

Plenary workshop 1 | Development

Tuesday 20 March, 14.30-16 | Chair: P. Blader

What I propose is a 10 minute talk, 1 minute summary and 2 minutes of questions. My idea is to transmit the science we are doing in the field but also the “how it was done” if you will, with the summary aimed at highlighting the approaches used and whether it might have been easier to do the work if there were community tools or better protocols available. If we manage to stay to time, then this format will leave about 10-15 minutes at the end of the session for the audience to complement our summaries.

Plenary workshop 2 | (Epi)Genome and transcriptional regulation

Wednesday 21 March, 9.00-10.30 | Chair: N. Vastenhouw

The aim of this workshop is to obtain an overview of the work done in the area of transcription regulation, chromatin structure, and nuclear organization. There will be 6 regular talks invited from the submitted abstracts. All talks will be 12 minutes, followed by 3 minutes discussion.

Nadine Vastenhouw: Transcription establishes microenvironments that organize euchromatin

Ferenc Mueller: In vivo imaging of native gene transcription reveals the cell cycle coordination of the first wave of zygotic gene activity before global activation of the zygotic genome

René F. Ketting: Zygotic activation of the zebrafish piRNA pathway in primordial germ cells

Yun-Jin Jiang: Udu/GON4L is involved in DNA Replication by Regulating CDC6 Expression and Participating in Pre-replication Complex Formation

Charles G. Sagerström: TALE Factors Control an Embryonic Gene Expression Program using Distinct Functional Modes at Early versus Late Developmental Stages

Juan Ramón Martínez Morales: cis-regulatory logic of Shh expression reveals common history of unpaired and paired fins

Plenary workshop 3 | TECH-SHOP: GENETIC ENGINEERING, SCREENING AND PLATFORMS.

Wednesday 21 March, 11.00-12.30 | Chair: C. Mosimann

In this workshop, the presenters will provide a broad update on currently applied genetic methods, screening approaches, and platforms available to the community. The speakers will discuss diverse topics that should act as appetizers for subsequent discussion and method priming for the other workshops.

EUFishBioMed General Assembly

Wednesday 21 March, 14.30-15.00 | Chair: U. Strahle

In the assembly of the EUFishBioMed Society we will report on the activities and financial situation of the Society. We will elect steering and managing board members and discuss future activities of the Society including a scientific meeting next year to possibly hold our assembly on European ground as a part of an interesting scientific event.

Concurrent workshop 1 | Morphogenesis

Wednesday 21 March, 15.00-16.30 | Chair: C. Norden

Welcome remarks Caren (3min)

Talks to raise workshop questions (5-7min each)

Steffen Scholpp: Imaging morphogenesis, recent advances and challenges

Marie Breau: Mapping forces in time and space in the developing zebrafish embryo, what do we need, what can we learn?

Cristina Pujades: Understanding spatio-temporal cell specification and differentiation alongside morphogenesis

Gil Levkowitz: Challenges and opportunities in the study of neurovascular development

Steve Wilson: How do early phenotypes disappear at later developmental stages? Roads to understand developmental robustness...

(Lucia Poggi: Benefits and downsides of using zebrafish to model human retinal disease)
(Lucia might have to teach, and will decide ad hoc if she can make it)

Caren Norden: Organoids as model tissue: opportunity, threat, hoax or all of the above for zebrafish research?

Community discussion on the diverse topics.

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Concurrent workshop 2 | Metabolism

Wednesday 21 March, 15.00-16.30 | Chair: P. Gut

Part 1: Talks (7min each – 45min)

Concurrent workshop 2 Room B

METABOLISM. Chair: P. Gut

15.00 - 16.30	Herman P. Spaink: The advantages of zebrafish larvae for system metabolomics
	Thomas Dickmeis: Differential rescue of metabolic alterations in a zebrafish model of adrenal insufficiency by glucocorticoid treatment
	Philipp Gut: Exercise biology in zebrafish
	Nikolay Ninov: Modelling beta-cell inflammation in zebrafish identifies a natural product for human beta-cell protection
	Yi Feng: Live imaging studies of metabolic change in pre-neoplastic cells and the host inflammation response in a zebrafish tumour initiation model
	Massimo Santoro: Zebrafish as model system to study metabolism and metabolic pathways

Part 2: Community discussion (45min)

During the community session we would like to reflect on various topics:

- Nano-scaling: how to achieve tissue resolution in larvae. Can we downscale physiology? Do we need to?
- Making the transition: what are the limits of the larval model for physiology, and when should one transition to experiments in adult zebrafish (or other experimental models, such as rodents)
- Studying energy metabolism in adult zebrafish. New developments, opportunities and limitations

Concurrent workshop 4 | LR Asymmetry & cilia

Wednesday 21 March, 15.00-16.30 | Chair: S. Lopes

The aim of this workshop is to discuss recent advances in left-right development from the early breaking of symmetry to the establishment of internal organ asymmetry. Some talks will focus on neural asymmetries and how fluid flow affects sensory organs. Other short talks will focus on new players in the nodal signaling and LR in general.

A 45 minute discussion session will happen in the end of the talks.

Suggested topics:

- **Ciliary calcium relevance in left-right**
- **Mechanosensation versus chemosensation**
- **Right-sided lateral plate mesoderm cascades**
- **Brain asymmetries and behavior**
- **Tools for the specific manipulation of intra- or extra-ciliary protein function**
- **Tools to monitor and manipulate the presence and function of the cilium**

Talks will last for 7 minutes

Susana S. Lopes: Dand5 and Nicalin1: two Nodal signalling inhibitors compared de novo in the Left-Right context

Maximilian Fürthauer: Myosin1D is an evolutionarily conserved determinant of animal Left/Right asymmetry.

Thomas Papamarcaki: The function of SET/I2PP2A in ciliogenesis; lessons from the zebrafish

Nathalie Jurisch-Yaksi: The function of motile-cilia driven flow in the nervous system

Matthias Carl: It's about timing: Left-right asymmetric habenular neural circuit development

Melanie Philipp: Tight control of mitochondrial function prevents heart defects through faithful ciliogenesis

Concurrent workshop 5 | (Cardio)Vascular

Wednesday 21 March, 17.00-18.30 | Chair: M. Santoro

Talks:

Daniela Panáková: AKAP2-PKA compartmentalization by alternative Wnt/GPCR signaling regulates L-type Ca²⁺ channel.

Wiebke Herzog: Wnt signaling regulates vascular pattern formation and anastomosis during brain angiogenesis

Arndt F. Siekmann: Duplicated vegfa genes control early central nervous system vascularization.

Monica Beltrame: Perturbed Vegf-C signalling enhances lymphatic defects in sox18 mutants, as in sox18 morphants.

Brant Weinstein: A Novel Endothelium-Derived Perivascular Cell Population in the Zebrafish Brain.

Natascia Tiso: Characterization of stable zebrafish models for Arrhythmogenic Cardiomyopathy Type 8; towards the identification of early pathogenetic events and new therapeutic targets

Discussion:

During the community discussion we will focus on the following questions:

- What are the major breakthrough in the cardiovascular field of the last year ?
- High throughput approaches (advance light microscopy, single cell RNA seq, metabolomics, etc.
- What about an update anatomical atlas of cardiovascular cells and tissues ?
- What's the future of cardiovascular studies in zebrafish model ?

Concurrent workshop 6 | Germ Cells

Wednesday 21 March, 17.00-18.30 | Chair: R. Dosch

The workshop will outline in the first part current research on germ cell development. In addition, the speakers will mention technical limitations, which slow down their progress in this emerging topic. These limitations will then form the basis for an open discussion in the second part to develop solutions overcoming technical problems.

Talks (10 min + 2 min questions)

Yaniv M Elkouby: From the stem cell to the follicle: novel cellular mechanisms of oocyte differentiation by a centrosome organizing center

Andrea Pauli: Small proteins with big roles: Bouncer enables sperm entry during fertilization in vertebrates

Virginie Lecaudey: The Hippo Pathway effector Taz is required for the formation of the Micropyle in Zebrafish

Florence L. Marlow: Contribution of intronic sequences to regulation of germline RNAs

Roland Dosch: Functional Conservation of the Zebrafish Germ Plasm Organizer Bucky ball and Drosophila Oskar

Erez Raz: The role of the Vertebrate Protein Dead End in controlling Primordial Germ Cell Fate

Discussion (15 min)

- **Function:**
Loss-of-function tools in the germline - Morpholinos & germline clones
- **Imaging:**
Clearing opaque oocytes
Developing reporters for oocyte regionalization/compartments
Improving follicle culture for long-term imaging and functional studies

Plenary workshop 5 | Imaging

Thursday 22 March, 11.00-12.30 | Chair: A. Haase

The workshop aims at reviewing some of the most successful optical imaging and manipulation techniques and recent results obtained with them. There will be 6 talks of 12 min presenting a broad spectrum of those techniques. The covered methods are, among others, two-photon imaging, optogenetics, light-sheet microscopy, electron microscopy, calcium imaging, and time lapse imaging.

The last 20 min will be used for a general discussion about recent developments in the fields of optical methods and will allow debating the suitability of different imaging modalities for specific scientific questions.

Presenters and titles:

Albrecht Haase: 3D and 4D in vivo imaging and image reconstruction methods to study neuronal development in zebrafish larvae via two-photon microscopy

Elizabeth Carroll: Adaptive optics for precision two-photon optogenetics in zebrafish

Owen J. Tamplin: Correlative Lightsheet and Electron Microscopy of the Larval Zebrafish Kidney

Francesco Vanzi: Whole-brain calcium activity measurements in zebrafish models of neurological disorders, basic research and application to novel drug screening methods

Robin A. Kimmel: In vivo imaging of emerging endocrine cells reveals a requirement for PI3K-regulated motility in pancreatic islet morphogenesis

Sophie Vriz: Tissue homeostasis is controlled by a feedback loop between nerves and H₂O₂ signaling in zebrafish

Concurrent workshop 7 | Aging, DDR & Cancer

Thursday 22 March, 14.00-15.30 | Chair: M. Mione

Part 1: TALKS (approx 7min each)

Freek van Eeden: Analysis of Von Hippel Lindau function in zebrafish

Kathleen BM Claes: Uncovering the role of atm in zebrafish

Catarina M. Henriques: Gut-associated leukocytes have telomerase-dependent hyper-long telomeres and require telomerase for efficient phagocytosis

Michela Ori: Generation of new in vivo tools to study healthy and pathological aging of nervous system (Flash presentation, 5 min)

Miguel Godinho Ferreira: Telomere shortening increases cancer incidence in a non-cell autonomous manner

Marina Mione: A preclinical zebrafish model of brain tumor with alternative mechanisms of telomere maintenance (ALT)

Rita Fior: Human tumor cell interactions and innate immune evasion in the zebrafish xenograft model

Part 2: COMMUNITY DISCUSSION (40 MIN)

Topic to be discussed during the workshop include:

- Aging and cancer. Essential techniques to study ageing.
- Microenvironment in ageing. How to study it?
- Role of chromatin in cancer, DNA damage and replication stress. How can the zebrafish help?

Concurrent workshop 8 | Hematopoiesis

Thursday 22 March, 14.00-15.30 | Chair: E. Trompouki

Part 1: TALKS (max 7min each)

Martin Gering: Gfi1aa and Gfi1b set the pace for primitive erythropoiesis

Trista E. North: Biophysical Induction of YAP Activity Regulates Hematopoietic Stem Cell Production

Eirini Trompouki: A metabolic interplay coordinated by HLX balances hematopoietic stem cell differentiation

Emma de Pater: The role of the Gata2 transcriptional program in familial MDS/AML

Han Wang: Ezh2 promotes clock function and hematopoiesis independent of histone methyltransferase activity in zebrafish

Petr Bartunek: Kit signaling in erythroid cell development (Flash presentation, 5 min)

Part 2: COMMUNITY DISCUSSION (45 MIN)

A number of participants expressed interest in discussing various aspects of zebrafish hematopoiesis. During the community discussion we will focus on the following questions:

- Use of zebrafish for modeling hematopoietic malignancies and identifying therapeutic modifiers
- Signals (coding and non coding effectors) that affect hematopoietic stem cell formation
- Hematopoietic stem cell niche-intravital imaging
- Sorting strategies

Concurrent workshop 9 | Neural Circuits

Thursday 22 March, 14.00-15.30 | Chair: I. Bianco & F. Del Bene

The aim of this workshop is to discuss recent advances in studying the function of neural circuits and control of behavior. There will be six short talks, invited from the submitted abstracts, followed by a community discussion (45 mins) focussed on approaches to measuring and understanding zebrafish behavior. We hope that all participants will contribute to the discussion. Below we highlight some questions that have been raised and that will be used the structure the discussion.

Part 1: TALKS (max 7 mins each)

Soojin Ryu: Developing a zebrafish model to identify stress resilience mechanisms

Konstantinos Ampatzis: What is inside the adult zebrafish spinal cord? Large scale analysis of the diversity, complexity and dynamics of spinal cord neurotransmitter typology

Herwig Baier: Neural circuits for prey recognition and hunting behavior in zebrafish

Koichi Kawakami: The amygdalar and hippocampal functions in zebrafish

Yoav Gothilf: Characterization of two zebrafish AgRP neuronal systems reveals new functions

Stephan C.F. Neuhauss: Glutamate Homeostasis in the Retina

Part 2: COMMUNITY DISCUSSION (45 min)

A number of participants expressed interest in discussing various aspects of zebrafish behavior. During the community discussion we will focus on the following questions:

- What are the best ***experimental paradigms*** for behavioural experiments?
- What technologies can we use for ***recording*** behaviour? High throughput approaches and online analysis.
- What frameworks and metrics should we use to ***describe*** behavior? Is it time for common standards in the community?
- What about ***machine learning*** approaches (for data acquisition and/or behavioural classification)?
- Are there special considerations for studying ***adult zebrafish behavior***?

Concurrent workshop 10 | Cancer

Thursday 22 March, 16.00-17.30 | Chair: E. Snaar-Jagalska

The aim of this workshop is to discuss recent results obtained using xenografts and genetic cancer models in zebrafish. There will be six short talks, invited from the submitted abstracts, followed by a community discussion (30 mins) focussing on how research in zebrafish relates to mammalian cancer biology and what are the strategic areas of focus for zebrafish cancer models.

Part 1: TALKS (max 10 mins each including discussion)

Ewa Snaar-Jagalska: Mechanical transduction mediated by Integrin-ILK dependent actin dynamics drives stem-plasticity leading experimental metastatic colonization of prostate cancer

Kimble Frazer: A New MYC-Driven D. rerio Precursor-B Cell Acute Lymphoblastic Leukemia Model

Zhiyuan Gong: Leptin induces muscle wasting in a kras-induced hepatocellular carcinoma model in transgenic zebrafish

Wolfram Goessling: Estrogenic activation of the G protein coupled receptor GPER1 regulates PI3K/mTOR signaling to promote normal and malignant liver growth

Jeroen den Hertog: Modeling RASopathies in zebrafish

Manfred Schartl: Epigenetic regulation of gene expression in premalignant pigment cell lesions and melanoma

Part 2: COMMUNITY DISCUSSION (30 min)

A number of participants expressed interest in discussing various aspects of cancer. During the community discussion we will focus on the following points/questions:

Xenografts, ZF-PDX, microenvironment, imaging

- Use of zebrafish for xenotransplantation, zPDX, quantification of tumor load and immune responses and rejection
- ZF patient-derived xenografts (zPDX): proof of- concept experiments that compare response to chemotherapy and biological therapies between patients and zPDX
- Single cell imaging of tumour heterogeneity and response to therapy in human-zebrafish xenografts
- Is zebrafish microenvironment comparable to mice or human?

Transgenic models

- How can we study the role of tumor drivers, modifier genes, cancer “evolution”, multistep carcinogenesis and weak effects on tumorigenesis?
- How can premalignant conditions be modeled in the zebrafish that are risk factors for known cancer phenotypes?
- How patient-specific genetic lesions drive tumorigenesis?
- Would cancer modelling in zebrafish improve by the use of genetic engineering tools to reproduce in zf the same mutations found in human cancer, especially in the study of tumor suppressors or copy number variations?

Translational values

- What are the advantages of using zebrafish to model cancer and immune responses in cancer?

- Can zebrafish model be a valid model in precision medicine and how we can convince colleagues in the clinical field for adopting the zebrafish model?
- Drug discovery/toxicity: expanding therapeutic options through drug combinations and repurposing; determining how genetic combinations influence drug sensitivity
- Cancer prevention in ZF: identification of chemicals to prevent cancer; the effect of germline polymorphisms on tumor behaviour
- The zebrafish cancer research should complement, and not compete, with what can be achieved in mammals. Specific findings from zebrafish models must be appropriately confirmed in mammalian models to ensure their relevance to human disease

Concurrent workshop 11 | Immunity & Inflammation

Thursday 22 March, 16.00-17.30 | Chair: B. Bajoghli

This workshop aims to discuss advantages of fish model systems to study the development of the adaptive immune system and innate immune response to pathogens and injuries. It includes six talks, invited from the submitted abstracts, followed by a community discussion focussed on models, reporters and approaches employed to study immunity in zebrafish model system. We hope that all participants will contribute to the discussion.

Part 1: TALKS (max. ten minutes each)

1. Baubak Bajoghli: A fish model to understand spatial and temporal aspects of T-cell development
2. Paul Martin: Investigating inflammation in the contexts of wound healing and cancer
3. Rebecca J. Richardson: Specific macrophage populations coordinate cardiac scarring and subsequent regeneration in adult zebrafish
4. Thomas Becker: Macrophage-mediated control of Il-1beta is essential for spinal cord regeneration in zebrafish.
5. Jean-Pierre Levraud: Tissue-specific control of viral infection in zebrafish by the interferon response
6. Astrid van der Saar: Mycobacteria employ two different mechanisms to cross the blood-brain barrier

Part 2: COMMUNITY DISCUSSION (30 min)

A number of participants expressed interest in discussing a strategy to better characterize immune cell lineages in zebrafish. For example, by developing new transgenic reporters, mutants or cell-specific antibodies. A systematic characterisation of various immune cell types would be a great benefit for all investigators that are studying hematopoiesis, immunology and cancer.

Concurrent workshop 12 | Stem Cell Plasticity

Thursday 22 March, 16.00-17.30 | Chair: C. Kizil

The focus of the workshop will be to discuss how zebrafish stem cells maintain and manifest their capacity for plasticity in various tissues. There will be five short talks (50 minutes), invited from the submitted abstracts, followed by a community discussion (40 mins). The discussion topics include but are not limited to whether the regenerative capacity of zebrafish stem cells relies on specific programs, how can zebrafish relate to improved understanding of stem cell biology in humans in health and disease, and which tools are available for in vivo assessment of stem cell behavior in zebrafish. We are looking forward to an active and fruitful discussion round.

Part 1: TALKS (10 mins each)

Laure Bally-Cuif

Single cell and population mechanisms of adult neural stem cell maintenance

Caghan Kizil

Neural stem cell plasticity in neurodegeneration models of adult zebrafish brain

Francesco Argenton

Phosphorylation of Y705 is needed for mitochondrial Stat3 mediated control of intestinal stem cell proliferation

Anna Jaźwińska

CNTF stimulates cardioprotection and the proliferative activity in the zebrafish heart

Robert Knight

Dissecting the regulation of muscle stem cells during regeneration by live cell imaging in the zebrafish

Part 2: COMMUNITY DISCUSSION (40 min)

During the community discussion, we will elaborate on the following questions. You are welcome to contribute to expanding the discussion topics.

- How similar or different is the ***process of tissue regeneration and stem cell response*** in zebrafish and humans? What can zebrafish teach us?
- Do stem cells recruit ***molecular programs distinct from development*** during regeneration?
- Do we need to establish ***benchmarks to validate zebrafish*** as a model for understanding stem cells in vivo?
- What is in our toolbox for ***live imaging of stem cell behavior*** in vivo? What can be improved?

Plenary workshop 7 | Regeneration

Friday 23 March, 11.00-12.45 | Chair: N. Mercader

The aim of this workshop is to present the latest results using the zebrafish model organisms to dissect the mechanisms of organ and tissue regeneration.

Given that this is the last workshop of the meeting, the talks will be followed by an open discussion aiming to integrate research results and novel tools presented during the meeting into the context of regeneration.

Talks: 10 min followed by 3 min discussion

António Jacinto: Regulation of dedifferentiation in zebrafish caudal fin regeneration

Michael Brand: Neuroinflammation is critically required as a cue for regeneration of the adult zebrafish retina

Dimitris Beis: Re-activation of Notch signaling is required for cardiac valve regeneration

Lieve Moons: Dendritic retraction is a prerequisite for efficient axonal regeneration in the adult zebrafish retinotectal system

Peter Currie: The role of distinct populations of muscle stem cells during regeneration and organ growth

Leonor Saude: Modulation of vascular repair during spinal cord regeneration

Nadia Mercader: Tbx5a lineage tracing shows cardiomyocyte plasticity during zebrafish heart regeneration