MEETING

LO STATO DELL'ARTE DEL PNRR: TELEMEDICINA E FORMAZIONE D'ECCELLENZA

VENERDÌ **21 FEBBRAIO** 2025
ore **9:00 - 13:00**

Aula Magna "Aldo Cossu"
Università degli Studi di Bari Aldo Moro
Via Scipione Crisanzio, 1 - Bari

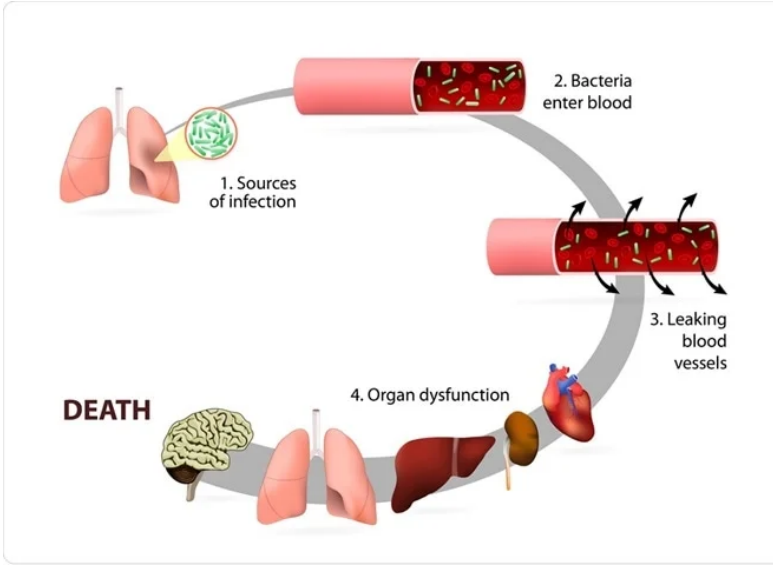
GIUSEPPE CALAMITA

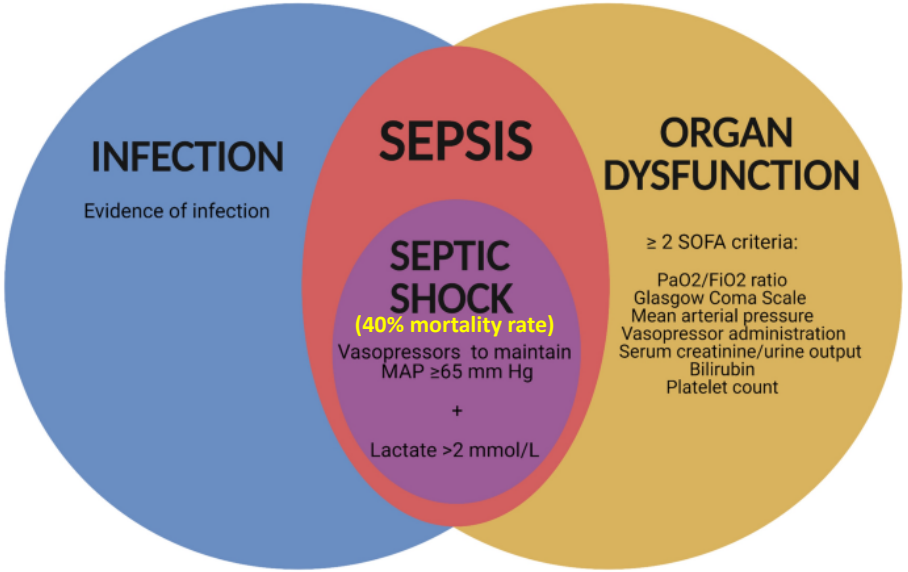
AQUAPORINA-9 E INTELLIGENZA ARTIFICIALE NELLA PREDIZIONE PROGNOSTICA DELLA SEPSI

Sepsis, one of the oldest and most ambiguous syndromes in medicine

Sepsis

When the immune system becomes overactive in response to an infection, causing inflammation that can affect the functioning of other tissues and organs





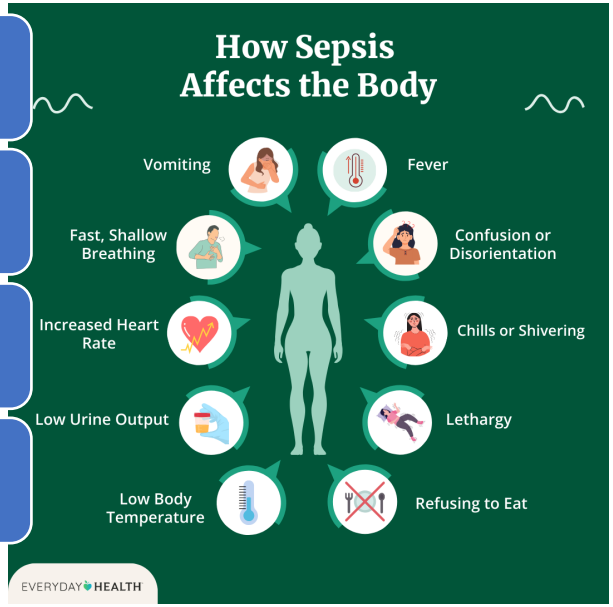
Sepsis, a silent killer and leading cause of death

40-70 million cases and 11 million deaths per year in the world (associated with one in five deaths on the planet)

Recognized as an acute inflammatory condition with the activation of the innate immune system triggered by infection

Main etiological causes: bacterial, fungal and viral infections

Different categories of subjects at risk



➢ It develops quickly, and it can be difficult to identify in its early stage

- Diagnostic and prognostic predictions are fundamental
- Need of novel drug targets

Scoring systems for the characterization of sepsis and associated outcomes

SOFA score

Sequential Organ Failure Assessment (SOFA)

- Performance of six organ systems in the body:
- Neurologic
- Blood
- Liver
- Kidney
- Blood pressure
- Blood hemodynamics

qSOFA score

Quick SOFA (qSOFA)

Three items:

- respiratory rate ≥ 22 breaths per minute
- altered mentation [GCS] < 15
- systolic blood pressure (SBP) < 100 mmHg

MEWS score

Modified Early Warning Score (MEWS)

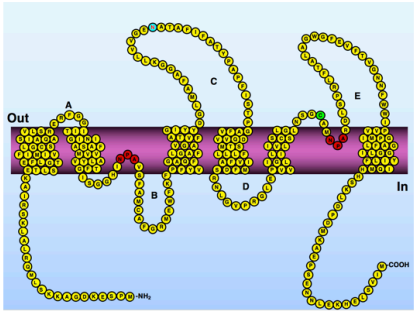
Four items:

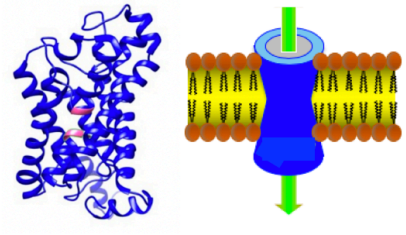
- respiratory rate >22 breaths per minute
- state of consciousness
- oxygen saturation
- heart rate

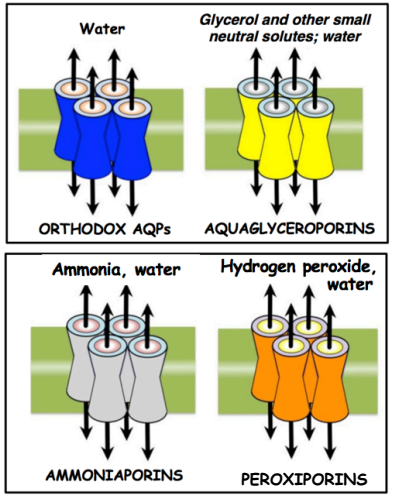
Groundbreaking advances in personalizing treatment of sepsis **are needed** to save lives

- Inclusion of state-of-the art **biomarkers**, replacement of time-consuming blood cultures (days) by a **rapid (hours) test kit** and **AI-supported methods of diagnostic and prognostic prediction**

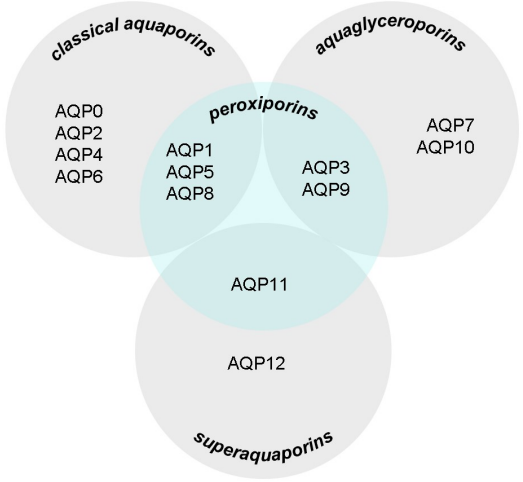
The Aquaporin family of membrane channels



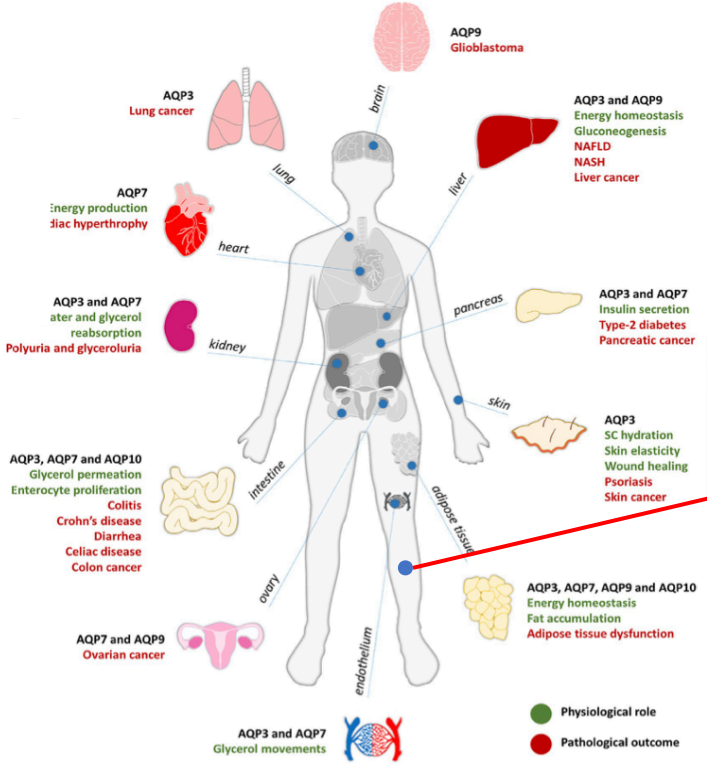




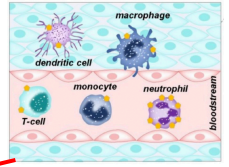
Humans have 13 AQPs (AQP0-AQP12)



Human Aquaporins in health and disease



Immune cells

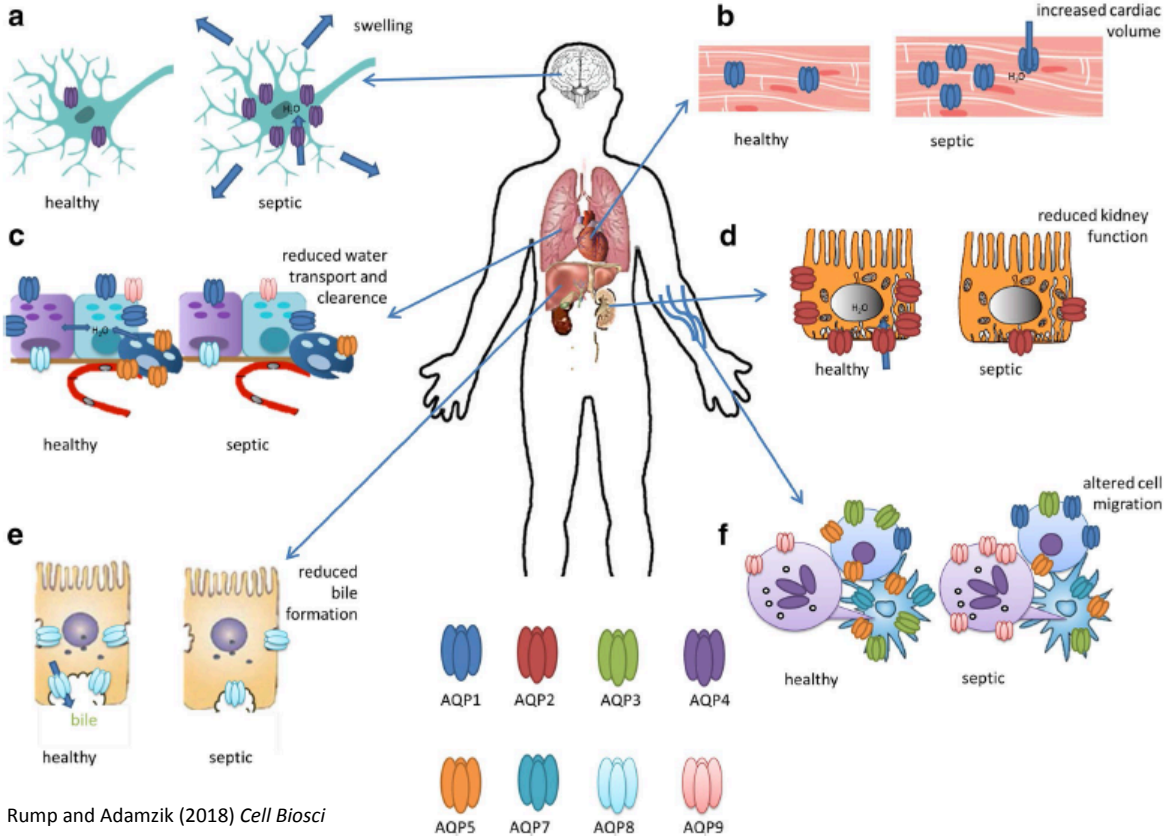


AQP1, AQP3, AQP5, AQP7, AQP9

- Cell migration
  - Neutrophils
  - Monocytes
  - Macrophages
- Extravasation
- Phagocytosis
- Dendritic cell activation
- Inflammasome activation
- T cell longevity
- Contact hypersensitivity

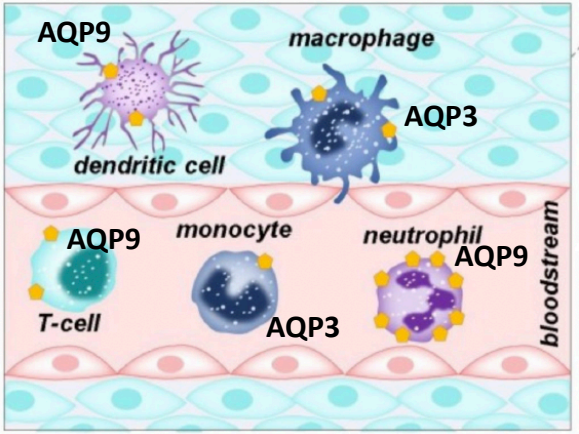
Immune system dysfunction
Sepsis

Expression and proposed roles of AQPs in sepsis



Rump and Adamzik (2018) *Cell Biosci*

AQP3 and AQP9 in immune cells



AQP3 and AQP9 have roles in the immune system

The Rockefeller University Press $30.00
J. Exp. Med. 2012 Vol. 209 No. 10 1743-1752
www.jem.org/cgi/doi/10.1084/jem.20112398

Chemokine-dependent T cell migration requires aquaporin-3–mediated hydrogen peroxide uptake

Mariko Hara-Chikuma,[1,2,4] Shunsuke Chikuma,[3] Yoshinori Sugiyama,[4] Kenji Kabashima,[1] Alan S. Verkman,[5,6] Shintaro Inoue,[4] and Yoshiki Miyachi[1]

Cellular and Molecular Life Sciences
https://doi.org/10.1007/s00018-020-03708-3
Cellular and Molecular Life Sciences

ORIGINAL ARTICLE

Check for updates

Aquaporin-3 is involved in NLRP3-inflammasome activation contributing to the setting of inflammatory response

Inês Vieira da Silva[1,2] · Carlos Cardoso[2,3] · Helios Martínez-Banaclocha[4] · Angela Casini[5] · Pablo Pelegrín[4] · Graça Soveral[1,2]

frontiers in Microbiology
ORIGINAL RESEARCH
published: 03 September 2015
doi: 10.3389/fmicb.2015.00915

Pseudomonas aeruginosa lasI/rhlI quorum sensing genes promote phagocytosis and aquaporin 9 redistribution to the leading and trailing regions in macrophages

*Angelika Holm, Thommie Karlsson and Elena Vikström **

Int. J. Mol. Sci. **2024**, *25*, 1209. https://doi.org/10.3390/ijms25021209
International Journal of *Molecular Sciences*
MDPI

Article

AQP3 and AQP9—Contrary Players in Sepsis?

Patrick Thon [1], Tim Rahmel [1], Dominik Ziehe [1], Lars Palmowski [1], Britta Marko [1], Hartmuth Nowak [1,2], Alexander Wolf [1], Andrea Witowski [1], Jennifer Orlowski [1], Björn Ellger [3], Frank Wappler [4], Elke Schwier [5], Dietrich Henzler [5], Thomas Köhler [5], Alexander Zarbock [6], Stefan Felix Ehrentraut [7], Christian Putensen [7], Ulrich Hermann Frey [8], Moritz Anft [9], Nina Babel [9], Barbara Sitek [1], Michael Adamzik [1], Lars Bergmann [1], Matthias Unterberg [1], Björn Koos [1] and Katharina Rump [1,*] on behalf of the SepsisDataNet.NRW Research Group

Our studies on AQP9 in inflammation and sepsis

frontiers in Immunology

ORIGINAL RESEARCH
published: 16 October 2018
doi: 10.3389/fimmu.2018.02355

Aquaporin-9 Contributes to the Maturation Process and Inflammatory Cytokine Secretion of Murine Dendritic Cells

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giuseppe.calamita@uniba.it

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Stefania De Santis [1,2,3†], Grazia Serino [1†], Maria R. Fiorentino [4], Vanessa Galleggiante [1], Patrizia Gena [5], Giulio Verna [1], Marina Liso [1], Monica Massaro [1], Jinggang Lan [4], Jacopo Troisi [6,7], Ilaria Cataldo [5], Alessia Bertamino [2], Aldo Pinto [2], Pietro Campiglia [2,8], Angelo Santino [9], Gianluigi Giannelli [1], Alessio Fasano [4,7], Giuseppe Calamita [5*‡] and Marcello Chieppa [1,2*‡]

Frontiers in Immunology | www.frontiersin.org June 2022 | Volume 13 | Article 900906

RG100204, A Novel Aquaporin-9 Inhibitor, Reduces Septic Cardiomyopathy and Multiple Organ Failure in Murine Sepsis

Shireen Mohammad [1*], Caroline E. O'Riordan [1], Chiara Verra [1], Eleonora Aimaretti [2], Gustavo Ferreira Alves [3], Klaus Dreisch [4], Johan Evenäs [4], Patrizia Gena [5], Angela Tesse [6], Michael Rützler [7,8], Massimo Collino [3], Giuseppe Calamita [5] and Christoph Thiemermann [1*]

Cells **2021**, *10*, 435. https://doi.org/10.3390/cells10020435

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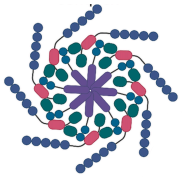
Article

Ablation of Aquaporin-9 Ameliorates the Systemic Inflammatory Response of LPS-Induced Endotoxic Shock in Mouse

Angela Tesse [1,*], Patrizia Gena [2], Michael Rützler [3,4] and Giuseppe Calamita [2,*]



International Immunopharmacology 137 (2024) 112450

Contents lists available at ScienceDirect

International Immunopharmacology

journal homepage: www.elsevier.com/locate/intimp

Inhibition of aquaporin-9 ameliorates severe acute pancreatitis and associated lung injury by NLRP3 and Nrf2/HO-1 pathways

Jiawei Chen [a,1], Xiandong Zhu [e,1], Ziqiong Wang [a], Michael Rützler [b], Qiaohong Lu [a], Hongjie Xu [a], Roland Andersson [c], Yinwei Dai [a], Zouwen Shen [a], Giuseppe Calamita [d], Shangjing Xie [a,*], Yongheng Bai [a,*], Bicheng Chen [a,*]

Cells **2022**, *11*, 3118. https://doi.org/10.3390/cells11193118

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Characterization of the Aquaporin-9 Inhibitor RG100204 In Vitro and in *db/db* Mice

Marilina Florio [1,†], Angelica Engfors [2,†], Patrizia Gena [1], Jessica Larsson [3], Alessandro Massaro [4,5], Stella Timpka [3], Martina Kvist Reimer [3], Per Kjellbom [2], Eric Beitz [6], Urban Johanson [2], Michael Rützler [2,7,*] and Giuseppe Calamita [1,*]