

## Training Event 3 minutes of H2020-ITN THERACAT (765497)

### Abstract

This document provides the minutes for the Training Event 3 of the THERACAT ITN project, held at University of Edinburgh in Edinburgh (UK) on February 4<sup>th</sup> – 7<sup>th</sup> 2020.

*Note: All presentations noted in the minutes are uploaded in the project website (intranet) with the exception of those that could not be distributed by the speaker due to confidentiality issues.*

### Issued by

<b>Name</b>	Rosa Miralles	<b>Partner</b>	IBEC	<b>Date</b>	24/04/2020
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### Reviewed by

<b>Name</b>	Lorenzo Albertazzi	<b>Partner</b>	IBEC	<b>Date</b>	28/04/2020
<b>Name</b>	All Attendees	<b>Partner</b>	All	<b>Date</b>	12/05/2020

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## 1. Attendees

**IBEC:** Lorenzo Albertazzi

**TAU:** Roey Amir

**UAB:** Maribel Ponferrada

**EDI:** Asier Unciti-Broceta

External trainers: Chris Boyd (EDI), Teresa Valero (EDI), Marc Vendrell (EDI), John Dawson (EDI), Jessica Valli (Edinburgh Super Resolution Imaging Consortium-ESRIC)

ESR Fellows:

Michela Vargiu\* (GRO)

Shreyas Wagle\* (TAU)

Krishna Vippala\* (TEVA)

Anjana Sathyan\* (TUE)

Stephen Croke\* (EDI)

Manos Arxontakis\* (TUE)

Alis Olea\* (IBEC)

Linlin Deng\* (TUE)

Africa Galvez\* (BGX)

Boris Lozhkin\* (BAS)

Melissa van de l'Isle\* (EDI)

Maria Vlastara\* (TAG)

Daniel Rodriguez\* (TAU)

*\* Have attended all week. The supervisors have attended the day of their training session.*

## 2. Agenda

### Training Event 3: Drug delivery and microscopy

#### Tuesday 4<sup>th</sup> February 2020: The power of microscopy techniques in biomedical research – principles and challenges

Schedule	Activity	Responsible	Attendees
09:00-10:30	Introduction to optical microscopy	Albertazzi	ESRs
10:30-10:45	Break	-	ESRs
10:45-13:00	Advanced techniques and fluorophore synthesis	Albertazzi	ESRs
13:00-14:00	<i>Lunch</i>	-	<i>ESRs</i>
14:00-16:00	Building the foldscope	Albertazzi	ESRs
16:00-16:15	Break	-	ESRs
16:15-18:00	Data analysis	Albertazzi	ESRs

#### Wednesday 5<sup>th</sup> February 2020: Designing delivery systems – concepts, examples and concerns

Schedule	Activity	Responsible	Attendees
09:00-10:30	Designing delivery systems: Introduction	Amir	ESRs
10:30-10:45	Break	-	ESRs
10:45-13:00	Designing delivery systems based on dendrimers and dendritic hybrids	Amir	ESRs
13:00-14:00	<i>Lunch</i>	-	<i>ESRs</i>
14:00-16:00	Open discussion on THERACAT dyes and drugs	Amir	ESRs
16:00-16:15	Break	-	ESRs
16:15-18:00	Therapeutic gene delivery to the lung	Boyd (EDI)	ESRs

**Thursday 6<sup>th</sup> February 2020: Gender balance in academia and lab tours**

Schedule	Activity	Responsible	Attendees
09:00-10:30	Gender Balance in academia	Ponferrada (UAB)	ESRs
10:30-10:45	Break	-	ESRs
10:45-13:00	Gender Dimension in research	Ponferrada (UAB)	ESRs
13:00-14:00	<i>Lunch</i>	-	<i>ESRs</i>
14:00-17:30	Lab tours in a microscopy facility including hands-on experience	Valero (EDI)	ESRs

**Friday 7<sup>th</sup> February 2020: Introduction to in-vitro imaging and cell assays**

Schedule	Activity	Responsible	Attendees
09:00-09:30	Introduction and overview of the session	Unciti-Broceta	ESRs
09:30-10:30	Activatable fluorescent probes for live-cell imaging	Vendrell (EDI)	ESRs
10:30-11:00	Break	-	ESRs
11:00-12:30	Multiparametric phenotypic assays	Dawson (EDI)	ESRs
12:30-14:00	<i>Lunch</i>	-	<i>ESRs</i>
14:00-15:00	Cytotoxicity assays	Unciti-Broceta	ESRs
15:00-15:30	Break	-	ESRs
15:30-17:00	Super Resolution Microscopy	Valli (ESRIC)	ESRs

## 3. Minutes

### 3.1 The power of microscopy techniques in biomedical research – principles and challenges

The course has been especially designed to be a crash course of optical microscopy for THERACATers. It has provided basics about general microscopy, dyes and labelling, and has gone into more detail on fluorescence, confocal and super resolution microscopy, showing also examples on nanotech and catalysis which are relevant for the ESRs. A hands-on activity to build a paper microscope (<https://www.foldscope.com/>) and collect data on ESRs phones was organized.

- Performed by: Lorenzo Albertazzi (IBEC)
- Content:
  - Introduction to optical microscopy: Why Resolution? A matter of size; History on microscopy
  - Advanced techniques and fluorophore synthesis: Fluorescence microscopy; Confocal microscopy; How to label? Covalent and cell labelling; Super resolution microscopy & diffraction limit: Fluorescence for THERACATers: prodyes, kinetics, super resolution & catalysis
  - Building the foldscope & data analysis

### 3.2 Designing delivery systems – concepts, examples and concerns

#### **Designing delivery systems based on dendrimers and dendritic hybrids**

The course has been focused on giving basic concepts about drug delivery and design of delivery systems, focusing mainly on dendrimers and dendritic hybrids (synthesis, characterization, study of drug release, enzymatic responsiveness). In the last part of the course there was a discussion between the ESRs and Roey Amir on the type of dyes and drugs that are used by the different groups and the different cell assays to create some standard protocols/assays for the whole network.

- Performed by: Roey Amir (TAU)
- Content:
  - Drug delivery: introduction
  - Passive and active drug delivery
  - Systemic therapeutics: barriers
  - Key requirements from delivery platforms and their preparation
  - Designing delivery systems based on dendrimers and dendritic hybrids (the power of molecular precision)

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### **Therapeutic gene delivery to the lung**

The course has been focused on introducing the concept of gene delivery, the usage of synthetic and viral transacting agents and the advantages and drawbacks of each type and challenges in the field. Examples for development of gene transfection to treat cystic fibrosis and description of clinical trials have been also discussed.

- Performed by: Chris Boyd (CF Gene Therapy Group Leader, Centre for Genomic and Experimental Medicine, EDI)
- Content:
  - Introduction to gene delivery
  - Synthetic and viral transacting agents
  - Using gene transfection to treat cystic fibrosis in clinical trials
  - Current challenges and future directions

### **3.3 Gender balance in academia and lab tours**

The course has given fundamental concepts about the sex-gender system and gender equality rights, making ESRs aware of gender barriers and gender discrimination in the professional careers. It has also been aimed at: developing the capacity of critical view of the androcentric bias and gender assumptions in science and research, including health and biology fields; and understanding the meaning of the inclusion of sex and gender analysis in research, following the recommendations of Horizon 2020, Gender Toolkit and Gendered Innovations project.

- Performed by: Maribel Ponferrada (Observatory for Equality, UAB)
- Content:
  - Gender equality in academia: introducing sex-gender concepts; gender inequalities in the professional career
  - Gender dimension in research

In the afternoon all ESRs have visited the EDI microscopy facility including a hands-on experience, guided by Dr. Teresa Valero from EDI.

### **3.4 Introduction to in-vitro imaging and cell assays**

The course has given a broad overview regarding in vitro imaging and cell assays, thanks to the know-how of the 3 external experts invited to give a lecture and the contribution of Asier Unciti-Broceta (PI of EDI).

#### **Activatable fluorescent probes for live-cell imaging**

- Performed by: Marc Vendrell (EDI)
- Optical transduction, basic concepts in fluorescence imaging, common optical techniques used in chembiolabs, chemical development of fluorescent probes, case-studies of fluorescent probes used in cell imaging

### **Multiparametric phenotypic assays**

- Performed by: John Dawson (EDI)
- Drug discovery challenges and why we use phenotypic assays, imaging technologies advancing high-content analysis (HCA) and developments in model assays, examples of phenotypic HCA assays.

### **Cytotoxicity assays**

- Performed by: Asier Unciti-Broceta (EDI)
- Cell viability reagents, live imaging methods, preliminary toxicology, advantages and disadvantages of cytotoxicity assays used by ESRs in the framework of the THERACAT project (discussion).

### **Super Resolution Microscopy**

- Performed by: Jessica Valli (Edinburgh Super Resolution Imaging Consortium-ESRIC)
- Microscopy techniques (introduction), SIM, SMLM, dSTORM, PALM, STED, comparison of super resolution techniques, ESRIC Case Study.