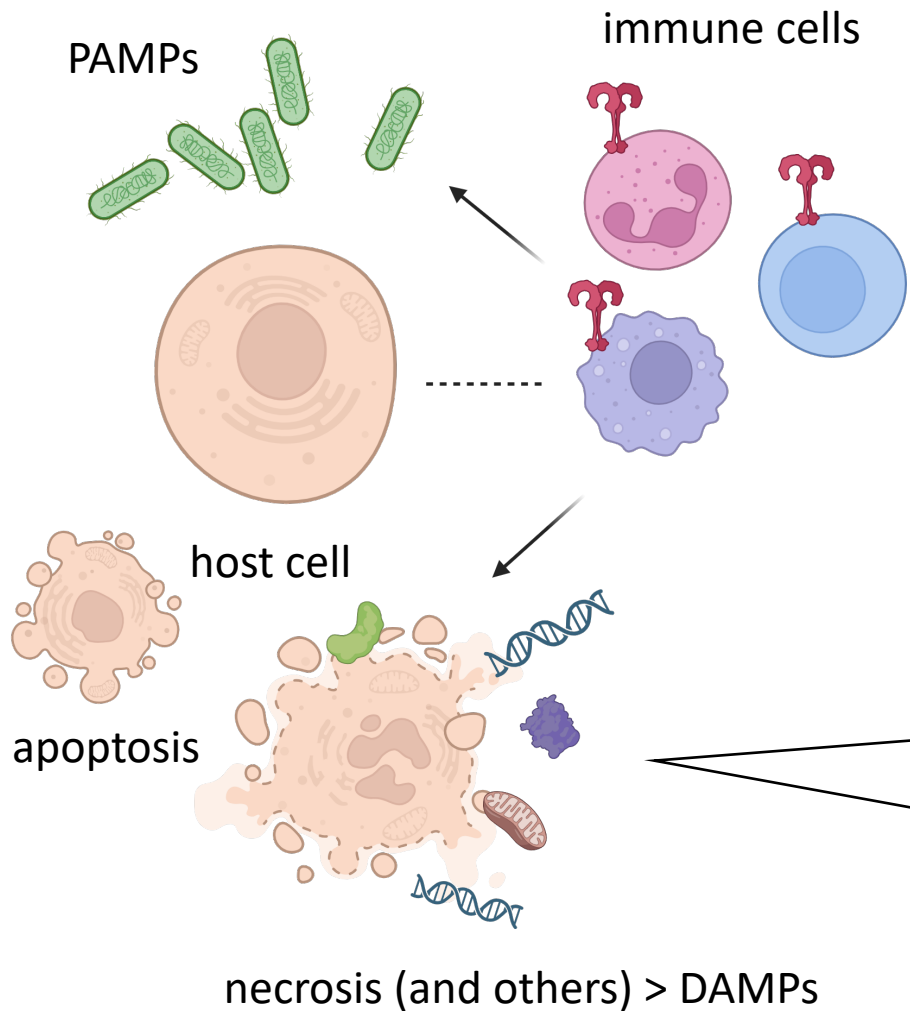
Approaching the Asymptote? Evolution and Revolution in Immunology

C.A. Janeway, Jr.

Cold Spring Harb Symp Quant Biol 1989 54: 1-13

Access the most recent version at doi:[10.1101/SQB.1989.054.01.003](https://doi.org/10.1101/SQB.1989.054.01.003)

homeostasis vs. danger



Approaching the Asymptote? Evolution and Revolution in Immunology

C.A. Janeway, Jr.

Cold Spring Harb Symp Quant Biol 1989 54: 1-13

Access the most recent version at doi:[10.1101/SQB.1989.054.01.003](https://doi.org/10.1101/SQB.1989.054.01.003)

Annu. Rev. Immunol. 1994. 12:991-1045

TOLERANCE, DANGER, AND THE EXTENDED FAMILY*

Polly Matzinger

JOURNAL OF NEUROTRAUMA 31:1639–1646 (October 1, 2014)
© Mary Ann Liebert, Inc.
DOI: 10.1089/neu.2013.3178

Elevated Cell-Free Plasma DNA Level as an Independent Predictor of Mortality in Patients with Severe Traumatic Brain Injury

Edison Moraes Rodrigues Filho¹, Daniel Simon^{1,2}, Nilo Ikuta^{1–3}, Caroline Klovian⁴, Fernando Augusto Dannenbrock⁴, Carla Oliveira de Oliveira¹, and Andrea Regner^{1,2,4}



Contents lists available at ScienceDirect
IJCV Heart & Vasculature

journal homepage: www.sciencedirect.com/journal/ijc-heart-and-vasculature



Cell-free DNA as a potential biomarker for acute myocardial infarction: A systematic review and meta-analysis

Elinor Tan^{a,1,*}, Daniel Liu^{b,2}, Luke Perry^{b,3}, John Zhu^{c,4}, Ximena Cid-Serra^{c,f,5}, Adam Deane^{a,6}, Colin Yeo^{a,7}, Andrew Ajani^{d,8}

Association of circulating cell-free double-stranded DNA and metabolic derangements in idiopathic pulmonary fibrosis

William Whalen¹, Mustafa Buyukozkan², Bethany Moore³, Jong-Seok Moon⁴, Charles S Dela Cruz^{5–6}, Fernando J Martinez¹, Augustine M K Choi¹, Jan Krumsiek², Heather Stout-Delgado¹, Soo Jung Cho¹

THE JOURNAL OF IMMUNOLOGY
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Vol. 96, No. 3
Printed in U.S.A.

CHARACTERISTICS OF A SOLUBLE NUCLEAR ANTIGEN PRECIPITATING WITH SERA OF PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS¹

E. M. TAN² AND H. G. KUNKEL



Cell-Free DNA as a Biomarker in Autoimmune Rheumatic Diseases

Bhargavi Duvvuri and Christian Lood*



Epigenetics, fragmentomics, and topology of cell-free DNA in liquid biopsies

Y. M. DENNIS LO, DIANA S. C. HAN, PEIYONG JIANG, AND ROSSAW. K. CHIU. [Authors Info & Affiliations](#)

SCIENCE • 9 Apr 2021 • Vol 372, Issue 6538 • DOI:10.1126/science.aaa3616

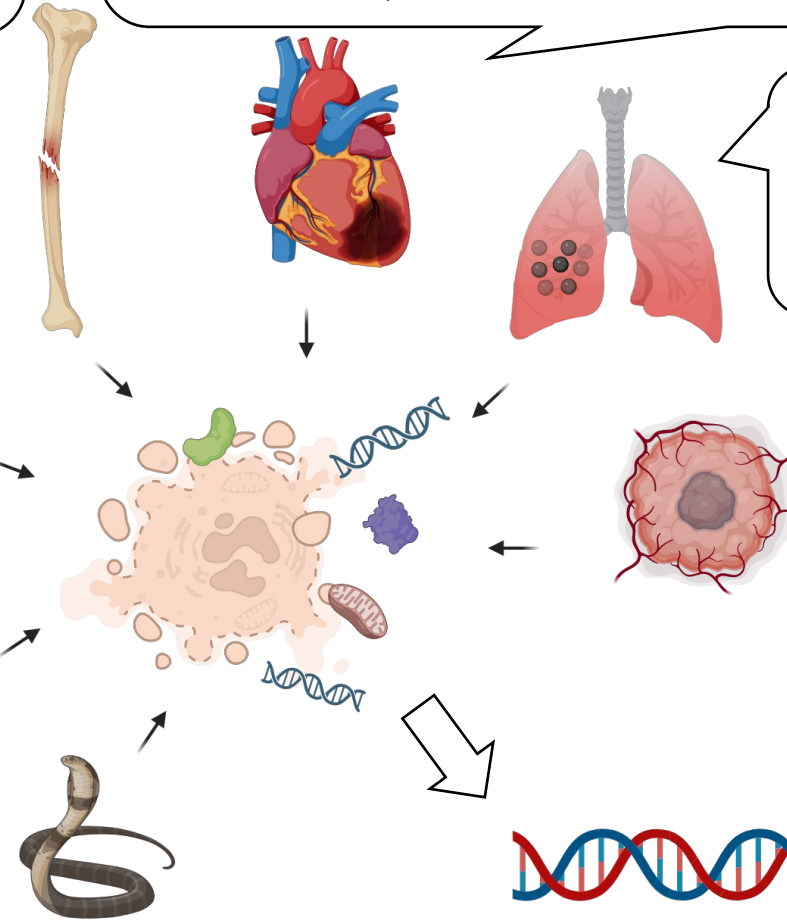


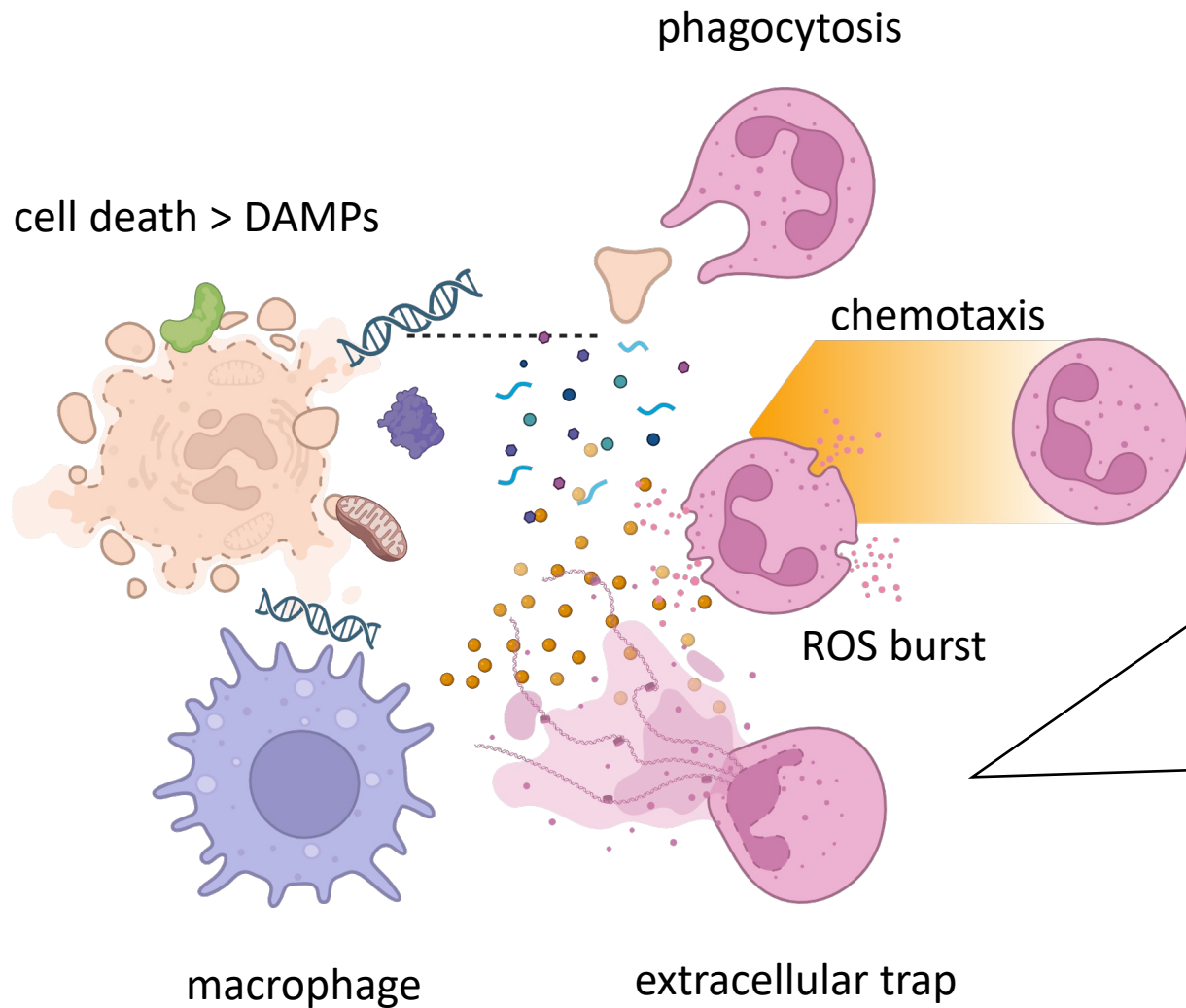
Toxicon
Volume 192, March 2021, Pages 66–73



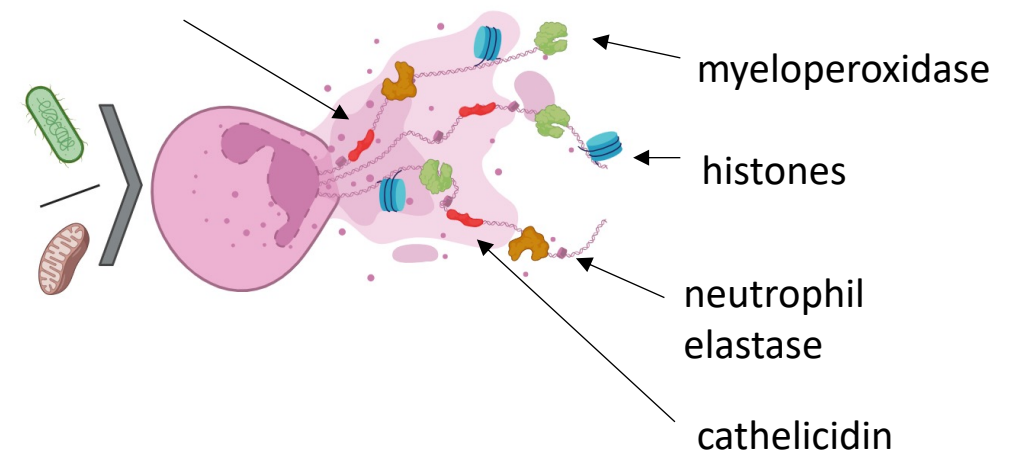
Association of cfDNA levels and bothrops envenomation

Éndila de Souza Barbosa^{a,b}, Hiocelson Najibe Santos Ibiapina^{a,b}, Siuhelem Rocha da Silva^c, Allyson Guimarães Costa^{a,b,d,e}, Fernando Fonseca Val^{a,b}, Iran Mendonça-da-Silva^{a,b}, Luiz Carlos de Lima Ferreira^{a,b,f}, Marco Aurélio Sartim^{b,d}, Wuelton Marcelo Monteiro^{a,b}, Gisely Cardoso de Melo^{a,b}, Jacqueline de Almeida Gonçalves Sachett^{a,b,g}





nuclear and
mitochondrial DNA

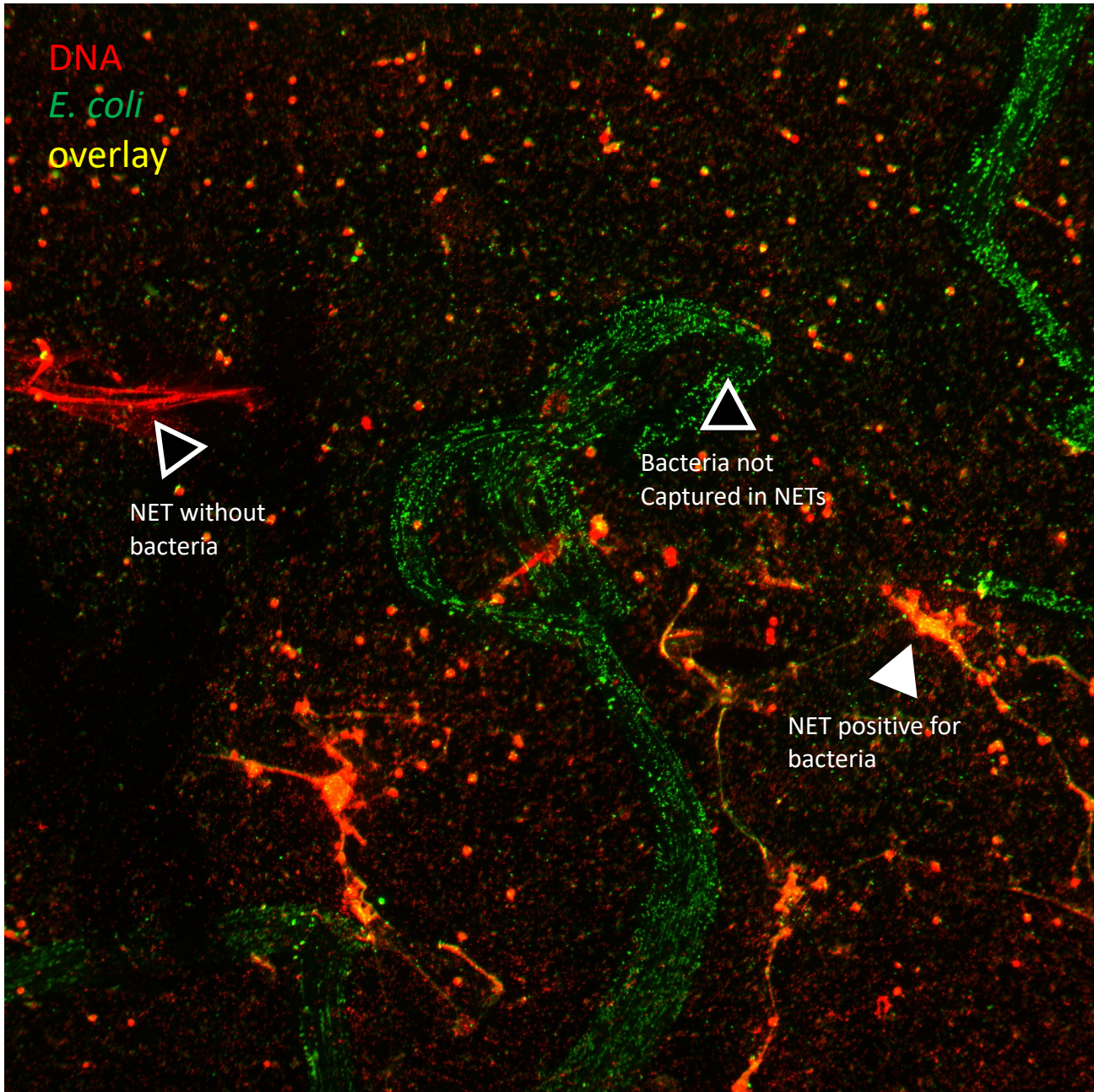


Neutrophil Extracellular Traps Kill Bacteria

Volker Brinkmann,¹ Ulrike Reichard,^{1,2} Christian Goosmann,^{1,2}
 Beatrix Fauler,¹ Yvonne Uhlemann,² David S. Weiss,²
 Yvette Weinrauch,³ Arturo Zychlinsky^{2*}

Neutrophils engulf and kill bacteria when their antimicrobial granules fuse with the phagosome. Here, we describe that, upon activation, neutrophils release granule proteins and chromatin that together form extracellular fibers that bind Gram-positive and -negative bacteria. These neutrophil extracellular traps (NETs) degrade virulence factors and kill bacteria. NETs are abundant *in vivo* in experimental dysentery and spontaneous human appendicitis, two examples of acute inflammation. NETs appear to be a form of innate response that binds microorganisms, prevents them from spreading, and ensures a high local concentration of antimicrobial agents to degrade virulence factors and kill bacteria.

Science · 5 Mar 2004 · Vol 303, Issue 5663



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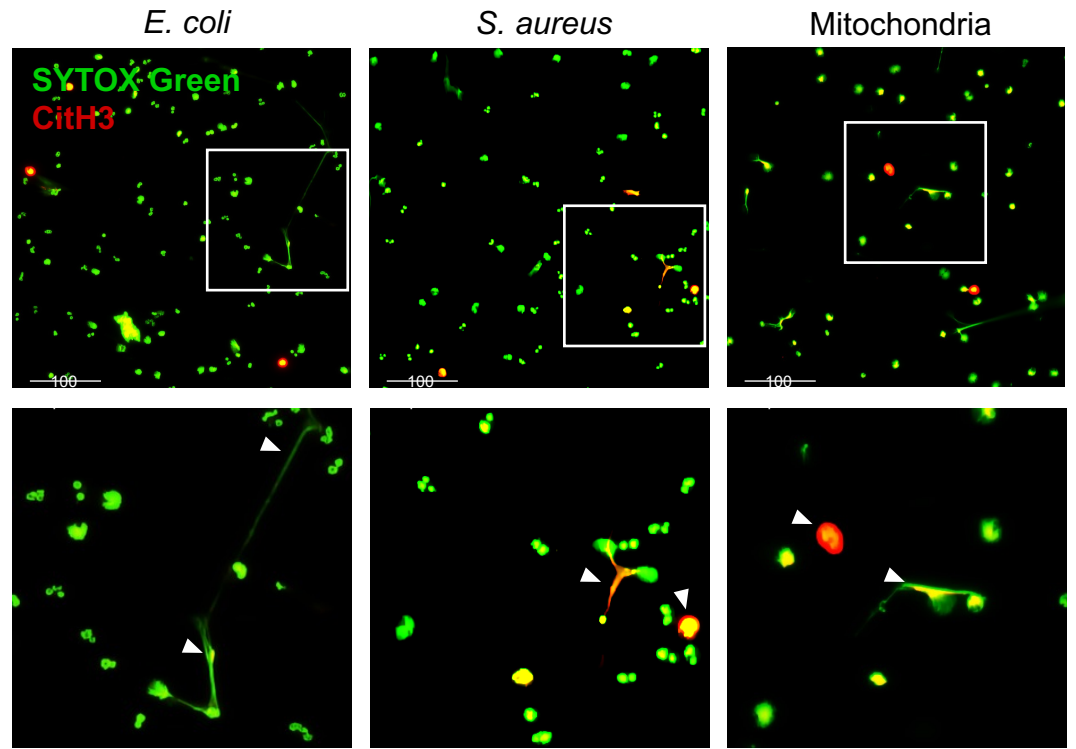
Published: 04 March 2010

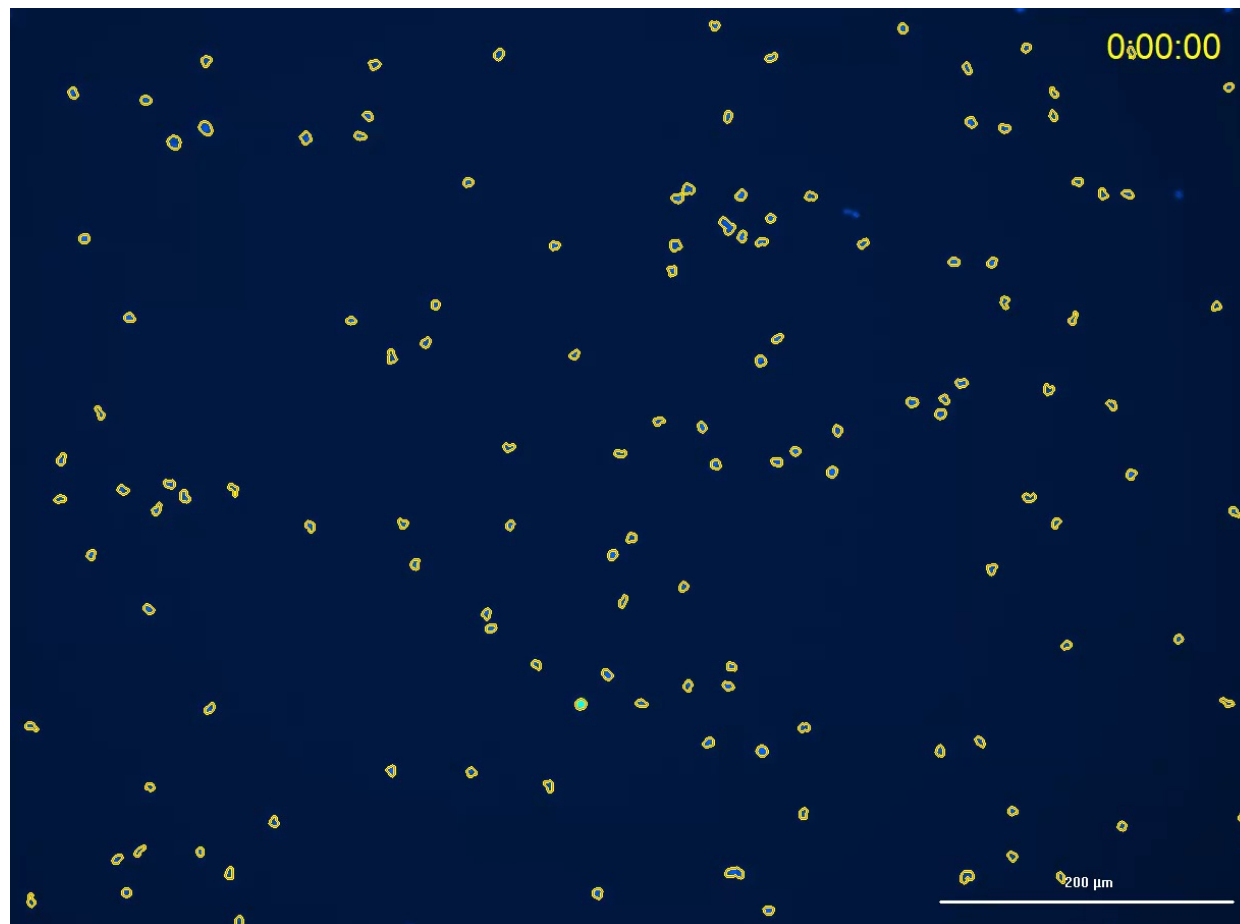
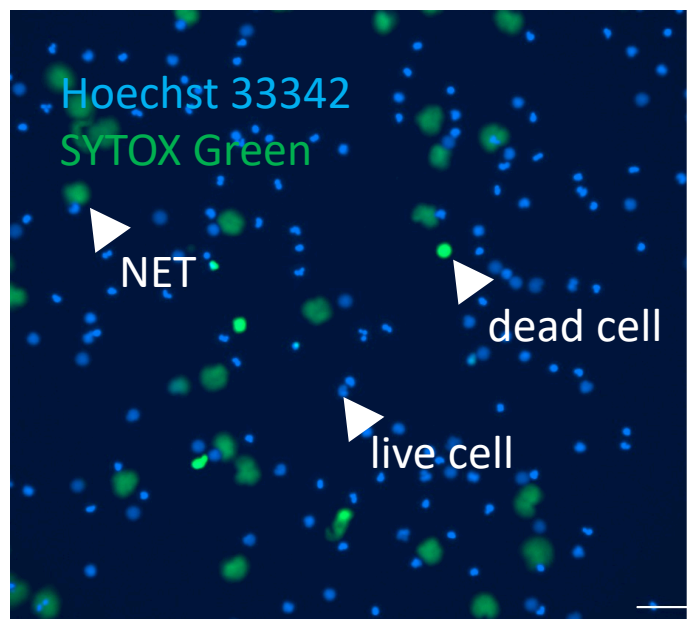
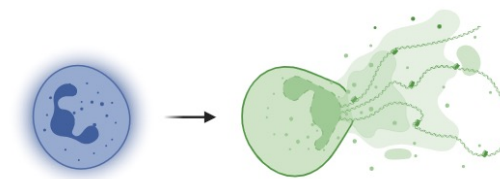
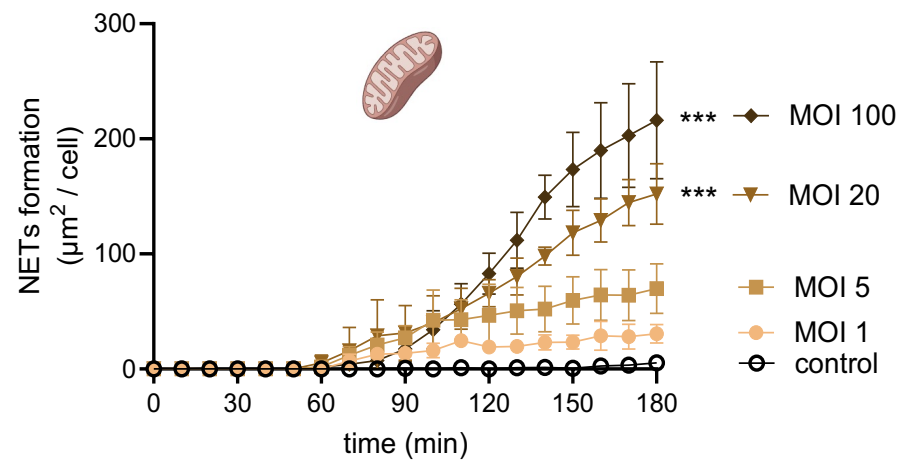
Circulating mitochondrial DAMPs cause inflammatory responses to injury

[Qin Zhang](#), [Mustafa Raouf](#), [Yu Chen](#), [Yuka Sumi](#), [Tolga Sursal](#), [Wolfgang Junger](#), [Karim Brohi](#), [Kiyoshi Itagaki](#) & [Carl J. Hauser](#)

[Nature](#) 464, 104–107 (2010) | [Cite this article](#)

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Letter | Published: 07 December 2000

A Toll-like receptor recognizes bacterial DNA

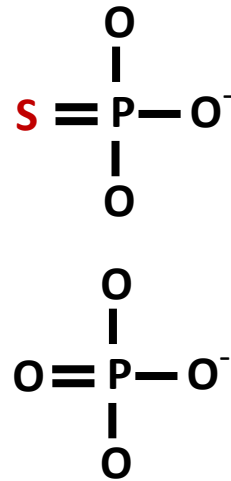
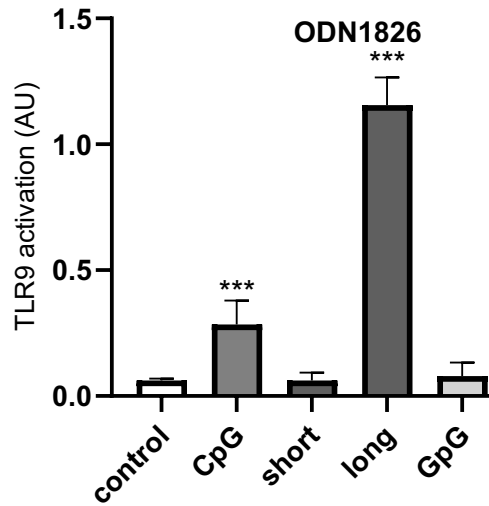
Hiroaki Hemmi, Osamu Takeuchi, Taro Kawai, Tsuneyasu Kaisho, Shintaro Sato, Hideki Sanjo, Makoto Matsumoto, Katsuki Hoshino, Hermann Wagner, Kiyoshi Takeda & Shizuo Akira

Nature 408, 740–745 (2000) | [Cite this article](#)

Mitochondrial DNA Released by Trauma Induces Neutrophil Extracellular Traps

Kiyoshi Itagaki, Elzbieta Kaczmarek, Yen Ting Lee, I. Tien Tang, Burak Isal, Yashar Adibnia, Nicola Sandler, Melissa J. Grimm, Brahm H. Segal, Leo E. Otterbein, Carl J. Hauser

Published: March 16, 2015 • <https://doi.org/10.1371/journal.pone.0120549>



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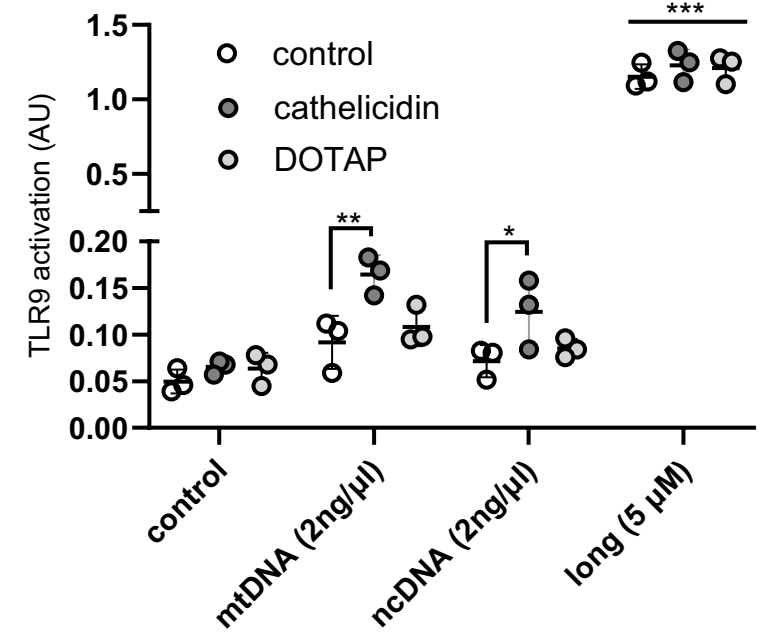
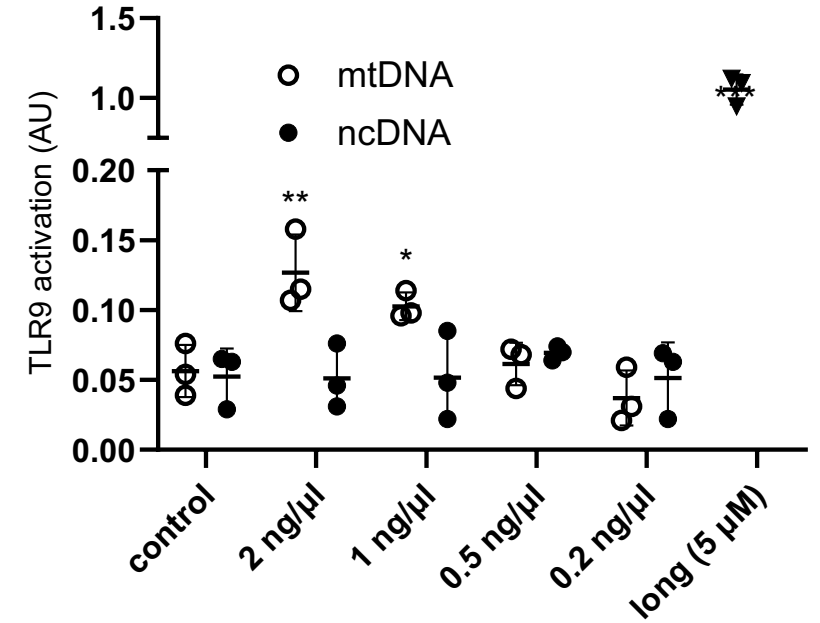
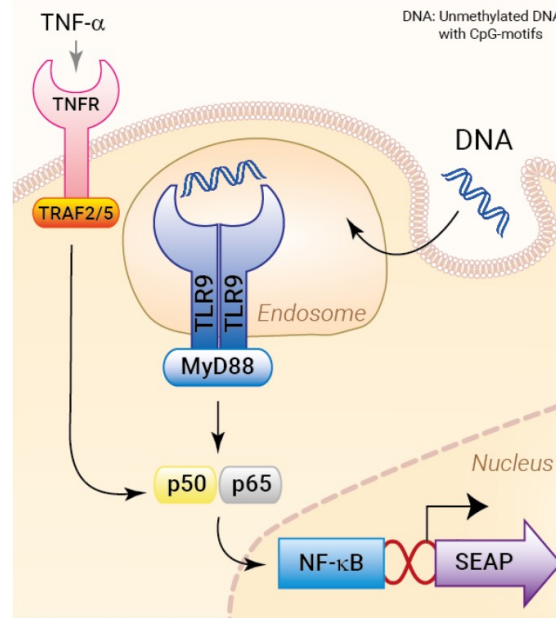
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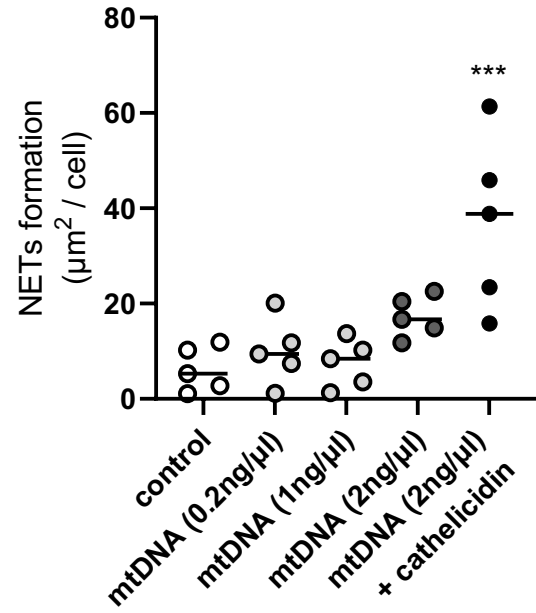
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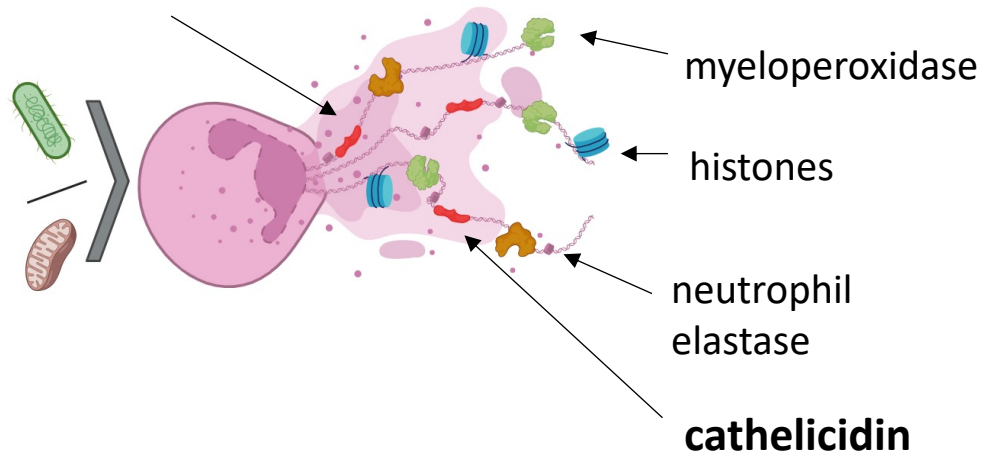
Signaling pathways in HEK-Blue™ hTLR9 cells



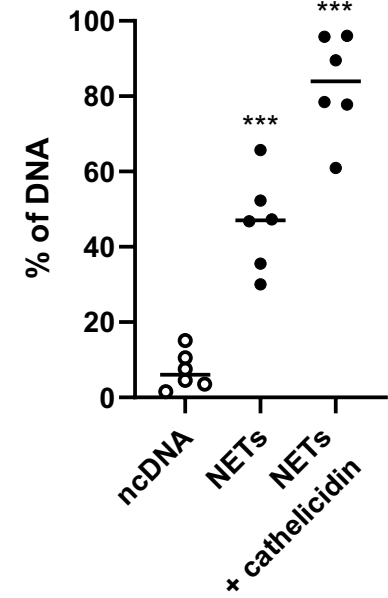
mtDNA induction of NETs





nuclear and
mitochondrial DNA



resistance to Dnase I



Mitochondrial DNA Released by Trauma Induces Neutrophil Extracellular Traps

Kiyoshi Itagaki , Elzbieta Kaczmarek, Yen Ting Lee, I. Tien Tang, Burak Isal, Yashar Adibnia, Nicola Sandler, Melissa J. Grimm, Brahm H. Segal, Leo E. Otterbein, Carl J. Hauser 


Published: March 16, 2015 • <https://doi.org/10.1371/journal.pone.0120549>

Am J Physiol Heart Circ Physiol 308: H500–H509, 2015.
First published December 19, 2014; doi:10.1152/ajpheart.00381.2014.

Neutrophil extracellular traps in ischemia-reperfusion injury-induced myocardial no-reflow: therapeutic potential of DNase-based reperfusion strategy

Lan Ge,^{1*} Xin Zhou,^{1*} Wen-Jie Ji,¹ Rui-Yi Lu,¹ Yan Zhang,² Yi-Dan Zhang,¹ Yong-Qiang Ma,¹ Ji-Hong Zhao,¹ and Yu-Ming Li¹

Particles of different sizes and shapes induce neutrophil necroptosis followed by the release of neutrophil extracellular trap-like chromatin

Jyaysi Desai, Orestes Foresto-Neto, Mohsen Honarpisheh, Stefanie Steiger, Daigo Nakazawa, Bastian Popper, Eva Miriam Buhl, Peter Boor, Shrikant R. Mulay & Hans-Joachim Anders 


Scientific Reports 7, Article number: 15003 (2017) | [Cite this article](#)

DNA of neutrophil extracellular traps promotes cancer metastasis via CCDC25

Linbin Yang, Qiang Liu, Xiaoqian Zhang, Xinwei Liu, Boxuan Zhou, Jianing Chen, Di Huang, Jiaqian Li, Heliang Li, Fei Chen, Jiang Liu, Yue Xing, Xueman Chen, Shicheng Su  & Erwei Song 

Nature 583, 133–138 (2020) | [Cite this article](#)

Netting Neutrophils Induce Endothelial Damage, Infiltrate Tissues, and Expose Immunostimulatory Molecules in Systemic Lupus Erythematosus

Eneida Villanueva, Srilakshmi Yalavarthi, Celine C. Berthier, Jeffrey B. Hodgins, Ritika Khandpur, Andrew M. Lin, Cory J. Rubin, Wenpu Zhao, Stephen H. Olsen, Matthew Klinker, David Shealy, Michael F. Denny, Joel Plumias, Laurence Chaperot, Matthias Kretzler, Allen T. Bruce, Mariana J. Kaplan 

[+ Author & Article Information](#)

J Immunol (2011) 187 (1): 538–552.

Front. Immunol., 03 September 2012







Sec. Inflammation

Volume 3 - 2012 | <https://doi.org/10.3389/fimmu.2012.00277>

This article is part of the Research Topic
Mechanisms of Sterile Inflammation

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Monosodium urate crystals induce extracellular DNA traps in neutrophils, eosinophils, and basophils but not in mononuclear cells

 Christine Schorn¹  Christina Janko¹  Melanie Latzko  Ricardo Chaurio
 Georg Schett  Martin Herrmann^{*}



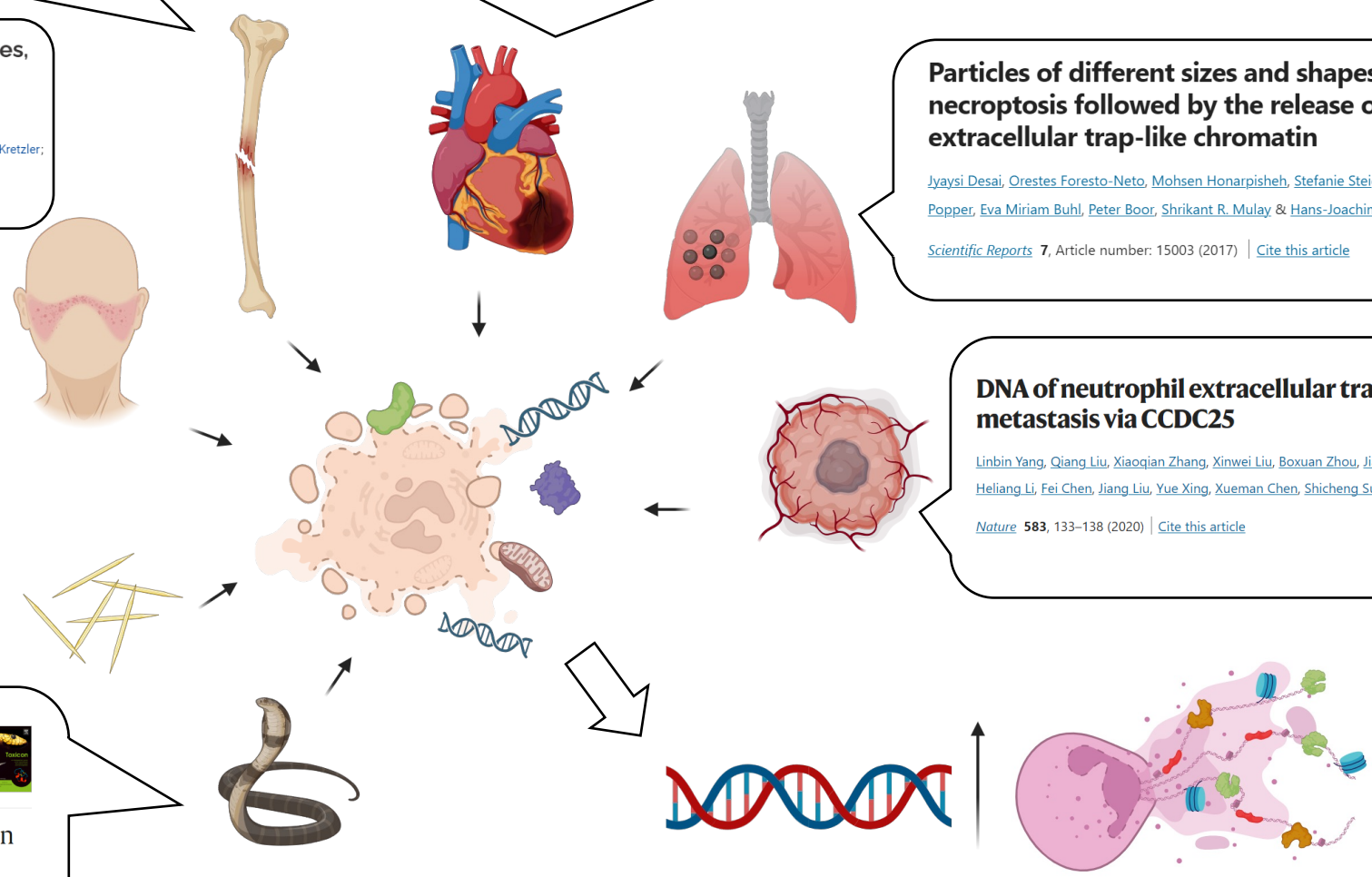
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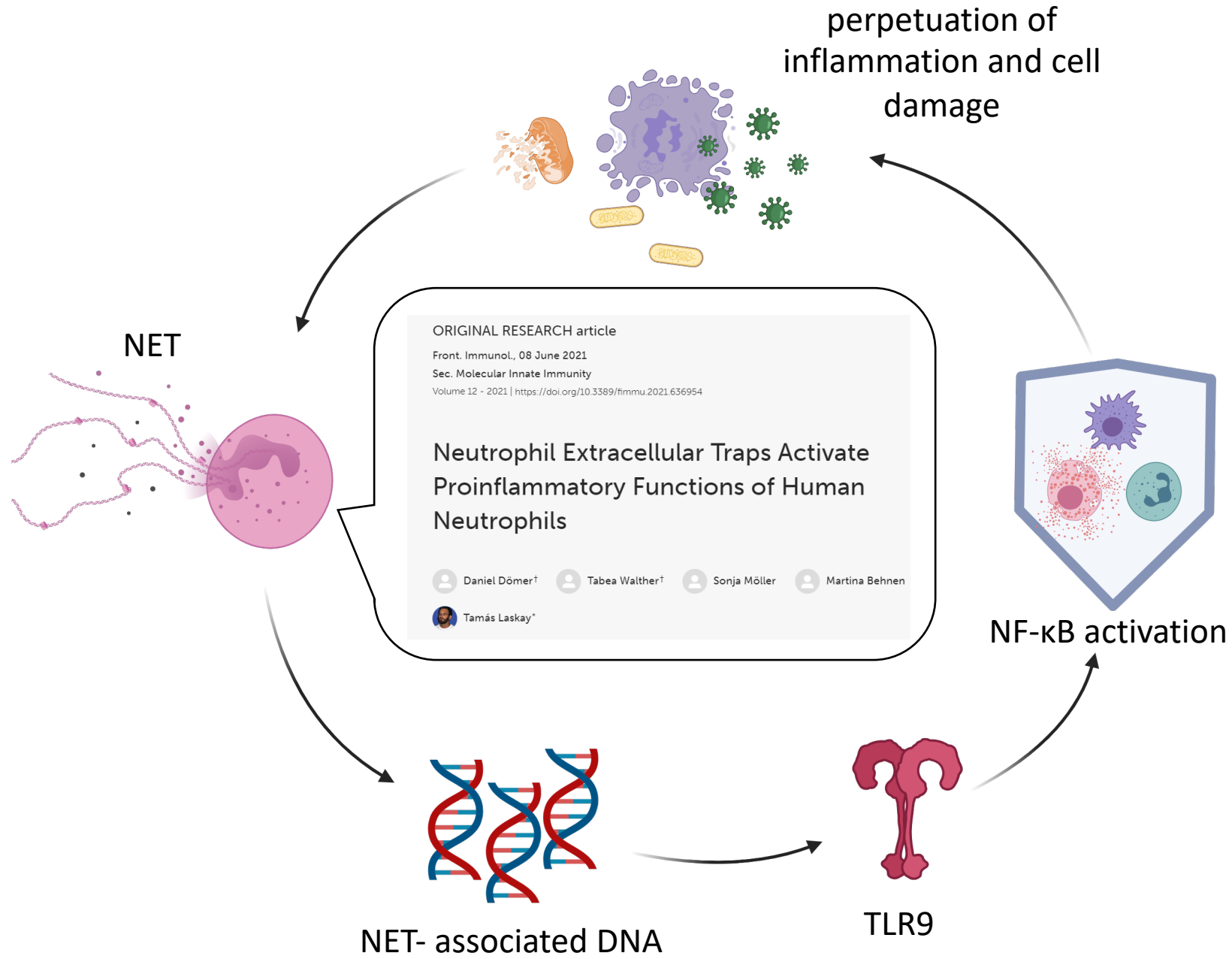
Volume 76, 15 December 2013, Pages 143-149



Effect of *Bothrops bilineata* snake venom on neutrophil function

Sulamita da Silva Setubal^a, Adriana Silva Pontes^a, Neriane Monteiro Nery^a,
Jéssica Silva Félix Bastos^a, Onassis Boeri Castro^a, Weverson Luciano Pires^b,
Kayena Delaix Zaquero^c, Leonardo de Azevedo Calderon^c, Rodrigo Guerino Stábili^d,
Andreimar Martins Soares^e, Juliana Pavan Zulliani^a  





Mitochondria-induced formation of neutrophil extracellular traps is enhanced in the elderly via Toll-like receptor 9

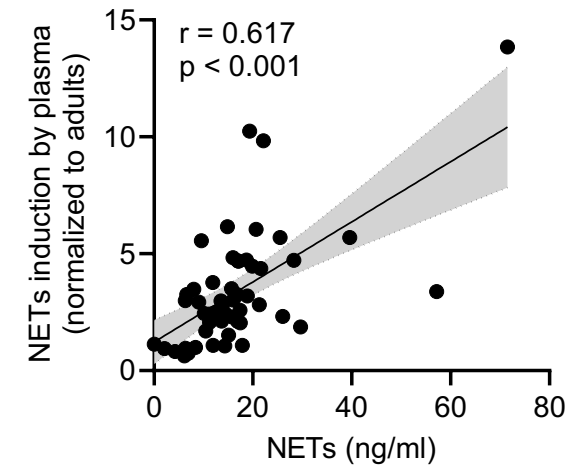
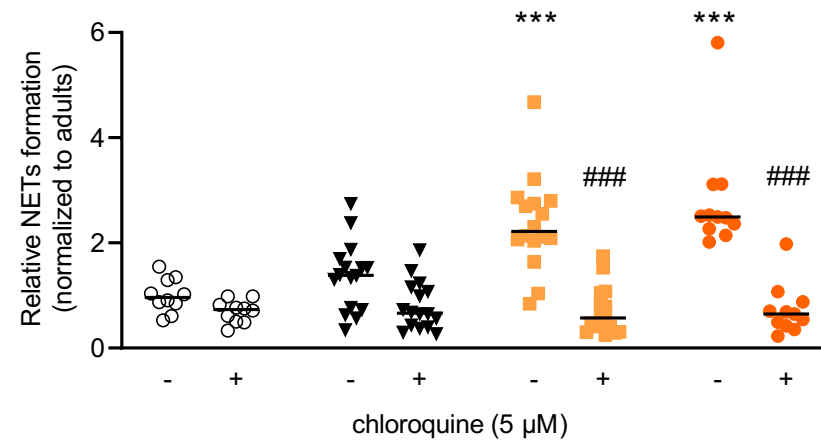
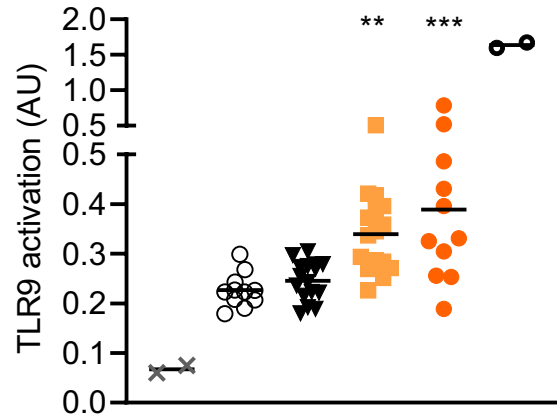
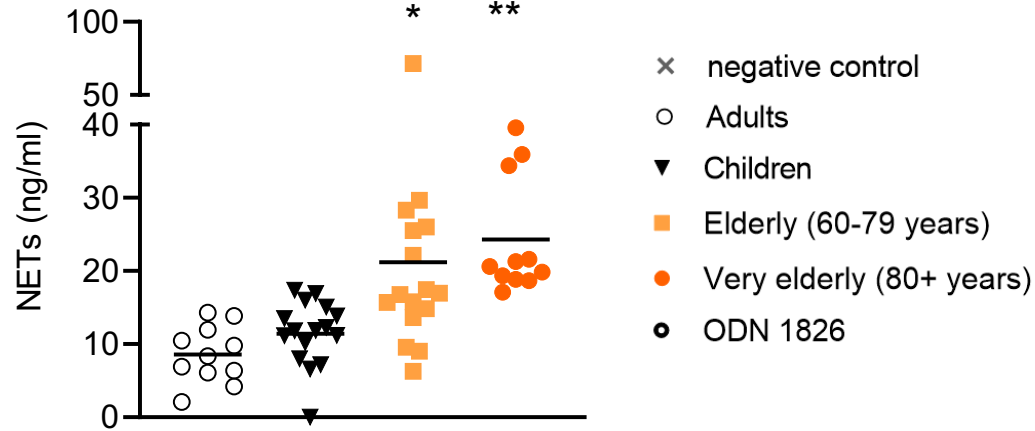
Michal Pastorek ✉, Barbora Konečná, Jakub Janko, Ľubica Janovičová,
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 Barbora Vlková, Peter Celec

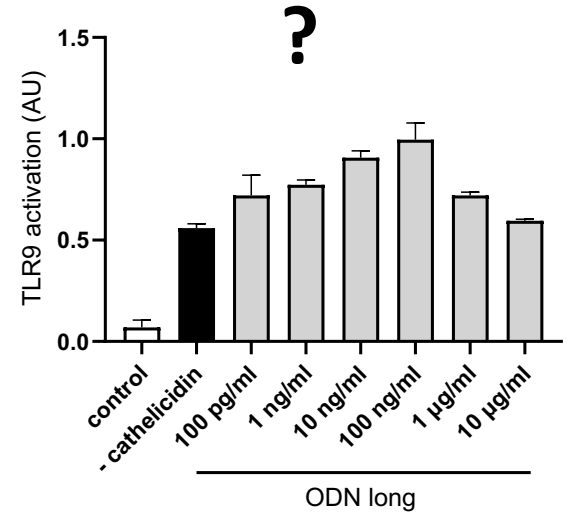
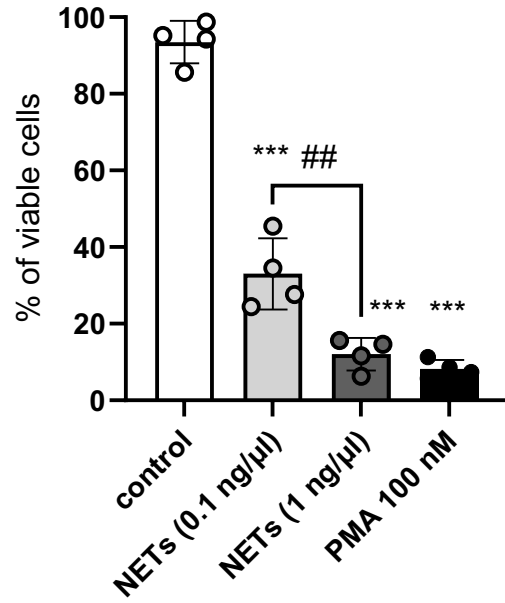
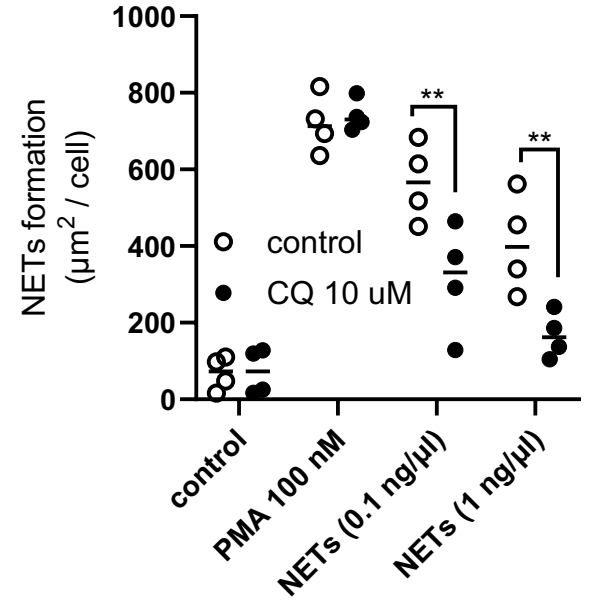
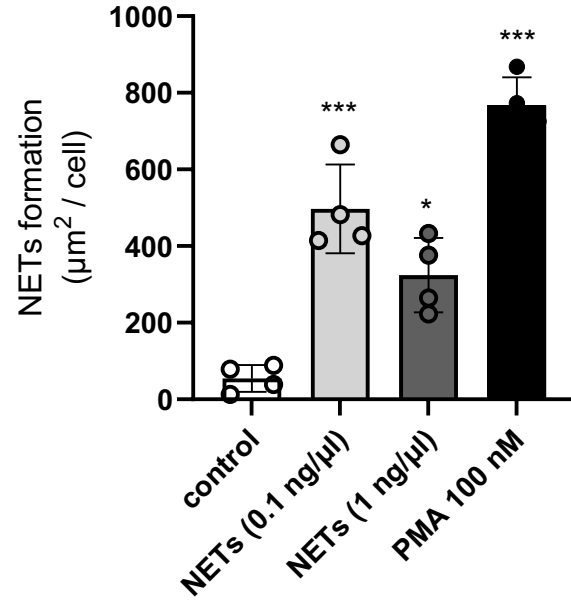
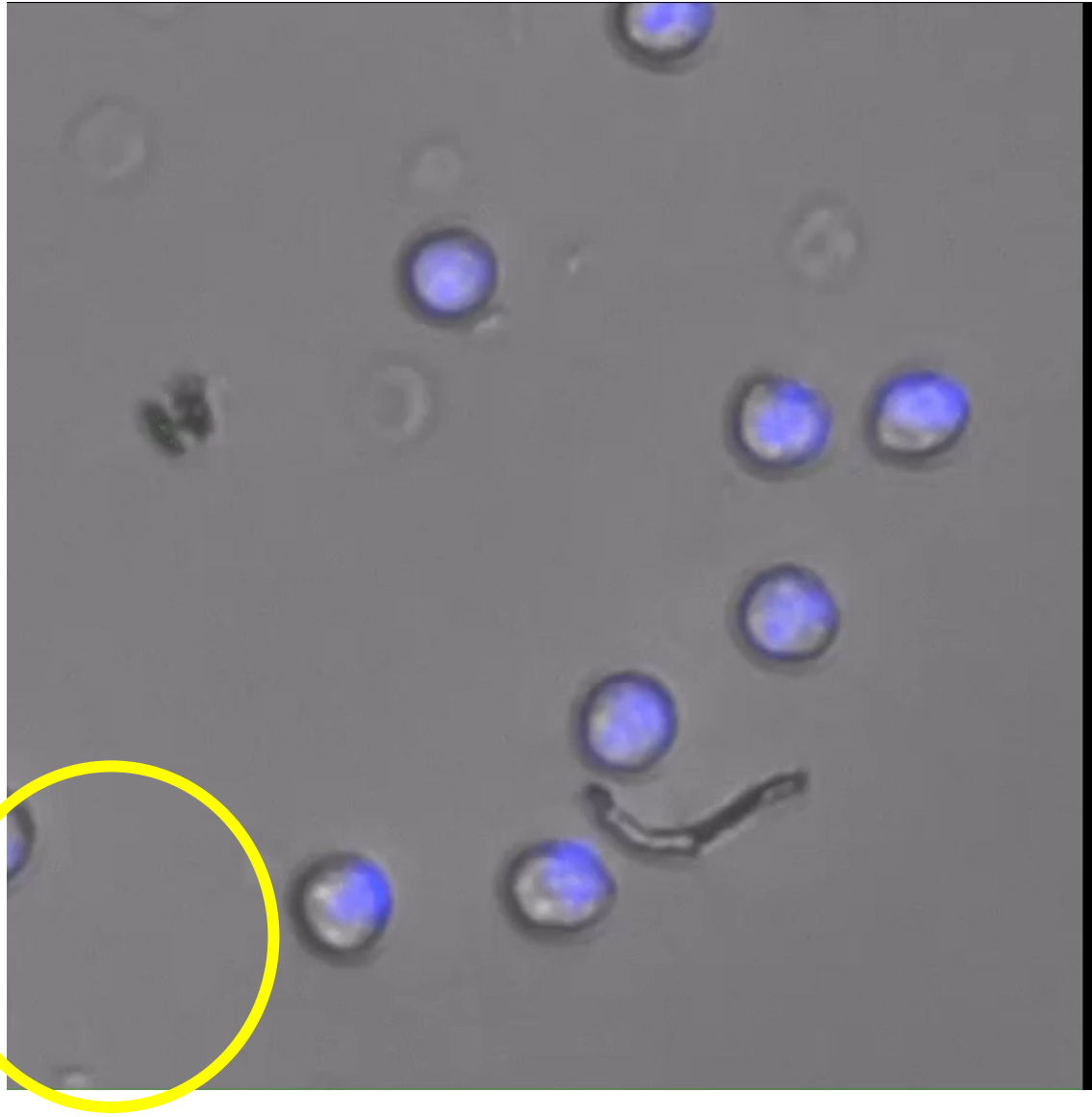
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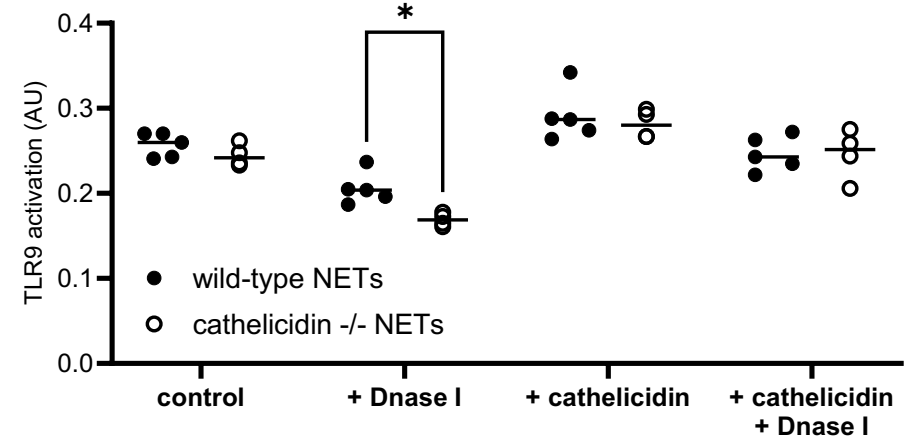
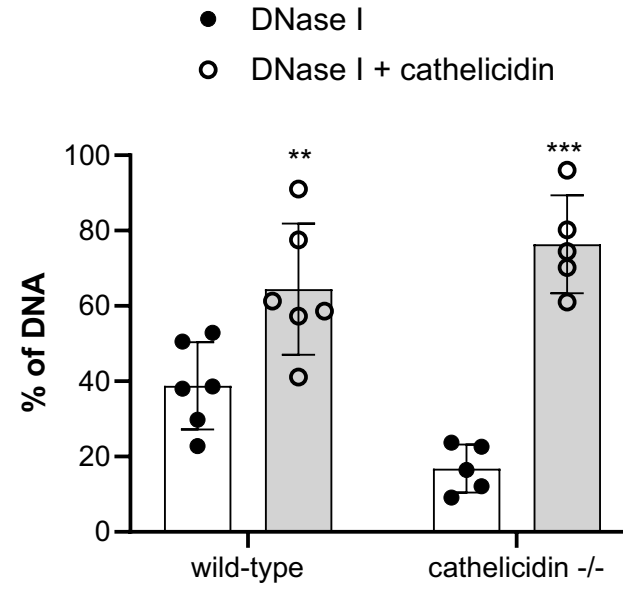
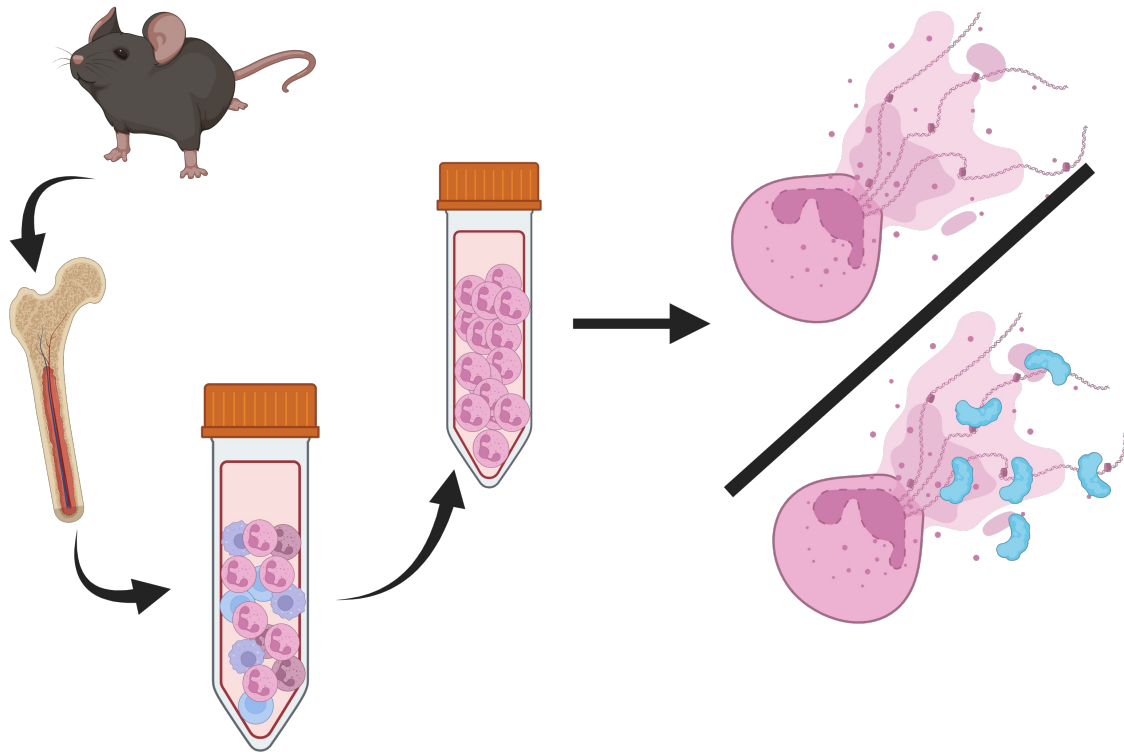
Journal of Leukocyte Biology, Volume 114, Issue 6, December 2023, Pages 651–665,

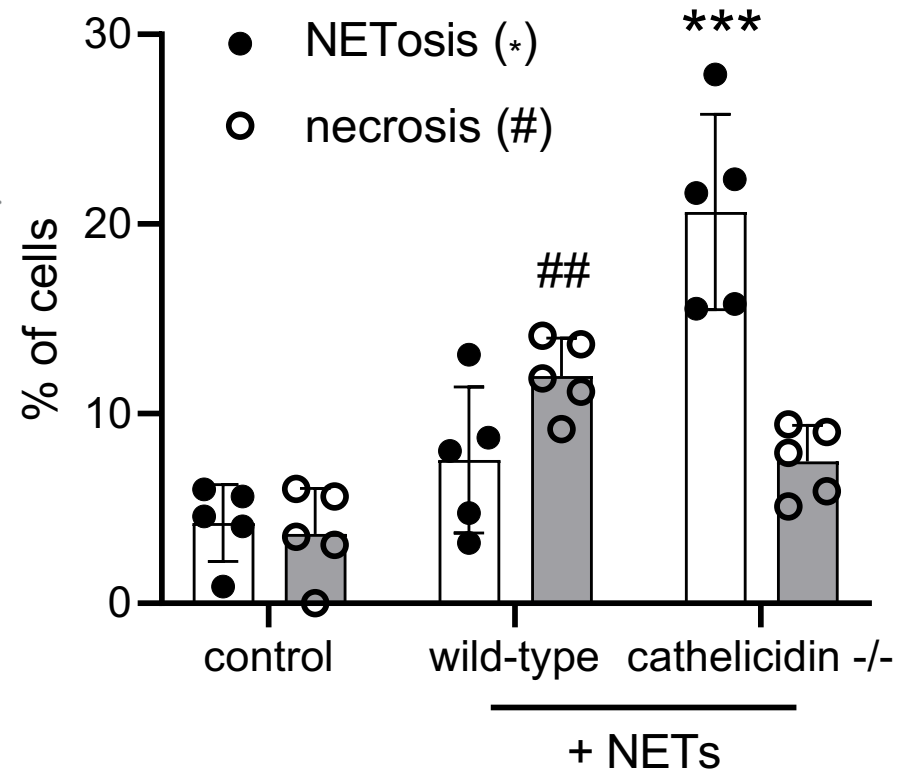
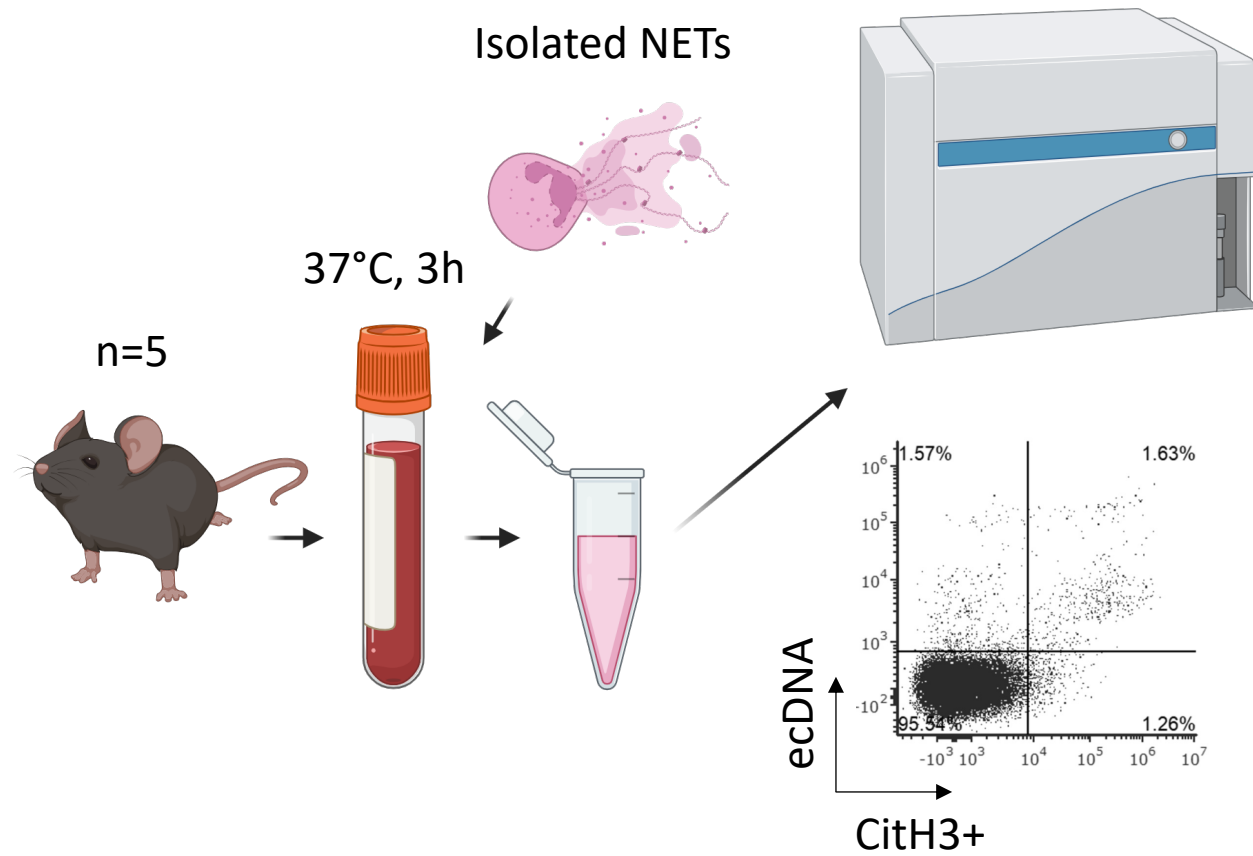
<https://doi.org/10.1093/jleuko/qiad101>

Published: 30 August 2023 [Article history](#) ▾









Neutrophil extracellular traps (NET) induced by different stimuli: A comparative proteomic analysis



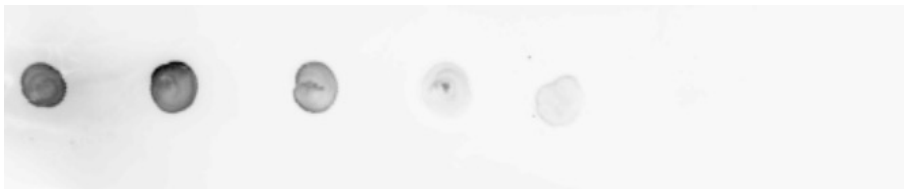
Andrea Petretto¹, Maurizio Bruschi², Federico Pratesi³, Cristina Croia³, Giovanni Candiano², Gianmarco Ghiggeri⁴, Paola Migliorini^{3*}

Neutrophil Extracellular Traps protein composition is specific for patients with Lupus nephritis and includes methyl-oxidized α enolase (methionine sulfoxide 93)

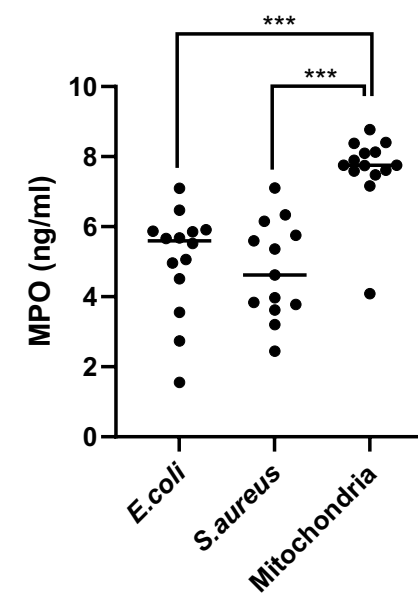
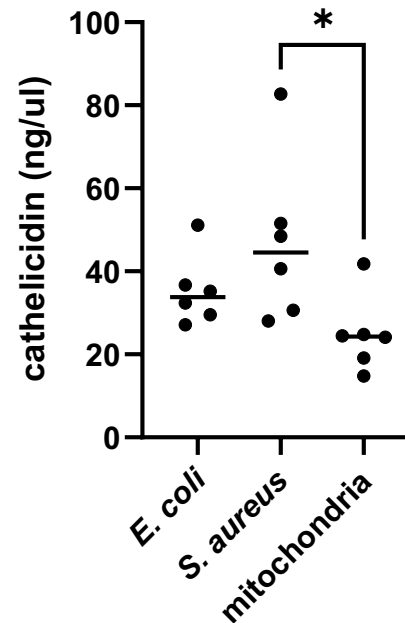
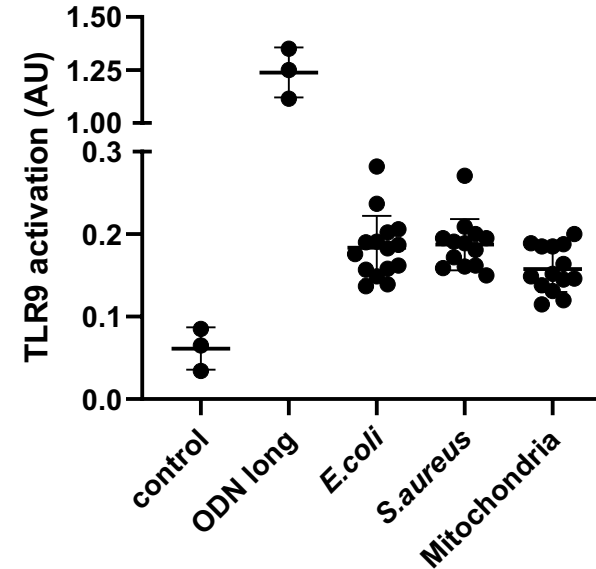
[Maurizio Bruschi](#), [Andrea Petretto](#), [Laura Santucci](#), [Augusto Vaglio](#), [Federico Pratesi](#), [Paola Migliorini](#), [Roberta Bertelli](#), [Chiara Lavarello](#), [Martina Bartolucci](#), [Giovanni Candiano](#), [Marco Prunotto](#) & [Gian Marco Ghiggeri](#)

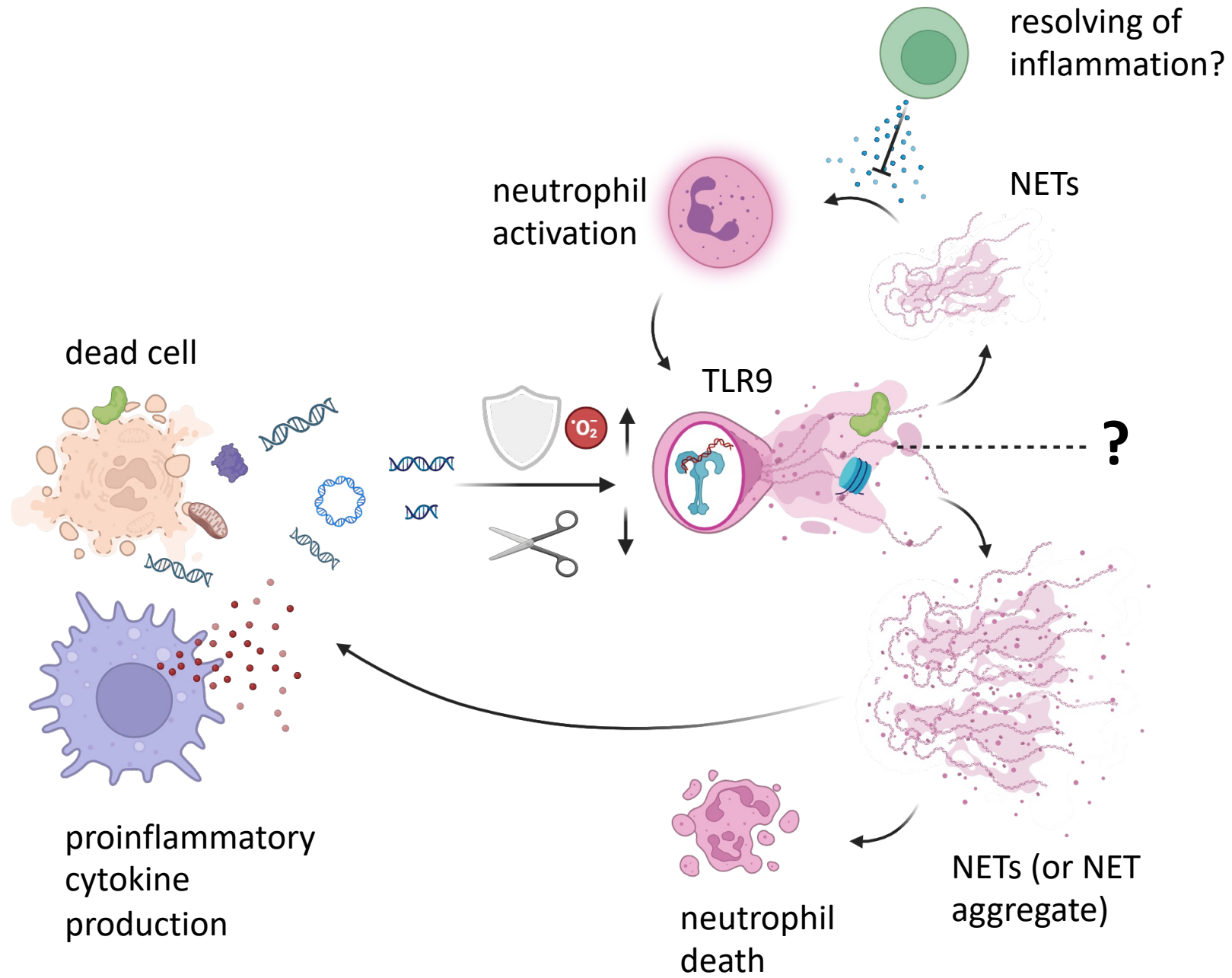
Scientific Reports 9, Article number: 7934 (2019) | [Cite this article](#)

200 μ g/ml $\xrightarrow{\text{serial dilutions (1/10)}}$ 200 pg/ml



dot blot for cathelicidin







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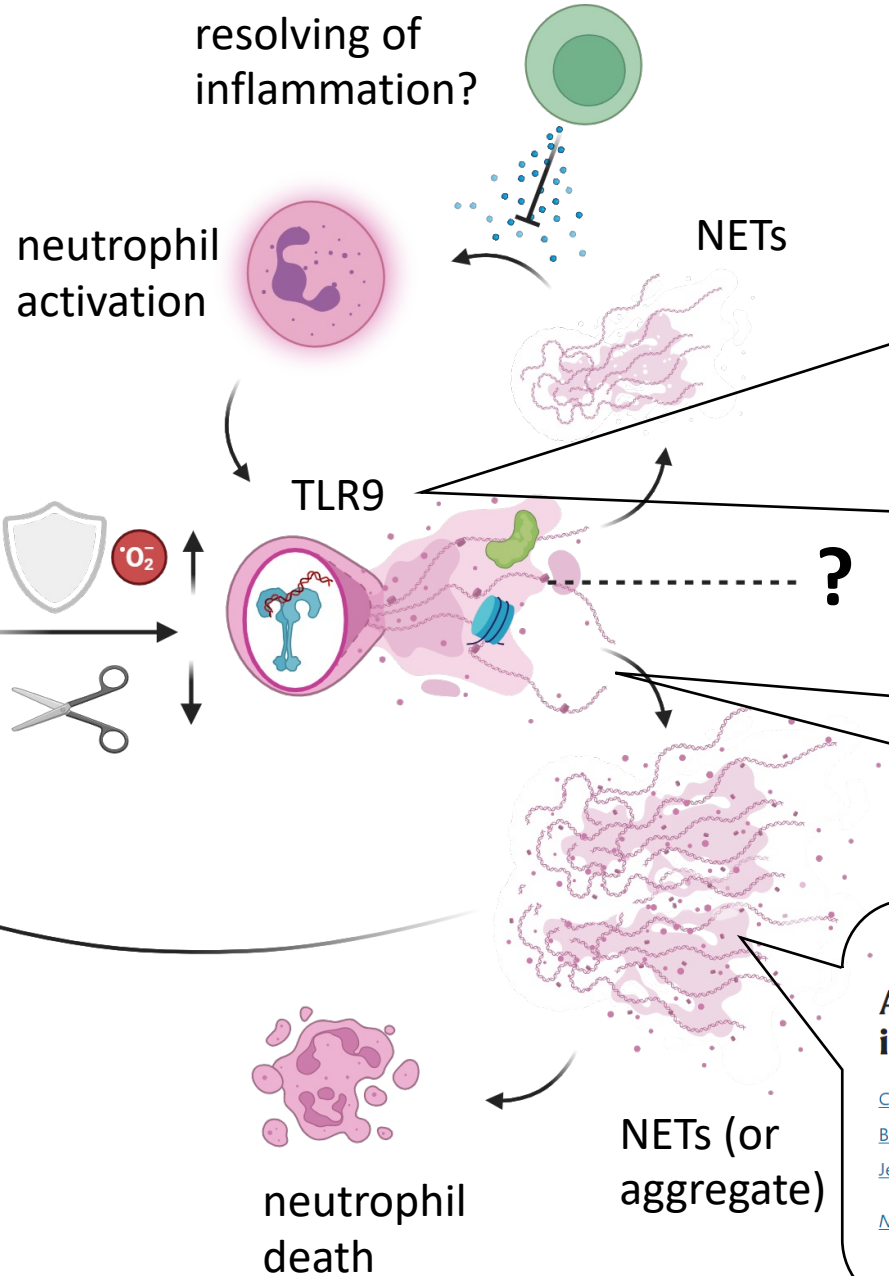
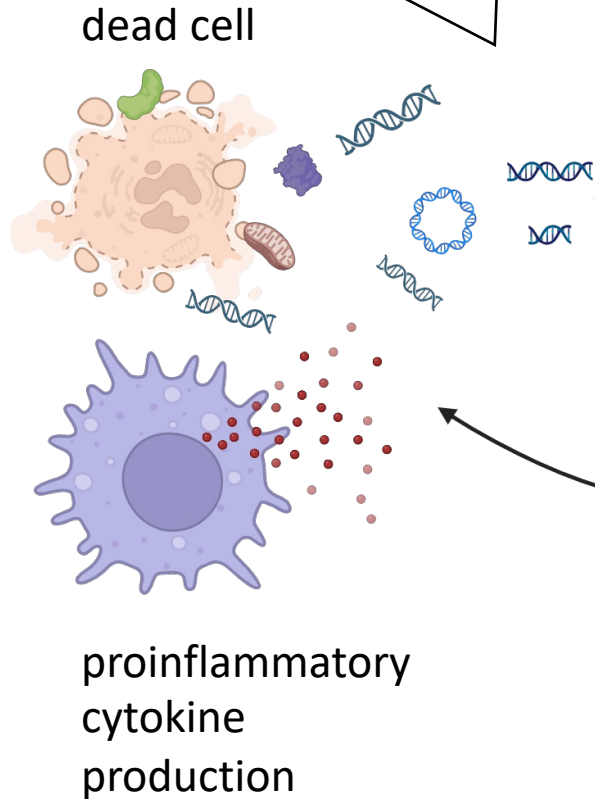
SLOVAK RESEARCH
AND DEVELOPMENT
AGENCY

This work was supported by grants from The Slovak Research and Development Agency No. PP-COVID-20-0016 and APVV-21-0378.

All Figures were Made in BioRender.com

Traumatic Injury and Exposure to Mitochondrial-Derived Damage Associated Molecular Patterns Suppresses Neutrophil Extracellular Trap Formation

Jon Hazeldine^{1,2*}, Robert J. Dinsdale^{1,3}, Paul Harrison^{1,3} and Janet M. Lord^{1,2,3}



Neutrophil extracellular traps contribute to immunothrombosis formation via the STING pathway in sepsis-associated lung injury

Shuainan Zhu, Ying Yu, Mengdi Qu, Zhiyun Qiu, Hao Zhang , Changhong Miao & Kefang Guo

Cell Death Discovery 9, Article number: 315 (2023) | [Cite this article](#)

Received: 28 April 2020 | Revised: 20 August 2020 | Accepted: 20 August 2020
DOI: 10.1096/fj.202000994RR

RESEARCH ARTICLE



The role of neutrophil extracellular traps and TLR signaling in skeletal muscle ischemia reperfusion injury

Nicole J. Edwards¹ | Charles Hwang¹ | Simone Marini¹ | Chase A. Pagani¹ | Philip J. Spreadborough² | Cassie J. Rowe² | Pauline Yu¹ | Annie Mei¹ | Noelle Visser¹ | Shuli Li¹ | Geoffrey E. Hespe¹ | Amanda K. Huber¹ | Amy L. Strong¹ | Miriam A. Sheler³ | Jason S. Knight⁴ | Thomas A. Davis² | Benjamin Levi^{1,5}

RNA Externalized by Neutrophil Extracellular Traps Promotes Inflammatory Pathways in Endothelial Cells

Luz P. Blanco, Xinghao Wang, Philip M. Carlucci, Jose Jiram Torres-Ruiz, Jorge Romo-Tena, Hong-Wei Sun, Markus Hafner, Mariana J. Kaplan

Aggregated neutrophil extracellular traps limit inflammation by degrading cytokines and chemokines

Christine Schauer, Christina Janko, Luis E Munoz, Yi Zhao, Deborah Kienhöfer, Benjamin Frey, Michael Lell, Bernhard Manger, Jürgen Rech, Elisabeth Naschberger, Rikard Holmdahl, Veit Krenn, Thomas Harrer, Ivica Jeremic, Rostyslav Bilyy, Georg Schett, Markus Hoffmann & Martin Herrmann

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