Dr Matthias Soller PhD

Lecturer

School of Biosciences (/schools/biosciences/index.aspx)

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About

My prime research interest is how the information encoded in chromosomes instructs building of the most complex organ, the brain, and allows an organism to perform elaborate tasks.

Qualifications

Diploma (University of Zurich, Switzerland)

PhD, with distinction (University of Zurich, Switzerland)

Biography

Fascinated by the elaborate interactions of a hymenopteran parasite and its symbiontic virus with its lepidopteran host, I did my Diploma thesis in the laboratory of Beatrice Lanzrein at the University of Berne, Switzerland and showed that the virus induces developmental arrest of the host. To learn about genes and behaviour, I started my PhD thesis in the laboratory of Eric Kubli at the University of Zurich, to study the molecular and cellular mechanisms how male-derived sex-peptide alters reproductive physiology and behaviour of Drosophila females.

Inspired by the emerging view that post-transcriptional regulation of gene expression is to bring about the molecular diversity to the brain to parallel its complexity, I then moved on to a Post-Doc in Kalpana White's laboratory at Brandeis University in Boston, USA to start working on RNA binding ELAV proteins in a Drosophila model of alternative splicing regulation in axon guidance, synaptic plasticity and neuronal degeneration.

In 2006, I moved to Birmingham, UK to continue studying post-transcriptional control of gene-expression in the brain, adaptive immunity and cancer as well as in the regulation of behaviour

Teaching

My teaching expertise is in Genetics and Molecular Biology covering e.g. topics of post-transcriptional regulation of gene expression (BIO325), the genetic basis of behavior (BIO394), functional genomics (MSc BIOM08, including module organizer), cytogenetics (BIO384) and the use of Molecular Biology techniques and Drosophila as a model organism (BIO268, BIO230, MSc Res and MSc Tox).

Postgraduate supervision

For a list of possible PhD projects offered by Dr Soller **www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Soller (http://www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Soller)**

Research

Research Theme within School of Biosciences: **Molecular Cell Biology and Signalling (/research/activity/molecular-cell-biology-signalling/index.aspx)**

Lab website address: http://www.biosciences-labs.bham.ac.uk/soller/ (http://www.biosciences-labs.bham.ac.uk/soller/)

Short research description

Alternative mRNA processing in neurons

Full research description

Post-transcriptional control of gene expression in neuronal development and function

Post-transcriptional regulation of gene expression is a major mechanism to generate organismal complexity from a limited number of genes. Particularly impressing is the large number of genes that are alternatively spliced; and this type of gene regulation is most prevalently found in the brain. Miss-regulation of pre-mRNA processing, including alternative splicing, as a result of genetic polymorphisms or of toxicity from small molecules, results in numerous brain diseases and neurological disorders. Our laboratory investigates mechanisms of alternative pre-mRNA processing in neurons. In particular, we examine how RNA binding proteins decode the degenerate sequence information present in short and spaced regulatory elements of pre-mRNA to generate high fidelity in gene-specific regulation.

We are using the sophisticated genetic tools of the fruit fly *Drosophila* in combination with chemical genetics to study alternative pre-mRNA processing. One of our favorite molecules is the neuronal splicing regulator ELAV. ELAV is the founding member of a family of RNA binding proteins and is a homologue of human Hu proteins. The activity of ELAV/Hu family proteins is tightly regulated and aberrant regulation results in neurological phenotypes. We aim to understand the mechanisms used by ELAV/Hu family proteins to generate gene-specificity in alternative pre-mRNA processing and how the activity of ELAVHu family proteins is regulated by cellular

siginalling. At the organismal level, we are studying the cellular mechanisms regulated by ELAV/Hu family proteins and how ELAV/Hu family proteins impact on neuronal development and function in health and disease.

Other activities

Member of the Genetics, RNA and Developmental Biology Societies.

Publications

RNA processing

Zaharieva, E., Chipman, K, and Soller, M. (2012) Alternative splicing interference by xenobiotics. Toxicology. 296: 1-12.

Hemani, Y. and Soller, M. (2012) Mechanisms of Drosophila Dscam mutually exclusive splicing regulation. Biochem. Soc. Trans. 40: 804-9.

Haussmann, I. U., Li, M. and Soller, M. (2011). ELAV mediated 3'-end processing of *ewg* transcripts is evolutionary conserved despite sequence degeneration of the ELAV binding site. Genetics. 189: 97-107.

Soller, M., Li, M. and Haussmann, I.U. (2010). Determinants of ELAV gene-specific regulation. Biochem. Soc. Trans. 38: 1122-4.

Soller, M.,Li, M. and Haussmann, I.U. (2008). Regulation of the ELAV target ewg: insights from an evolutionary perspective. Biochem. Soc. Trans. 36: 502-504.

Soller, M. (2006). Pre-messengerRNA processing and its regulation: A genomic perspective. Cell. Mol. Life Sci. 63: 796-819.

Soller, M. and White, K. (2005). ELAV multimerizes on conserved AU4-6 motifs important for ewg splicing regulation. Mol. Cell. Biol. 25: 7580-7591.

Soller, M. and White, K. (2004). ELAV. Curr. Biol. 14: R53.

Soller, M. and White, K. (2003). ELAV inhibits 3' end formation to promote splicing of ewg pre-mRNA. GenesDev. 17: 2526-2538.

Neuronal development and function

Haussmann, I. U., Hemani, Y., Wjiesekera, T., Dauwalder, B. and Soller, M. (2013) Multiple pathways mediate the sex-peptide-regulated switch in female Drosophila reproductive behaviors. Proceedings of the Royal Society B 280: 20131938.

Haussmann, I.U. and Soller, M. (2010). Differential activity of EWG transcription factor isoforms identifies a subset of differentially regulated genes important for synaptic growth regulation. Dev. Biol. 348: 224-230. Cover story.

Haussmann, I. U. , White, K. and Soller, M. (2008). Erect wing regulates synaptic growth in Drosophila by integration of multiple signaling pathways. Genome Biol. 9: 73.1-17. Cover story.

Soller, M., Haussmann, I. U., Hollmann, M., Choffat, Y., White, K., Kubli, E. and Schäfer, M. A. (2006). Sex-peptide-regulated female sexual behavior requires a subset of ascending ventral nerve cord neurons. Curr. Biol. 16: 1771-1782.

Fan, Y., Soller, M., Flister, S, Hollmann, M., Müller, M., Bello, B., Egger, B., White, K., Schäfer, M. A. and Reichert, H. (2005). The egghead gene is required for compartmentalization in Drosophila optic lobe development. Dev. Biol. 287: 61-73.

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