Curriculum Vitae Prof. Dr. Feng Shao

Name: **Feng Shao**
Born: **1 January 1972**

Research priorities: Innate immunity, inflammation, pyroptosis, immunogenic cell death, bacterial infection

Feng Shao has discovered a series of cytosolic innate immune receptors for major bacterial products (like LPS) as well as the downstream pyroptosis executioner gasdermin-D (GSDMD). These original contributions lay out the foundation for understanding how our body recognizes and defends against various pathogenic bacterial infections in the cytosol space. His further identification of the Gasdermin family of pore-forming proteins re-defines the concept of pyroptosis, thereby opening a new area in cell death, inflammation and immunity.

Academic and professional Career

since 2014	Deputy Director for Academic Affairs, National Institute of Biological Sciences, Beijing, China
since 2012	Investigator, National Institute of Biological Sciences, Beijing, China
2009 - 2012	Associate investigator, National Institute of Biological Sciences, Beijing, China
2005 - 2009	Assistant investigator, National Institute of Biological Sciences, Beijing, China
2004 - 2005	Damon Runyon Postdoctoral Fellow, Harvard Medical School, Boston, MA, USA
2003	Postdoctoral research fellow, University of California, San Diego, CA, USA
1999 - 2003	PhD in Biological Chemistry, University of Michigan, Ann Arbor, MI, USA
1996 - 1999	MS in Molecular Biology, Institute of Biophysics, Chinese Academy of Sciences, Beijing, China
1991 - 1996	BS in Applied Chemistry, Peking University, Beijing, China

Functions in scientific societies and committees

since 2020	Member of the External Advisory Board (EAB) of UCL Great Ormond Street Institute of Child Health
since 2020	Editorial board, Cell Host and Microbe
since 2020	Associate editor, Science Advances
Since 2019	Editorial board, PLOS Biology
since 2019	Member and consultant, the Roche Immunology Incubator Board
2019 - 2021	Hong Kong Research Grants Council (RGC) Biology and Medicine Panel Member
since 2018	Member of the China National Committee of Science and Technology Awards
since 2018	Vice president, The Chinese Society of Biochemistry and Molecular Biology (CSBMB)
since 2018	Board of Directors, The Chinese Biological Investigator Society (CBIS)
since 2017	Council Member, China National Postdoctoral Science Foundation
since 2017	Scientific advisor, the Life Science Division of the Natural Science Foundation of China
2015 - 2018	Board of Directors, The Ray Wu Memorial Fund
2012 - 2018	Board of Reviewing Editors, eLife
since 2012	Editor, Cellular Microbiology

Project coordination, memberships in collaborative projects

2018 - 2022	NSFC Basic Science Center Project on “Innate immunity and inflammatory diseases” (#81788101)
2016 - 2022	China Ministry of Science and Technology Key Research and Development Plan Project on “Protein machinery in regulation of biological processes” (#2016YFA0501500)
2014 - 2017	The Program for International Collaborations between NSFC and ISC (Israel Science Foundation) on “Pathogen sensing by epithelial cells: the enteropathogenic E. coli paradigm” (#31461143006)
2012 - 2018	The Strategic Priority Research Program of the Chinese Academy of Sciences on “Protein Machinery” (#XDB08020202)

Honours and awarded memberships

2019	Future Science Prize – Life Sciences
2019	Qiu Shi Outstanding Scientist Award
since 2019	Member of the German National Academy of Sciences Leopoldina

since 2016	Elected Fellow of American Academy of Microbiology
since 2015	Elected Member of the Chinese Academy of Sciences
since 2015	Elected Associate Member of the EMBO
2014	The Wu Jieping-Paul Janssen Medical & Pharmaceutical Award
2013	The Protein Society Young Investigator Award (formally The Irving Sigal Young Investigator Award)
2012 - 2016	Howard Hughes Medical Institute (HHMI), International Early Career Award

Research priorities

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Central to the immune system is the sensing of pathogen infection. Toll-like receptors (TLRs) recognize extracellular bacteria and stimulate cytokine production, but little was known about how bacteria are detected in the cytosol. Feng Shao has identified several pattern recognition receptors (PRRs) for invading bacterial pathogens/toxins. These include the NAIP family for bacterial flagellin and type III secretion apparatus, and Pyrin (encoded by the familial Mediterranean fever gene) that senses various bacterial toxins. He has also showed that caspase-4/5 in humans and caspase-11 in mice are intracellular receptors for bacterial LPS. In addition, he has uncovered that ADP-heptose, a precursor of LPS biosynthesis, is recognized by a host kinase ALPK1 and stimulates NF-κB-mediated proinflammatory responses, therefore revealing another way through which LPS is sensed by host immune system. This series of landmark discoveries establish a framework about cytosolic antibacterial immunity.

Cytosolic immune receptors often activate pyroptosis, but the mechanism was unknown for 20 years. Shao has solved the mystery by identifying the GSDMD protein, whose cleavage and activation by caspase-1 and caspase-4/5/11 determines pyroptosis. He further found that GSDMD has a membrane pore-forming activity that directly executes pyroptosis and also mediates the release of caspase-1-processed IL-1β. Shao's findings raise a novel concept that systemic pyroptosis activated by the intracellular LPS-sensing pathway determines sepsis.

Shao has further discovered that the large gasdermin family are all pyroptosis-inducing factors, redefining pyroptosis as gasdermin-mediated programmed necrosis. His work shows that GSDME is cleaved and activated by caspase-3 and therefore switches apoptosis to pyroptosis. The finding has overturned the dogma that caspase-3 activation is a marker for apoptosis, and changed our

understanding about the role of caspases in programmed cell death.