

## Curriculum Vitae

### Name & Address

**Birgit Strobl** – *University Assistant*

*Current Position: Group Leader Department of Biomedical Sciences at Vetmeduni Vienna*

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### Main Research Interests

Our major interest is the Janus kinase (JAK)/ signal transducer and activator (STAT) signaling cascade and its role in health and disease. We are particularly interested in the JAK/STAT family members tyrosine kinase 2 (TYK2) and STAT1 and how they regulate tissue homeostasis, immune cell activation and plasticity, inflammation (endotoxemia, *E. coli*-induced peritonitis, ConA-induced hepatitis, allergic skin inflammation), the immune defence against infections (*Listeria monocytogenes*, *Citrobacter rodentium*, *Salmonella typhimurium*, murine cytomegalovirus (MCMV), encephalomyocarditis virus (EMCV), vesicular stomatitis virus (VSV)) and tumour immune surveillance (transplant models). We use transgenic mice to study signaling networks *in vivo* and analyse molecular mechanisms of signal transduction and transcriptional control in primary cells. Currently, we are using knockin and conditional knockout mice to (a) decipher kinase-dependent and -independent functions of TYK2 (b) characterize cell type-specific functions of TYK2 (macrophages, dendritic cells, NK cells, T cells), (c) analyse the role of STAT1 in macrophages during viral infections, (d) determine transcriptional activities of the individual STAT1 isoforms (STAT1 $\alpha$  and STAT1 $\beta$ ) and (e) dissect the role of STAT1 $\alpha$  and STAT1 $\beta$  in the immune defence *in vivo*.

### Scientific Education & Career History

since 2012	Principle Investigator, Univ. Ass., Institute of Animal Breeding and Genetics, University of Veterinary Medicine Vienna
since 2005	Univ. Ass., Institute of Animal Breeding and Genetics, University of Veterinary Medicine Vienna
2002 - 2005	PI junior group (FWF-funded, stand-alone project) at the Institute of Animal Breeding and Genetics, University of Veterinary Medicine Vienna, Austria
2001	Postdoctoral fellow at the Institute of Animal Breeding and Genetics, University of Veterinary Medicine Vienna, Austria
1999 - 2001	Postdoctoral fellow at the Imperial Cancer Research Fund (now Cancer Research UK), London UK
1998	Postdoctoral fellow at the Institute of Molecular Biology, Austrian Academy of Sciences, Salzburg, Austria
1993 – 1997	Doctoral thesis at the Institute of Molecular Biology, Austrian Academy of Sciences, Salzburg, Austria
1986 – 1992	Study of Biology (Genetics) at the University of Vienna, Vienna, Austria

### Experience in Scientific Management and Organization & Student Supervision

Since 2006	Supervision & training of <b>4 Diploma/Masters (M.Sc.) &amp; 7 PhD students</b>
2010	Scientific Advisory Board member, FEBS Special Meeting on Jak-Stat Signalling: from Basics to Disease, Vienna, Austria
2014	Local organizing committee 28 <sup>th</sup> Annual Conference of the European Macrophages and Dendritic Cell Society (EMDS), Vienna, Austria

2017 Local organizing committee Annual Meeting of the ÖGAI (Austrian Society for Allergology and Immunology), Vienna, Austria

### **Supervision of Doctoral (PhD) Thesis Students** (past five years – 7 since 2005)

**Christian Semper**–PhD Student – 2007 – 2012

"Analysis of mouse models to dissect the role of STAT1 isoforms and kinase-independent functions of TYK2"

**Agnieszka Witalisz-Siepracka**–PhD Student - 2012 – 2016

"The function of the Janus kinase TYK2 in tumorigenesis"

**Matthias Parrini**- PhD Student - 2012 – [ongoing](#)

"STAT1 isoforms in transcriptional control"

**Andrea Pölzl** –PhD Student – 2014 - [ongoing](#)

"TYK2 in the innate immune response during sepsis"

**Dominika Gogova** –PhD Student– 2015 - [ongoing](#)

"Cell type-specific functions of TYK2"

### **Invited Conference Lectures** (5 recent selected)

- 2017 - Invited Speaker at the 2<sup>nd</sup> International Conference on Cytokine Signaling in Cancer, Aegean Conferences, Heraklion, Greece
- 2016 - Invited Speaker at the 26<sup>th</sup> Translational Conference of the Center of Chronic Immunodeficiency, Freiburg, Germany
- 2016 - Invited Speaker at the Meeting of the 10<sup>th</sup> Anniversary of Center for Proteomics, Rijeka, Croatia
- 2016 - Invited Speaker at the 1<sup>st</sup> Splicing Conference, Caparica, Portugal
- 2015 - Invited Speaker at the 1<sup>st</sup> International Conference on Cytokine Signaling in Cancer, Aegean Conferences, Chania, Greece
- 2014 - Invited Speaker Joint Symposium between Taiwan-Austria Research Community, Taipei, Taiwan

### **Member of Reviewing Panels, Editorial Boards, Scientific Organizations:**

since 2010 Member of the European Macrophage and Dendritic Cell Society (EMDS)

since 2014 Review Editor for Frontiers in Microbial Immunology

2017-2019 Board member ÖGAI (Austrian Society for Allergology and Immunology)

### **Most Important Research Funding**

- 2013 – 2017, FWF– Tyk2 in the innate immune response during sepsis - 346 k€
- 2013 – 2017, FWF-SFB F28 – Special research programme 'Jak-Stat Signalling: From Basics to Disease; [www.jak-stat.at](http://www.jak-stat.at); Subproject - 369 k€

### **Key International Collaborators** (selection of 5 with joint publications)

- **Andrew Larner** Virginia Commonwealth University, USA - [andrew.larner@vcuhealth.org](mailto:andrew.larner@vcuhealth.org)
- **Klaus Pfeffer** University of Düsseldorf, GER - [klaus.pfeffer@hhu.de](mailto:klaus.pfeffer@hhu.de)
- **Peter Staehli** Universitätsklinikum Freiburg, GER - [peter.staeheli@uniklinik-freiburg.de](mailto:peter.staeheli@uniklinik-freiburg.de)
- **Stipan Jonjic** Medical Faculty of Rijeka, CRO - [stipan.jonjic@medri.uniri.hr](mailto:stipan.jonjic@medri.uniri.hr)
- **Peter Ghazal** University of Edinburgh, UK - [pghazal@staffmail.ed.ac.uk](mailto:pghazal@staffmail.ed.ac.uk)

## List of Publications (2012 - 2016)

Overall, **60 original publications**, 6 peer-reviewed reviews and 1 editorial. The cumulative impact factor of all publications is **401**. Based on *Google Scholar*, publications received more than **2200** citations, with a current life-time Hirsch **h Index** of **25**.

Since 2012, **29 original peer-reviewed** papers, 2 peer-reviewed reviews and 1 editorial.

1. Raje V, Derecka M, Cantwell M, Meier J, Szczepanek K, Sisler JD, **Strobl B**, Gamero A, Harris TE, Lerner AC. (2016). Kinase inactive Tyrosine kinase (Tyk2) Supports Differentiation of Brown fat Cells. **Endocrinology**. Nov 1:en20152048. [Epub ahead of print]
2. Maier BB, Hladik A, Lakovits K, Korosec A, Martins R, Kral JB, Mesteri I, **Strobl B**, Müller M, Kalinke U, Merad M, Knapp S. (2016). Type I interferon promotes alveolar epithelial type II cell survival during pulmonary *Streptococcus pneumoniae* infection and sterile lung injury in mice. **Eur J Immunol**. 46(9):2175-86. doi: 10.1002/eji.201546201.
3. Floss DM, Klöcker T, Schröder J, Lamertz L, Mrotzek S, **Strobl B**, Hermanns H, Scheller J. (2016). Defining the functional binding sites of interleukin 12 receptor  $\beta$ 1 and interleukin 23 receptor to Janus kinases. **Mol Biol Cell**. 27(14):2301-16. doi: 10.1091/mbc.E14-12-1645.
4. Castiglia, V., Piersigilli, A., Ebner, F., Janos, M., Goldmann, O., Damböck, U., Kröger, A., Weiss, S., Knapp, S., Jamieson, A., Kirschnig, C., Kalinke, U., **Strobl, B.**, Müller, M., Stoiber, D., Lienenklaus, S., and Kovarik, P. (2016). Type I Interferon Signaling Prevents Lethal Systemic IL-1 Signaling-Driven Hyperinflammation during Invasive Bacterial Infection of Soft Tissue. **Cell Host Microbe** 19, 375-387. DOI: 10.1016/j.chom.2016.02.003.
5. Gotthardt, D., Putz, E.M., Grundschober, E., Prchal-Murphy, M., Straka, E., Kudweis, P., Heller, G., Bago-Horvath, Z., Witalisz-Siepracka, A., Kumaraswamy, A.A., Gunning, P.T., **Strobl, B.**, Müller, M., Moriggl, R., Stockmann, C., and Sexl, V. (2016). STAT5 is a key regulator in NK cells and acts as molecular switch from tumor surveillance to tumor promotion. **Cancer Discov** 6, 414-429. DOI:10.1158/2159-8290.CD-15-0732
6. Hainzl, E., Stockinger, S., Rauch, I., Heider, S., Berry, D., Lassnig, C., Schwab, C., Rosebrock, F., Milinovich, G., Schleder, M., Wagner, M., Schleper, C., Loy, A., Urich, T., Kenner, L., Han, X., Decker, T., **Strobl, B.**, and Müller, M. (2015). Intestinal epithelial cell tyrosine kinase 2 transduces interleukin-22 signals to protect from acute colitis. **J Immunol** 195, 5011-5024. doi: 10.4049/jimmunol.1402565
7. Leitner, N.R., Witalisz-Siepracka, A., **Strobl, B.**, and Müller, M. (2015). Tyrosine kinase 2 - surveillant of tumours and bona fide oncogene. **Cytokine** 2015 Nov 26. pii: S1043-4666(15)30086-7. DOI: 10.1016/j.cyto.2015.10.015. [review]
8. Meissl, K., Macho-Maschler, S., Müller, M., and **Strobl, B.** (2015). The good, the bad and the unknown faces of STAT1 in carcinogenesis. **Cytokine** 2015 Nov 26. pii: S1043-4666(15)30099-5. DOI: 10.1016/j.cyto.2015.11.011 [review]
9. Prchal-Murphy, M., Witalisz-Siepracka, A., Bednarik, K.T., Putz, E.M., Gotthardt, D., Meissl, K., Sexl, V., Müller, M., and **Strobl, B.** (2015). In vivo tumor surveillance by NK cells requires TYK2 but not TYK2 kinase activity. **Oncoimmunology** 4:11, e1047579. DOI: 10.1080/2162402X.2015.1047579
10. Rauch, I., Rosebrock, F., Hainzl, E., Heider, S., Majoros, A., Wienerroither, S., **Strobl, B.**, Stockinger, S., Kenner, L., Müller, M., and Decker, T. (2015). Non canonical effects of IRF9 in intestinal inflammation: more than type I and type III interferons. **Mol Cell Biol** 35, 2332-2343. DOI: 10.1128/MCB.01498-14
11. Wienerroither, S., Shukla, P., Farlik, M., Majoros, A., Stych, B., Vogl, C., Cheon, H., Stark, G.R., **Strobl, B.**, Müller, M., and Decker, T. (2015). Cooperative transcriptional activation of antimicrobial genes by STAT and NF $\kappa$ B pathways through concerted recruitment of the mediator complex. **Cell Rep** 12, 300-312. DOI: 10.1016/j.celrep.2015.06.021
12. Wiesauer, I., Gaumannmüller, C., Steinparzer, I., **Strobl, B.** and Kovarik, P. (2015). Promoter occupancy of STAT1 in interferon responses is regulated by processive transcription. **Mol Cell Biol** 35, 716-27. DOI: 10.1128/MCB.01097-14

13. Pathria, P., Gotthardt, D., Prchal-Murphy, M., Putz, E.M., Holcman, M., Schleder, M., Grabner, B., Crncec, I., Svinka, J., Musteanu, M., Hoffmann, T., Filipits, M., Berger, W., Poli, V., Kenner, L., Bilban, M., Casanova, E., Müller, M., **Strobl, B.**, Bayer, E., Mohr, T., Sexl, V., and Eferl, R. (2015). Myeloid STAT3 promotes formation of colitis-associated colorectal cancer in mice. **Oncoimmunology** 4, e998529. DOI: 10.1080/2162402X.2014.998529
14. Bauer, E., Witalisz, A., **Strobl, B.** and Stoiber, D. (2015). Methods to study tumor surveillance using tumor cell transplantation into genetically engineered mice. **Methods Mol Biol**, 1267, 439-456 [review]. DOI: 10.1007/978-1-4939-2297-0\_22
15. Bosmann, M., Russkamp, N.F., **Strobl, B.**, Roewe, J., Balouzian, L., Pache, F., Radsak, M.P., van Rooijen, N., Zetoune, F.S., Sarma, J.V., Núñez, G., Müller, M., Murray, P.J., and Ward, P.A. (2014). Interruption of macrophage-derived IL-27(p28) production by IL-10 during sepsis requires STAT3 but not SOCS3. **J Immunol** 193, 5668-5677. DOI: 10.4049/jimmunol.1302280
16. Bosmann, M., **Strobl, B.**, Kichler, N., Pache, F., Murray, P.J., Müller, M., and Ward, P.A. (2014). Tyrosine kinase 2 promotes sepsis-associated lethality by facilitating production of interleukin-27. **J Leukoc Biol** 96, 123-131. DOI: 10.1189/jlb.3A1013-541R
17. Gotthardt, D., Putz, E.M., Straka, E., Kudweis, P., Baggio, M., Poli, V., **Strobl, B.**, Müller, M., and Sexl, V. (2014). Loss of STAT3 in murine NK cells enhances NK cell-dependent tumor surveillance. **Blood** 124, 2370-2379. DOI: 10.1182/blood-2014-03-564450
18. Keil, E., Finkenstädt, D., Wufka, C., Trilling, M., Liebfried, P., **Strobl, B.**, Müller, M., and Pfeffer, K. (2014). Important scaffold function of the Janus kinase 2 uncovered by a novel mouse model harboring a Jak2 activation loop mutation. **Blood** 123, 520-529. DOI: 10.1182/blood-2013-03-492157
19. Leitner, N.R., Lassnig, C., Rom, R., Heider, S., Bago-Horvath, Z., Eferl, R., Müller, S., Kolbe, T., Kenner, L., Rüllicke, T., **Strobl, B.**, and Müller, M. (2014). Inducible, dose-adjustable and time-restricted reconstitution of Stat1 deficiency in vivo. **PLoS One** 29, e86608. DOI: 10.1371/journal.pone.0086608
20. Liehl, P., Zuzarte-Luís, V., Chan, J., Zillinger, T., Baptista, F., Carapau, D., Konert, M., Hanson, K.K., Carret, C., Lassnig, C., Müller, M., Kalinke, U., Saeed, M., Ferreira Chora, A., Golenbock, D.T., **Strobl, B.**, Prudencio, M., Coelho, L.P., Kappe, S.H., Superti-Furga, J., Pichlmair, A., Vigário, A.M., Rice, C.M., Fitzgerald, K.A., Barchert, W., and Mota, M.M. (2014). Host-cell sensors for Plasmodium activate innate immunity against liver-stage infection. **Nat Med** 20, 47-53. DOI: 10.1038/nm.3424
21. Rauch, I., Hainzl, E., Rosebrock, F., Heider, S., Schwab, C., Berry, D., Stoiber, D., Wagner, M., Schleper, C., Loy, A., Urich, T., Müller, M., **Strobl, B.**, Kenner, L., and Decker, T. (2014). Type I interferons have opposing effects during the emergence and recovery phases of colitis. **Eur J Immunol** 44, 2749-2760. DOI: 10.1002/eji.201344401
22. Schwab, C., Berry, D., Rauch, I., Rennisch, I., Ramesmayer, J., Hainzl, E., Heider, S., Decker, T., Kenner, L., Müller, M., **Strobl, B.**, Wagner, M., Schleper, C., Loy, A., and Urich, T. (2014). Longitudinal study of murine microbiota activity and interactions with the host during acute inflammation and recovery. **ISME J** 8, 1101-1114. DOI: 10.1038/ismej.2013.223
23. **Strobl, B.** and Moriggl, R. (2014). Recovery from chemotherapy depends on STAT1 for replenishment of B lymphopoiesis. **J Leukoc Biol** 95, 849-851. [Editorial]. DOI: 10.1189/jlb.0114051
24. Semper, C., Leitner, N.R., Lassnig, C., Parrini, M., Mahlakoiv, T., Rammerstorfer, M., Lorenz, K., Rigler, D., Müller, S., Kolbe, T., Vogl, C., Rüllicke, T., Staeheli, P., Decker, T., Müller, M., and **Strobl, B.** (2014). STAT1 $\beta$  is not dominant negative and is capable of contributing to IFN $\gamma$ -dependent innate immunity. **Mol Cell Biol** 34, 2235-2248. DOI: 10.1128/MCB.00295-14
25. Vielnascher, R.M., Hainzl, E., Leitner, N.R., Rammerstorfer, M., Popp, D., Witalisz, A., Rom, R., Karaghiosoff, M., Kolbe, T., Müller, S., Rüllicke, T., Lassnig, C., **Strobl, B.**, and

Müller, M. (2014). Conditional ablation of TYK2 in immunity to viral infection and tumor surveillance. **Transgenic Res** 23, 519-529. DOI: 10.1007/s11248-014-9795-y

26. Bancerek, J., Poss, Z.C., Steinparzer, I., Sedlyarov, V., Pfaffenwimmer, T., Mikulic, I., Dölken, L., **Strobl, B.**, Müller, M., Taatjes, D.J., and Kovarik, P. (2013). CDK8 kinase phosphorylates transcription factor STAT1 to selectively regulate the interferon response. **Immunity** 38, 250-262. DOI: 10.1016/j.immuni.2012.10.017

27. Warszawska, J.M., Gawish, R., Sharif, O., Sigel, S., Doninger, B., Lakovits, K., Mesteri, I., Nairz, M., Boon, L., Spiel, A., Fuhrmann, V., **Strobl, B.**, Müller, M., Schenk, P., Weiss, G., and Knapp, S. (2013). Lipocalin-2 deactivates macrophages via induction of IL-10 and impairs outcome during pneumococcal pneumonia. **J Clin Invest** 123, 3363-3372. DOI: 10.1172/JCI67911

28. Berry, D., Schwab, C., Milinovich, G., Reichert, J., Mahfoudh, K.B., Decker, T., Engel, M., Hai, B., Hainzl, E., Heider, S., Kenner, L., Müller, M., Rauch, I., **Strobl, B.**, Wagner, M., Schleper, C., Urich, T., and Loy, A. (2012). Phylotype-level 16S rRNA analysis reveals new bacterial indicators of health state in acute murine colitis. **ISME J** 6, 2091-2106. DOI: 10.1038/ismej.2012.39

29. Kernbauer, L., Maier, V., Stoiber, D., **Strobl, B.**, Schneckenleithner, C., Sexl, V., Reichart, U., Kalinke, U., Reizis, B., Jamieson, A., Müller, M., and Decker, T. (2012). Conditional Stat1 ablation reveals the importance of interferon signaling for immunity to *Listeria monocytogenes* infection. **PLoS Pathog** 8, e1002763. DOI: 10.1371/journal.ppat.1002763

30. Derecka, M., Gornicka, A., Koralov, S. B., Szczepanek, K., Morgan, M., Raje, V., Sisler, J., Zhang, Q., Otero, D., Cichy, J., Rajewsky, K., Shimoda, K., Poli, V., **Strobl, B.**, Pellegrini, S., Harris, T. E., Seale, P., Russell, A. P., McAinch, A. J., O'Brien, P. E., Keller, S. R., Croniger, C. M., Kordula, T. and Larner, A. C. (2012). Tyk2 and Stat3 regulate brown adipose tissue differentiation and obesity. **Cell Metab** 16, 814-824. DOI: 10.1016/j.cmet.2012.11.005

31. Mizutani, T., Neugebauer, N., Putz, E.M., Moritz, N., Simma, O., Zebedin-Brandl, E., Gotthardt, D., Warsch, W., Eckelhart, E., Kantner, H.-P., Kalinke, U., Lienenklaus, S., Weiss, S., **Strobl, B.**, Müller, M., Sexl, V., and Stoiber, D. (2012). Conditional and IFNAR1 ablation reveals distinct requirements of type I IFN signaling for NK cell maturation tumor surveillance. **Oncoimmunology** 1, 1027-1037. DOI: 10.4161/onci.21284

32. Prchal-Murphy, M., Semper, C., Lassnig, C., Wallner, B., Gausterer, C., Teppner-Klymiuk, I., Kobolak, J., Müller, S., Kolbe, T., Karaghiosoff, M., Dinnyes, A., Rüllicke, T., Leitner, N.R., **Strobl, B.**, and Müller, M. (2012). TYK2 Kinase Activity Is Required for Functional Type I Interferon Responses In Vivo. **PLoS One** 7, e39141. DOI: 10.1371/journal.pone.0039141

## 10 Most Important Career Publications (only as first or corresponding author)

1. Prchal-Murphy, M., Witalisz-Siepracka, A., Bednarik, K.T., Putz, E.M., Gotthardt, D., Meissl, K., Sexl, V., Müller, M., and **Strobl, B.** (2015). In vivo tumor surveillance by NK cells requires TYK2 but not TYK2 kinase activity. **Oncoimmunology**, 4:11, e1047579. DOI: 10.1080/2162402X.2015.1047579

2. Semper, C., Leitner, N.R., Lassnig, C., Parrini, M., Mahlakoiv, T., Rammerstorfer, M., Lorenz, K., Rigler, D., Müller, S., Kolbe, T., Vogl, C., Rüllicke, T., Staeheli, P., Decker, T., Müller, M., and **Strobl, B.** (2014). STAT1 $\beta$  is not dominant negative and is capable of contributing to IFN $\gamma$ -dependent innate immunity. **Mol Cell Biol** 34, 2235-2248. DOI: 10.1128/MCB.00295-14

3. Grunert, T., Leitner, N. R., Marchetti-Deschmann, M. Miller, I., Wallner, B., Radwan, M., Vogl, C., Kolbe, T., Kratky, D., Gemeiner, M., Allmaier, G., Muller, M. **Strobl, B.** (2011). A comparative proteome analysis links tyrosine kinase 2 (Tyk2) to the regulation of cellular glucose and lipid metabolism in response to poly(I:C). **J Proteomics** 74 (12), 2866-2880.

4. **Strobl, B.**, D. Stoiber, V. Sexl, and M. Mueller. 2011. Tyrosine kinase 2 (TYK2) in cytokine signalling and host immunity. **Front Biosci** (Landmark Ed) 16: 3214-3232. *review*
5. Radwan, M., Stiefvater, R., Grunert, T., Sharif, O., Miller, I., Marchetti-Deschmann, M., Allmaier, G., Gemeiner, M., Knapp, S., Kovarik, P., Müller, M. and **Strobl, B.** (2010). Tyrosine kinase 2 controls interleukin-1b production at the translational level. **J Immunol** 185, 3544-3553. DOI: 10.4049/jimmunol.0904000
6. Hofmann, E., Reichart, U., Gausterer, C., Guelly, C., Meijer, D., Muller, M., Strobl, B. (2010). Octamer-binding factor 6 (Oct-6/Pou3f1) is induced by interferon and contributes to dsRNA-mediated transcriptional responses. **BMC Cell Biol** 11, 61
7. Radwan, M., Miller, I., Grunert, T., Marchetti-Deschmann, M., Vogl, C., O'Donoghue, N., Dunn, M. J., Kolbe, T., Allmaier, G., Gemeiner, M., Muller, M., **Strobl, B.** (2008). **Proteomics** 8 (17), 3469-3485.
8. **Strobl, B.**, Bubic, I., Bruns, U., Steinborn, R., Lajko, R., Kolbe, T., Karaghiosoff, M., Kalinke, U., Jonjic, S., Müller, M. (2005). Novel functions of Tyk2 in the antiviral defense against murine cytomegalovirus. **J. Immunol.** 175, 4000-4008. DOI: 10.4049/jimmunol.175.6.4000.
9. Costa-Pereira, A. P.\*, Tininini, S\*., **Strobl, B\*.**, Alonzi, T., Schlaak, J. F., Is'harc, H., Gesualdo, I., Newman, S. J., Kerr, I. M., Poli, V. (2002). Mutational switch of an IL-6 response to an interferon-gamma-like response. **Proc Natl Acad Sci U S A** 99 (12), 8043-8047. *\* equal contribution*
10. **Strobl, B.**, Arulampalam, V., Is'harc, H., Newman, S. J., Schlaak, J. F., Watling, D., Costa-Pereira, A. P., Schaper, F., Behrmann, I., Sheehan, K. C., Schreiber, R. D., Horn, F., Heinrich, P. C. and Kerr, I. M. (2001). A completely foreign receptor can mediate an interferon-gamma-like response. **EMBO J** 20, 5431-5442. DOI: 10.1093/emboj/20.19.5431.