



Prof. Dr. Jules Hoffmann

Chair of Integrative Biology and Professor, University of Strasbourg Institute for Advanced Study



Jules Hoffmann is the Chair for Developmental Biology at the University of Strasbourg Institute for Advanced Study and Emeritus Research Director at CNRS. He dedicated much of his work to the study of the cellular, genetic and molecular mechanisms responsible for innate immunity in insects. The work of Hoffmann and associates has provided new insights into the defense mechanisms that organisms, from the most primitive up to humans, employ against infectious agents. By demonstrating the marked conservation of innate defense mechanisms between insects and humans, the work initiated by Hoffmann and his collaborators has led to a re-evaluation of the role of innate immunity in mammals. More generally, the *Drosophila* model has enabled biologists throughout the world to make considerable progress, not only in developmental genetics and innate immunity but also in the study of certain human pathologies and in the understanding of memory, behavior, sleep and nutrition phenomena. With Bruce A. Beutler and Ralph M. Steinman, Hoffmann was awarded the Nobel Prize in Physiology or Medicine in 2011.

Hoffmann set up and headed the CNRS laboratory “Endocrinology and Immunology of Insects” within the CNRS Institut de Biologie Moléculaire et Cellulaire in Strasbourg, which he also directed from 1994 to 2006 and where he still works with some of his collaborators. He was President of

the French Académie des Sciences in 2007 and 2008, and is a Foreign Associate member of the Academy of Sciences of the United States of America, the American Association for Cancer Research, Germany and Russia and of the American Academy of Arts and Sciences. For his contributions to immunity, Hoffmann was awarded numerous prizes, including, in recent years, the Robert Koch Prize (2004, with Bruce Beutler and Shizuo Akira) the Balzan Prize (2007, with Bruce Beutler), the Rosenstiel Award (2010, with Ruslan Medzhitov), the Keio Medical Science Prize (with Shizuo Akira, 2010), the International Gairdner Award (2011, with Shizuo Akira) and the Shaw Prize in Life Science and Medicine (2011, with Bruce Beutler and Ruslan Medzhitov). He also received in 2011 the CNRS Gold Medal. Hoffmann is Officier de la Légion d'Honneur in France and is an Immortel at the Académie française (2012).

---

- J.A. HOFFMANN (1970). Les organes hématopoïétiques de deux Insectes Orthoptères : *Locusta migratoria* et *Gryllus bimaculatus*. Z. Zellforsch. Vol 106 451-472.
- J.A. HOFFMANN (1973). Blood-forming tissues in Orthopteran Insects : an analogue to Vertebrate hemopoietic organs. Experientia. Vol 29 50-51.
- J.A. HOFFMANN, J. KOOLMAN, P. KARLSON & P. JOLY (1974). Molting hormone titer and metabolic fate of injected ecdysone during the fifth larval instar and in adults of *Locusta migratoria*. Gen. Compar. Endocrinol. Vol 22 90- 97.
- P. KARLSON, J. KOOLMAN & J.A. HOFFMANN (1975). Biochemistry of ecdysone. Amer. Zool. Vol 15 49-59.
- G. TSOUPRAS, B. LUU & J.A. HOFFMANN (1982). Isolation and identification of three ecdysteroid conjugates with a C-20 hydroxy group in eggs of *Locusta migratoria*. Steroids. Vol 40 551-560.
- M.F. COSTET, M. EL ACHOURI, M. CHARLET, R. LANOT, P. BENVENISTE & J.A. HOFFMANN (1987). Ecdysteroid biosynthesis and embryonic development are disturbed in insects (*Locusta migratoria*) reared on plant diet (*Triticum sativum*) with a selectively modified sterol profile. Proc. Nat. Acad. Sci. Vol 84 643-647.
- J. LAMBERT, E. KEPPI, J.L. DIMARCQ, C. WICKER, J.M. REICHHART, B. DUNBAR, P. LEPAGE, A. VAN DORSELAAER, J.A. HOFFMANN, J. FOTHERGILL & D. HOFFMANN (1989). Insect immunity. Isolation from immune blood of the Dipteran *Phormia terraenovae* of two novel antibacterial peptides with sequence homology to rabbit lung macrophage bactericidal peptides. Proc. Nat. Acad. Sci. Vol 86 262-266.
- M. LAGUEUX, L. LWOFF, M. MEISTER, F. GOLTZENÉ & J.A. HOFFMANN (1990). cDNAs from neurosecretory cells of brains of *Locusta migratoria* (Insecta, Orthoptera) encoding a novel member of the superfamily of insulins. Eur. J. Biochem. Vol 187 249-254.
- J.A. HOFFMANN & D. HOFFMANN (1990). The inducible antibacterial peptides of dipteran insects. Res. Immunol. Vol 141 910-918.
- DIMARCQ JL, HOFFMANN D, MEISTER M, BULET P, LANOT R, REICHHART JM & HOFFMANN JA (1994). Characterization and transcriptional profiles of a *Drosophila* gene encoding an insect defensin. A study in insect immunity. Eur. J. Biochem. Vol 221 201-209.

- LEMAITRE B, KROMER-METZGER E, MICHAUT L, NICOLAS E, MEISTER M, GEORGEL P, REICHHART JM & HOFFMANN JA (1995). A recessive mutation, immune-deficiency (imd), defines two distinct control pathways in the Drosophila host defense. Proc. Natl. Acad. Sci. Vol 92 9465-9469.
- FRANC N, DIMARCO JL, LAGUEUX M, HOFFMANN JA & EZEKOWITZ A (1996). Croquemort, a novel Drosophila hemocyte/macrophage receptor that recognizes apoptotic cells. Immunity. Vol 4 431-443.
- LEMAITRE B, NICOLAS E, MICHAUT L, REICHHART JM & HOFFMANN JA (1996). The dorsoventral regulatory gene cassette spaetzle/toll/cactus controls the potent antifungal response in Drosophila adults. Cell. Vol 86 973-983.
- FERRANDON D, JUNG AC, CRIQUI MC, LEMAITRE B, UTTENWEILER-JOSEPH S, MICHAUT L, REICHHART JM & HOFFMANN JA (1998). A GFP-drosomycin reporter transgene reveals a local immune response in Drosophila that is not dependent on the Toll pathway. EMBO J. Vol 17 1217-1227.
- DIMARCO JL, BULET P, HETRU C & HOFFMANN JA (1998). Cysteine-rich antimicrobial peptides in invertebrates. Biopolymers (Peptide Science). Vol 47 465-477.
- HOFFMANN JA, KAFATOS FC, JANEWAY CA JR & EZEKOWITZ RAB (1999). Phylogenetic perspectives in innate immunity. Science. Vol 284 1313-1318.
- RUTSCHMANN S, JUNG AC, ZHOU R, SILVERMAN N, HOFFMANN JA & FERRANDON D (2000). Role of Drosophila IKK in a Toll-independent antibacterial immune response. Nature Immunol. Vol 1 342-347.
- TZOU P, OHRESSER S, FERRANDON D, CAPOVILLA M, REICHHART JM, LEMAITRE B, HOFFMANN JA & IMLER JL (2000). Tissue-specific inducible expression of antimicrobial peptide genes in Drosophila surface epithelia. Immunity. Vol 13 737-748.
- GEORGEL, P., NAITZA S., KAPPLER, C., FERRANDON, D., ZACHARY, D., SWIMMER, C., KOPCZYNSKI, C., DUYK, G., REICHHART, J-M., AND HOFFMANN, J.A. ( 2001). Drosophila Immune Deficiency (IMD) is a Death Domain Protein that Activates Antibacterial Defence and Can Promote Apoptosis. Developmental Cell. Vol 1, 1- 20, 503-514.
- MICHEL T, REICHHART JM, HOFFMANN JA & ROYET J. (2001). Drosophila Toll is activated by Gram-positive bacteria via a circulating peptidoglycan recognition protein. Nature. Vol 414, 756-759.
- GOTTAR M, GOBERT V, MICHEL T, BELVIN M, DUYK G, HOFFMANN JA, FERRANDON D, ROYET J, (2002). The Drosophila immune response against Gram-negative bacteria is mediated by a peptidoglycan recognition protein, Nature. Vol 416, 641-644.
- LIGOXYGAKIS P, PELTE N, HOFFMANN JA, REICHHART JM, (2002), Activation of Drosophila Toll during fungal infection by a novel blood serine protease, Science. Vol 297, 114-116
- HOFFMANN JA, (2003). The immune response of Drosophila. Nature. Vol 426, 33-38.
- DOSTERT C, JOUANGUY E, IRVING P, TROXLER L, GALIANA-ARNOUX D, HETRU C, HOFFMANN JA, IMLER JL (2005). The Jak-STAT signaling pathway is required but not sufficient for the antiviral response of Drosophila. Nature Immunol. Vol 6, 946-953.
- FROLET C, THOMA M, BLANDIN S, HOFFMANN JA, LEVASHINA EA (2006). Boosting NF- $\kappa$ B

- Dependent Basal Immunity of *Anopheles gambiae* Aborts Development of *Plasmodium berghei*. *Immunity*. Vol 25, 677-685.
- BEUTLER B, EIDENSCHENK C, CROZAT K, IMLER JL, TAKEUCHI O, HOFFMANN JA, AKIRA S (2007). Genetic analysis of resistance to viral infection. *Nature Reviews of Immunology*. Vol 7, 753-766.
- FERRANDON D, IMLER JL, HETRU C, HOFFMANN JA (2007). The *Drosophila* systemic immune response: sensing and signalling during bacterial and fungal infections. *Nature Reviews of Immunology*. Vol 7, 862-874.
- LEMAITRE B, HOFFMANN JA (2007). The host defense of *Drosophila melanogaster*. *Annual Review of Immunology*. Vol 25, 697-743.
- HOFFMANN JA (2007). Antifungal defense in *Drosophila*. *Nature Immunology*. Vol 8, 543-545.
- DEDDOUCHE S, MATT N, BUDD A, MUELLER S, KEMP C, GALIANA-ARNOUX D, DOSTERT C, ANTONIEWSKI C, HOFFMANN JA, IMLER JL (2008). The DExD/H-box helicase Dicer-2 mediates the induction of antiviral activity in *Drosophila*. *Nature Immunology*. Vol 9, 1425-1432.
- FRAITURE M, BAXTER RH, STEINERT S, CHELLIAH Y, FROLET C, QUISPE-TINTAYA W, HOFFMANN JA, BLANDIN SA, LEVASHINA EA (2009). Two mosquito LRR proteins function as complement control factors in the TEP1-mediated killing of *Plasmodium*. *Cell Host Microbe*. Vol 5, 273-84.
- MISHIMA Y, QUINTIN J, AIMANIANDA V, KELLENBERGER C, COSTE F, CLAVAUD C, HETRU C, HOFFMANN JA, LATGE JP, FERRANDON D, ROUSSEL A (2009). The N-terminal domain of *Drosophila* Gram- negative binding protein 3 (GNBP3) defines a novel family of fungal pattern recognition receptors. *Journal of Biological Chemistry*. Vol 284, 28687-28697.
- HETRU C, HOFFMANN JA (2009). NF-kappaB in the immune response of *Drosophila*. *Cold Spring Harb Perspect Biol*. Vol 6. Review.
- MUELLER S, GAUSSON V, VODOVAR N, DEDDOUCHE S, TROXLER L, PEROT J, PFEFFER S, HOFFMANN JA, SALEH MC, IMLER JL (2010). RNAi-mediated immunity provides strong protection against the negative-strand RNA vesicular stomatitis virus in *Drosophila*. *Proc Natl Acad Sci U S A*. Vol 45, 19390-19395.
- ELEFTHERIANOS I, WON S, CHTARANOVA S, SQUIBAN B, OCORR K, BODMER R, BEUTLER B, HOFFMANN JA, IMLER JL (2011). ATP-sensitive potassium channel (K(ATP))-dependent regulation of cardiotropic viral infections. *Proc Natl Acad Sci U S A*. Vol 29, 12024-12029.
- KEMP C, MUELLER S, GOTO A, BARBIER V, PARO S, BONNAY F, DOSTERT C, TROXLER L, HETRU C, MEIGNIN C, PFEFFER S, HOFFMANN JA, IMLER JL (2013). Broad RNA interference-mediated antiviral immunity and virus-specific inducible responses in *Drosophila*. *The Journal of Immunology*. Vol 2, 650-658.
- BONNAY F, COHEN-BERROS E, HOFFMANN M, KIM SY, BOULIANNE GL, HOFFMANN JA, MATT N, REICHHART JM (2013). big bang gene modulates gut immune tolerance in *Drosophila*. *Proceedings of the National Academy of Sciences U S A*. Vol 8, 2957-2962.
- FUKUYAMA H, VERDIER Y, GUAN Y, MAKINO-OKAMURA C, SHILOV A V, LIU X, MAKSOUD E, MATSUBAYASHI J, HADDAD I, SPIROHN K, ONO K, HETRU C, ROSSIER J,

- IDEKER T, BOUTROS M, VINH J, HOFFMANN JA (2013). Landscape of protein-protein interactions in Drosophila immune deficiency signaling during bacterial challenge. *Proceedings of the National Academy of Sciences U S A.* Vol 26, 10717-10722.
- TARTEY S, MATSUSHITA K, VANDENBON A, ORI D, IMAMURA T, MINO T, STANDLEY DM, HOFFMANN JA, REICHHART JM, AKIRA S, TAKEUCHI O (2014). Akirin2 is critical for inducing inflammatory genes by bridging I $\kappa$ B- $\zeta$  and the SWI/SNF complex. *EMBO Journal.* Vol 20, 2332-2348.
- MAJZOUB K, HAFIRASSOU ML, MEIGNIN C, GOTO A, MARZI S, FEDOROVA A, VERDIER Y, VINH J, HOFFMANN JA, MARTIN F, BAUMERT TF, SCHUSTER C, IMLER JL (2014). RACK1 controls IRES-mediated translation of viruses. *Cell.* Vol 5, 1086-1095.
- LAMIABLE O, KELLENBERGER C, KEMP C, TROXLER L, PELTE N, BOUTROS M, MARQUES JT, DAEFFLER L, HOFFMANN JA, ROUSSEL A & IMLER JL (2016). Cytokine Diedel and a viral homologue suppress deleterious IMD-dependent gene expression in Drosophila. *Proc. Natl. Acad. Sci USA.* Vol 113, 698-703.
- GOTO A, OKADO K, CAI H, BARBIER V, LAMIABLE O, TROXLER L, SANTIAGO E, KUHN L, PALK D, SIVERMAN N, HOLLEUFER A, HARTMANN R, LIU J, TENG T, HOFFMANN JA, MEIGNIN C, DAEFFLER L, IMLER JL (2018). The kinase IKK $\beta$  regulates a STING- and NF-K $\beta$  dependent antiviral response pathway in Drosophila. *Immunity.* Vol 49, 225-234.
- VANPOUILLE-BOX C, HOFFMANN JA, GALLUZZI L, (2019). Pharmacological modulation of nucleic acid sensors – therapeutic potential and persisting obstacles. *Nature Reviews Drug Discovery.* Vol 18, 845-867.
- CHEN D, ROYCHOWDHURY-SINHA A, PRAGYA P, LAN X, FAN F, GOTO A, HOFFMANN A. (2021). A time course transcriptomic analysis of host and injected oncogenic cells reveals new aspect of Drosophila immune defenses. *Proc Natl Acad Sci USA.* Vol 12.. e2100825118.
- CHEN D, X LAN, X HUANG, J HUANG, X ZHOU, Z MIAO, Y MA, A GOTO, S JI, JA HOFFMANN. (2023). Single cell analysis of the fate of injected oncogenic RasV12 cells in adult wild type Drosophila. *Journal of Innate Immunity.* (In the press).