

- **Dates:** June 1<sup>st</sup>, June 2<sup>nd</sup>, June 8<sup>th</sup> and June 9<sup>th</sup>, each day from 13:00 to 17:00 CEST
- Venue:** Online meeting
- Virtual host:** Radboud university medical center, Nijmegen, The Netherlands
- Lecturers:** Dr. Kim Wever, Dr. Thomas Steckler, Prof. Malcolm Macleod, Prof. Martin Michel, Dr. Anton Bespalov

### Day-to-day program

#### Day 1 (Tuesday June 1<sup>st</sup>)

Why are we here? The context and rationale of the need to improve research rigour		
Time	Topic	Tutor
Pre-read /do	- Ioannidis 2005 - Nuzzo 2015 - SYRCLE's E-learning on systematic reviews	
13:00 - 13:15	Introductions, agenda and workshop objectives	Kim Wever
13:15 - 14:00	<b>Lecture</b> - Evidence for lacking rigor in research <i>i.a. meta-research, PPV and the Ioannidis paper, surveys of current practices and the reproducibility discussion</i>	Thomas Steckler
14:00 - 14:20	<b>Poll and discussion</b> - The origins of lacking rigor in research <i>i.a. competition, pressure to publish, lack of tolerance to negative data, risks of bias, lack of training and dichotomous decision making</i>	Thomas Steckler
14:20 - 14:40	<b>Lecture</b> - The impact of lacking rigor in research <i>i.a. ethics, patients, reputation of individual scientists, monetary (society, funders, scientists), intellectual property and good research practice versus research integrity</i>	Thomas Steckler
14:40 - 15:10	<b>Discussion</b> - Who is in the greatest need of higher research quality standards: industry, academia, CROs, young scientists or mature researchers? <i>Includes brief homework assignment: the research integrity policy of your institution</i>	Anton Bespalov
15:10 - 15:25	Coffee break, networking and remaining questions	All
15:25 - 16:10	<b>Lecture and quiz:</b> Systematic reviews: a tool to identify factors important for research quality	Kim Wever
16:10 - 16:55	<b>Practical assignment:</b> Assessing internal validity and risks of bias in primary animal studies	Kim Wever
16:55 - 17:00	Challenge question day 1	Anton Bespalov

#### Day 2 (Wednesday June 2<sup>nd</sup>)

How to improve the robustness of animal studies: study design and planning		
Time	Topic	Tutor
Pre-read	- Dirnagl 2020 - Bert et al 2019 - Lefevre and Balice-Gordon 2020	
13:00 - 13:15	<b>Discussion</b> of the day 1 challenge question	Martin Michel
13:15 - 14:00	<b>Lecture and quiz:</b> How to define knowledge-claiming research? <i>i.a. exploratory versus confirmatory research, attributes of knowledge-claiming research (must and should) and factors that prevent implementation of maximal possible rigor</i>	Martin Michel

14:00 - 14:15	<b>Discussion:</b> Should these standards apply to in vitro research? To what extent?	Martin Michel
14:15 - 14:45	<b>Lecture:</b> Pre-specification <i>i.a. researcher's degrees of freedom, inclusion &amp; exclusion criteria and preregistration</i>	Anton Bespalov
14:45 - 15:00	<b>Discussion:</b> (Electronic) lab journals - what they are and why are they important?	Anton Bespalov
15:00 - 15:15	Coffee break, networking and remaining questions	All
15:15 - 16:00	<b>Lecture:</b> practical aspects and challenges of blinding & randomization	Anton Bespalov
16:00 - 16:15	<b>Discussion:</b> When and how can research rigor measures be harmful?	Anton Bespalov
16:15 - 16:55	<b>Lecture:</b> The importance of statistical power <i>i.a. prevalence of underpowered studies, when power becomes critical, biological versus experimental units and technical versus biological replicates</i>	Martin Michel
16:55 - 17:00	Challenge question day 2	Martin Michel

 Day 3 (Tuesday June 8<sup>th</sup>)

How to improve the robustness of animal studies: data integrity and analysis		
Time	Topic	Tutor
Pre-read	- Motulsky 2014	
13:00 - 13:15	<b>Discussion</b> of the day 2 challenge question	Martin Michel
13:15 - 13:45	<b>Lecture:</b> Practical aspects of effect size estimation (do's and don'ts)	Martin Michel
13:45 - 14:00	<b>Discussion:</b> Effect size estimation troubleshooting <i>e.g. what to do when no prior studies are available, or the therapeutic relevance of an effect size is unknown?</i>	Martin Michel
14:00 - 15:00	<b>Lecture:</b> From pre-specified endpoints to data analysis: Common mistakes and how this affects data robustness	Kim Wever
15:00 - 15:15	Coffee break, networking and remaining questions	All
15:15 - 15:30	<b>Discussion:</b> Why do we need to keep raw data?	Kim Wever
15:30 - 16:20	<b>Lecture:</b> Data integrity <i>i.a. raw data, the ALCOA principles and the FAIR principles</i>	Kim Wever
16:20 - 17:00	<b>Discussion:</b> - How to set-up unique study IDs? - How to trace back published data to raw data? - How to archive data?	Anton Bespalov
16:55 - 17:00	Challenge question day 3	Anton Bespalov

Day 4 (Wednesday June 9<sup>th</sup>)

Time	Topic	Tutor
What to do next? Practical implementation of measures to improve research rigour		
Pre-read /view	<ul style="list-style-type: none"> <li>- ARRIVE 2.0 guidelines with explanations (separate file)</li> <li>- Videos introducing EQIPD Quality System: Why (Part 1), What (Part 2), and How (Part 3)</li> </ul>	
13:00 - 13:15	<b>Discussion</b> of the day 3 challenge question	Thomas Steckler
13:15 - 13:45	<b>Lecture and poll:</b> Publication standards <i>i.a. ARRIVE and minimum information reporting standards</i>	Thomas Steckler
13:45 - 14:30	<b>Lecture:</b> Presenting data in publications (bar graphs, approaches to inference, etc.)	Malcolm Macleod
14:30 - 14:45	<b>Discussion:</b> What if the editor or reviewers request data to be presented in a “conventional way”?	Malcolm Macleod
14:45 - 15:15	<b>Lecture and poll:</b> Negative results: What are they and what do we do with them?	Thomas Steckler
15:15 - 15:30	Coffee break, networking and remaining questions	All
15:30- 16:00	<b>Lecture:</b> The EQIPD Quality System <i>i.a. introduction using a series of examples and implementation options</i>	Anton Bespalov
16:00 - 16:15	<b>Discussion:</b> Why does quality matter for you (referring to the EQIPD slide deck)?	Anton Bespalov
16:15 - 16:45	Surveys, feedback, closing remarks & adjourn	Kim Wever