

Otto Haller, M.D., Institute of Virology, Freiburg

Selected publications 1974 – 2021

Chen Y., Graf L., Chen T., Liao Q., Bai T., Petric P. P., Zhu W., Yang L., Dong J., Lu J., Chen Y., Shen J., **Haller O.**, Staeheli P., Kochs G., Wang D., Schwemmler M., Shu Y.
Rare variant MX1 alleles increase human susceptibility to zoonotic H7N9 influenza virus
Science 373(6557):918-922 (2021). doi: 10.1126/science.abg5953
[PubMed](#)

Haller O., Kochs G.
Mx Genes: host determinants controlling influenza virus infection and trans-species transmission
Hum Genet. 139:695-705 (2020) doi: 10.1007/s00439-019-02092-8
[PubMed](#)

Staeheli P, **Haller O.** Human MX2/MxB: a potent interferon-induced postentry inhibitor of herpesviruses and HIV-1.
J Virol 92:e00709-18. <https://doi.org/10.1128/JVI.00709-18>. (2018)
[PubMed](#)

Haller O., Arnheiter H, Pavlovic J, Staeheli P.
The Discovery of the Antiviral Resistance Gene Mx: A Story of Great Ideas, Great Failures, and Some Success.
Annu Rev Virol. 5:33-51 (2018)
[PubMed](#)

Deeg CM, Hassan E, Mutz P, Rheinemann L, Götz V, Magar L, Schilling M, Kallfass C, Nürnberger C, Soubies S, Kochs G, **Haller O.**, Schwemmler M, Staeheli P.
In vivo evasion of MxA by avian influenza viruses requires human signature in the viral nucleoprotein
J Exp Med. 214:1239-1248 (2017)
Transgenic mice expressing restricting factor MxA exhibit robust resistance to influenza viruses of avian but not human origin. In vivo evasion of MxA is mediated by distinct amino acids in the nucleoprotein of human influenza viruses.
[PubMed](#)

Götz V, Magar L, Dornfeld D, Giese S, Pohlmann A, Höper D, Kong B-W, Jans DA, Beer M, **Haller O.**, Schwemmler M: Influenza A viruses escape from MxA restriction at the expense of efficient nuclear vRNP import. *Sci. Rep.* 6, 23138; doi: 10.1038/srep23138 (2016).
Escape from MxA restriction is an evolutionary bottleneck for newly emerging influenza A viruses
[PubMed](#)

Haller O.
A tribute to Jean Lindenmann, co-discoverer of interferon (1924-2015).
Cytokine. 76: 113 – 115 (2015) (letter)
[PubMed](#)

Haller O.
Jean Lindenmann: from viral interference to interferon and beyond (1924-2015).
J Interferon Cytokine Res. 35 :239-241 (2015) (obituary)
[PubMed](#)

Haller, O., Staeheli P., Schwemmler M., and Kochs G:
Mx GTPases: dynamin-like antiviral machines of innate immunity
Trends in Microbiology, 23: 154-163 (2015) (review)
[PubMed](#)

Haller, O.:
Dynamins are forever: MxB inhibits HIV-1
Cell Host Microbe 14: 371-373 (2013) (preview)

[>PubMed](#)

Mänz, B., Dornfeld, D., Götz, V., Zell, R., Zimmermann, P., **Haller, O.**, Kochs, G., Schwemmler, M.:
Pandemic Influenza A Viruses Escape from Restriction by Human MxA through Adaptive Mutations in the Nucleoprotein.

PloS Pathog. e1003279 (2013)

[>PubMed](#)

Adaptive mutations in the nucleoprotein of pandemic influenza A strains were found to confer a degree of resistance to human MxA.

Mitchell, P.S., Patzina, C., Emerman, M., **Haller, O.**, Malik, H.S., Kochs, G.:

Evolution-guided identification of antiviral specificity determinants in the broadly acting interferon-induced innate immunity factor MxA.

Cell Host Microbe. 12: 598-604 (2012)

[>PubMed](#)

An evolution-guided approach revealed that the loop L4 of MxA has recurrently evolved under positive selection in primates and is the determinant of antiviral specificity for certain viruses.

Gao, S., Von der Malsburg, A., Dick, A., Faelber, K., Schröder, G.F., **Haller, O.**, Kochs, G., Daumke, O.:
Structure of myxovirus resistance protein A reveals intra- and intermolecular domain interactions required for the antiviral function.

Immunity. 35: 514-525 (2011)

[>PubMed](#)

Description of the crystal structure of the dynamin-like MxA GTPase providing insight into its antiviral action as a molecular machine. Preview by Sadler, A.J., and Williams B.R.G.: „Dynamiting viruses with MxA“, Immunity 35: 491 – 493 (2011).

Gao, S., Von der Malsburg, A., Paeschke, S., Behlke, J., **Haller, O.**, Kochs, G., Daumke, O.:

Structural basis of oligomerization in the stalk region of dynamin-like MxA

Nature. 465: 502-506 (2010)

[>PubMed](#)

First description of the architecture of a dynamin-like large GTPase oligomer.

Grimm, D., Staeheli, P., Hufbauer, M., Koerner, I., Martínez-Sobrido, L., Solórzano, A., García-Sastre, A., **Haller, O.**, Kochs, G.:

Replication fitness determines high virulence of influenza A virus in mice carrying functional Mx1 resistance gene.

Proc Natl Acad Sci USA. 104: 6806-6811 (2007).

[>PubMed](#)

Demonstration that highly pathogenic influenza viruses escape the innate host response by high speed of replication.

Kochs, G., Janzen, Ch., Hohenberg, H. & **Haller, O.**:

Antivirally active MxA protein sequesters La Crosse virus nucleocapsid protein into perinuclear complexes.

Proc Natl Acad Sci USA. 99: 3153-3158 (2002).

[>PubMed](#)

Evidence that human MxA missorts nucleocapsid proteins in infected cells.

Bouloy, M., Janzen, C., Vialat, P., Khun, H., Pavlovic, J., Huerre, M. & **Haller, O.**:

Genetic evidence for an interferon- antagonistic function of Rift Valley fever virus nonstructural protein NSs.

J. Virol. 75: 1371 – 1377 (2001).

[>PubMed](#)

First description of the interferon-antagonistic function of a nonstructural protein in bunyaviruses.

Kochs, G. & **Haller, O.**:

Interferon-induced human MxA GTPase blocks nuclear import of Thogoto virus nucleocapsids.

Proc Natl Acad Sci USA. 96: 2082-2086 (1999).

[>PubMed](#)

Evidence that human MxA recognizes viral nucleocapsids in living cells.

Arnheiter, H. & **Haller, O.:**

Antiviral state against influenza virus neutralized by microinjection of antibodies to interferon induced Mx proteins.

EMBO J. 7: 1315-1320, (1988).

[>PubMed](#)

Demonstration that the antiviral "intracellular immunity" mediated by the mouse Mx protein can be neutralized by antibodies in living cells.

Stäheli, P., **Haller, O.**, Boll, W., Lindenmann, J. & Weissmann, C.:

Mx protein: Constitutive expression in 3T3 cells transformed with cloned Mx cDNA confers selective resistance to influenza virus.

Cell. 44: 147-158 (1986).

[>PubMed](#)

Cloning of an interferon-stimulated gene with specific antiviral function with intrinsic antiviral activity. Editors' choice of The Journal of Infectious Diseases: D. R. Spriggs, "Mx Genes, Interferon, and Enlightenment", J. Inf. Dis, 154, 381-382 (1986).

Stäheli, P. & **Haller, O.:**

Interferon-induced human protein with homology to protein Mx of influenza virus resistant mice.

Mol Cell Biol. 5: 2150-2153 (1985).

[>PubMed](#)

Description of a human ortholog of mouse Mx.

Horisberger, M.A., Stäheli, P. & **Haller, O.:**

Interferon induces a unique protein in mouse cells bearing a gene for resistance to influenza virus.

Proc Natl Acad Sci USA. 80: 1910-1914 (1983).

[>PubMed](#)

Identification of the Mx protein.

Haller, O., Arnheiter, H., Lindenmann, J. & Gresser, I.:

Host gene influences sensitivity to interferon action selectively for influenza virus.

Nature. 283: 660-662 (1980).

[>PubMed](#)

Demonstration that the antiviral activity of interferon is governed in a virus-specific way by host genes (now called ISGs, for interferon-stimulated genes). Comment by Akiko Iwasaki in Nat Rev Immunol 16: 339 (2016) doi: 10.1038/nri.2016.44

Haller, O., Arnheiter, H., Gresser, I. & Lindenmann, J.:

Genetically determined, interferon-dependent resistance to influenza virus in mice.

J Exp Med. 149: 601-612 (1979).

[>PubMed](#)

Demonstration that Mx-mediated resistance to influenza viruses depends on interferon.

Haller, O., Hansson, M., Kiessling, R. & Wigzell, H.:

Role of non-conventional, natural killer cells in resistance against syngeneic tumor cells in vivo.

Nature. 270: 609-611 (1977).

[>PubMed](#)

Evidence for a role of NK cells in suppressing tumor cell growth in vivo. Editorial by R. W. Baldwin "Immune surveillance revisited", Nature, 270, 557 (1977).

Haller, O., Kiessling, R., Oern, A. & Wigzell, H.:

Generation of natural killer cells: An autonomous function of the bone marrow.

J Exp Med. 145: 1411-1416 (1977).

[>PubMed](#)

Evidence that Natural Killer (NK) cells originate from bone marrow precursor cells.

Haller, O. & Lindenmann, J.:

Athymic (nude) mice express gene for myxovirus resistance.

Nature. 250: 679-680 (1974).

[>PubMed](#)

Experimental evidence showing that (i) Mx resistance to influenza virus is intact in the immunocompromised host and that (ii) the IgG response against the viral hemagglutinin depends on T cell help.