

Travel Report

**Global Master's Programme in Toxicology 2021 - 2023
Institute of Environmental Medicine (IMM), Karolinska Institutet (KI),
Sweden**

**JRC Summer School on Non-animal Approaches in Science:
Towards Sustainable Innovation.**

**Joint Research Centre (JRC) 23 - 26 May 2023
Ispra, Italy**



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Date of report: 2023-08-30

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Appendix 1: JRC Summer School on Alternative Approaches in Science – Towards sustainable
innovation - Programme



Disclaimer

This report comprises the personal reflections from the students, and is not an official report from the Global Master’s Programme in Toxicology

1. Programme

JRC Summer School on Non-Animal Approaches in Science: Towards Sustainable Innovation, 23 - 26 May 2023 at the JRC site in Ispra (Italy).

The aim of the JRC Summer School is to share knowledge and experience on the latest non-animal approaches used in research and testing including *in vitro* methods and computational modelling. In addition, the intention is to explore the role of the Three Rs (Replacement, Reduction and Refinement of animal experiments) in science today through discussion and debate.

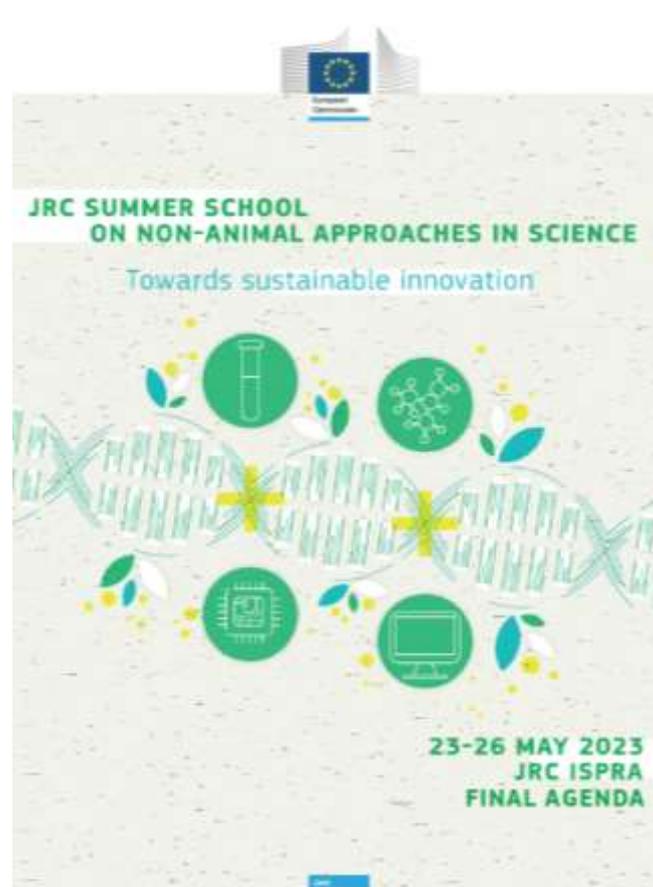
2. Participants, Global Master's Programme in Toxicology 2021 - 2023, IMM, KI, Sweden

Students

Twenty-nine international students from 11 different countries: Turkey, Sweden, Greece, China, Italy, Canada, Ireland, Austria, Gambia, Portugal, and Finland.

Faculty

Annika Hanberg, *Programme Director, Global Master's Programme in Toxicology, IMM, KI*
Kristian Dreij, *Deputy Programme Director, Global Master's Programme in Toxicology, IMM, KI*
Anna Beronius, *Deputy Programme Director, Global Master's Programme in Toxicology, IMM, KI*
Lars Wiklund, *RegSafe, Teacher, Global Master's Programme in Toxicology, IMM, KI*



3. Monday 22 May

The students of the Master's Program in Toxicology at Karolinska Institutet had the great opportunity to travel to Italy together and visit the European Commission's Joint Research Centre (EC-JRC) to attend the JRC summer school on non-animal approaches in science - Towards Sustainable Innovation, in Ispra close to Lago Maggiore.

This was the 14th visit to **JRC, Ispra** arranged by **Annika Hanberg**, programme director, and **Lars Wiklund** together with **JRC** (including two digital visits).

The travel to Italy

The Departure schedule from Stockholm Arlanda Airport to Milan was at 9.25 am. We all got ready and excited around 8 am, and the flight went well to Milano Linate airport.



The beautiful summer sunshine and pretty views made us feel very welcomed in Italy. At around 13.15 we took the hired bus to Angera, where the hotel is located. In the meantime, we got an "assignment" of learning some basic Italian during the trip.





Since the Summer School was set to begin on Tuesday, we filled our time with fun activities. Some of us swam in the lake and enjoyed the sunshine while others explored the Angera town centre.



At 18.00 we all gathered in the hotel garden for a welcome aperitivo hosted by our teachers, **Annika, Anna, Kristian** and **Lars**. We mingled while having prosecco and snacks!





After the aperitivo we decided to go for dinner with our friends so we headed towards town to find nice restaurants. Since we are in Italy, pizza and pasta were a must so most of us selected those options. A nice pizza place for example, called Artepizza provided us with a delicious meal in the small town Angera.

After dinner we returned back to hotel Lido and most of us went straight to sleep as our day had been very long and intensive.



4. Tuesday 23 May

Morning and registration

On Tuesday morning we had to be downstairs at 7:30 for breakfast, in order to be ready for the bus to JRC that left at 8.25.



JRC Summer School 2023: Non-Animal Approaches in Science, *Towards Sustainable Innovation – Ispra, Italy*

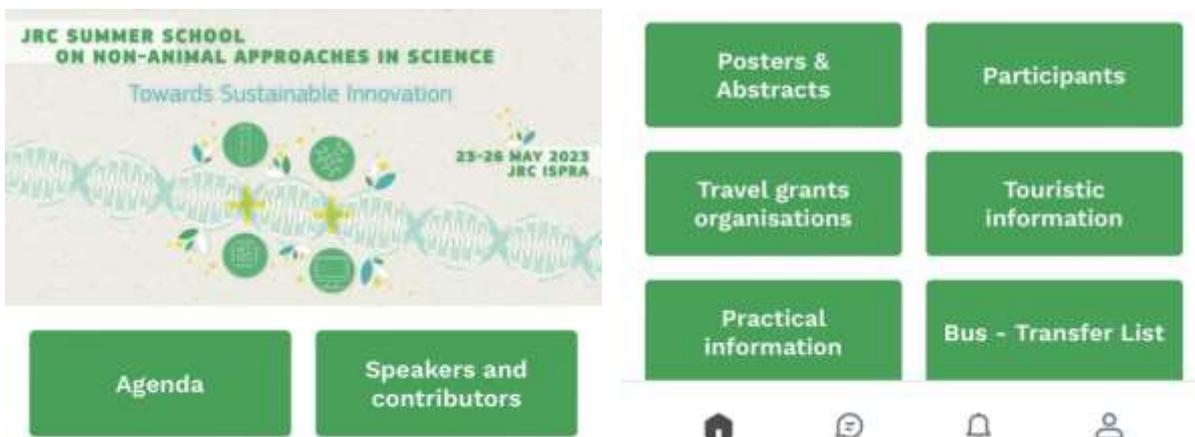
There were multiple buses that took us directly from Hotel Lido to JRC Ispra. Since we didn't all fit in one, some of us had to take a second bus to the summer school, but everyone managed to arrive perfectly on time without any complications.



Upon arrival to the JRC, we had to show our passports and scan our bags at security. We were given name tags and made our way to the reception area where we were given pins for our respective groups.

They also had some other goodies that we could take such as USB sticks shaped like people, and more pins with labels like 'AOPs are the future'. Which we think many of us would agree with!

In order to be more sustainable, and save paper, the school's programme was available on the JRC app. We were able to register and log in to it before the start of the conference.



10.00 – 10.30 WELCOME SESSION (Chair: Elisabet Berggren, JRC)

The summer school started with the Welcome session where **Guy van den Eede, Director Health and Food, JRC**, and **Maurice Whelan, Head of Unit Systems Toxicology, JRC**, introduced the main aspects and discussion points of the Summer School and raised the question of 'Are we doing responsible science?'



This was followed by information of the programme & activities by **Eva Åhs** and **Debora Valsesia, JRC**.



10.30 – 13.00 SESSION 1: Animals & non-animal approaches in science

(Chair: Pierre Deceuninck, JRC)

Session 1 started with the topic on “**Legal obligations and state of play in the European Union**” by **Susanna Louhimies, DG ENV**. The lecture focused on the legislative aspects of research on animals in relation to 3Rs and defined the ultimate goal as the full replacement of animal models.

Then we continued with the lecture on “**Animals used for scientific purposes: facts and figures**” by **Pierre Deceuninck, JRC**. In this lecture, an overview of the animal use in research was presented providing data from all over the world. Differences in the reporting systems were also discussed.



11.00 – 11.20 Coffee Break



11.20 – 13.00 SESSION 1 continued

Dr. Jarrod Bailey, from *Animal Free Research UK*, gave the first lecture focused on “*Encouraging a shift toward more human-focused biomedical research*”, addressing the limitations and ethical considerations associated with invasive animal studies. He first introduced the invasive animal studies, such as the utility of non-human primates in the study of post-traumatic stress disorder (PTSD). Those studies often inflict substantial harm and suffering on the animals. While these studies may contribute to the field of neuroscience, their relevance to human health outcomes is questionable due to species differences.

Then he provided evidence to support the notion that alternative techniques, centred on human-based approaches, can offer more relevant and ethically sound solutions. The genetic data available further reinforced the argument for animal replacement, as the genetic differences between non-human primates and humans can significantly impact research outcomes. By utilizing human cell culture, microfluidics-body on chip, organoids, and computer models, researchers can explore alternative methods that better capture human biology. The lecture emphasized the potential of these alternative techniques to advance scientific understanding and reduce the reliance on animal studies.

Human cell culture allows researchers to study the responses to drugs directly, providing more accurate insights into human biology. Microfluidics-body on chip and organoid technologies offer the ability to model human organs and organ systems, allowing for a more comprehensive understanding of human physiology and disease. Additionally, computer models can simulate complex biological processes, enabling researchers to explore hypotheses and test interventions without the need for animal experimentation.



Next **Sofia Batista Leite, EFSA**, and **Annalisa Gastaldello, JRC**, provided a thought-provoking analysis of the role of methods and protocols in scientific research in their presentation ***“Can We Do Good Science Without Proper Consideration of Methods and Protocols?”*** They highlighted two key issues that are prevalent within the scientific community: the undervaluation of the methods section in publications and the varying levels of awareness regarding this matter.

They stressed that a substantial number of published research papers tend to neglect the methods section, focusing more on the results and conclusions. This neglect can lead to irreproducibility and hinder the progress of scientific knowledge. However, the encouraging aspect was that a growing segment of the scientific community is aware of this problem and actively participating in initiatives to address it.

The initiatives discussed during the lecture aimed to increase awareness among researchers, foster good reporting practices, and develop better means of sharing and publishing protocols. Furthermore, they highlighted the pressing need to secure increased funding and investment in education programs focused on teaching researchers how to effectively report methods and protocols.

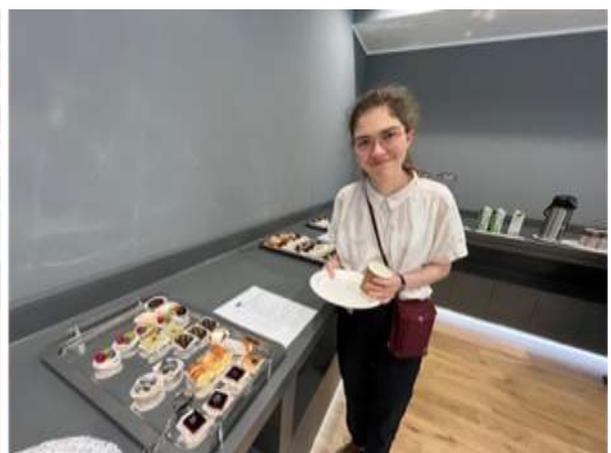
In the following **World Café** the students had a discussion with the speakers.



13.00 – 14.00 Lunch



For lunch, we had a beautiful and tasty vegan buffet. The caterers served oven-baked vegetables, rice with olives, chickpea balls, a gazpacho and other dishes. In classic Italian style, the lunch included wine, a dessert platter and of course coffee.



The number of little cakes served for dessert was rather impressive! The nice-printed description of the dessert was put beside each plate that notifies the ingredients in detail.



Tuesday afternoon

14.00 – 15.00 Student groups with coaches to prepare 3R lessons & debates

After lunch, it was time to participate in an activity we are all familiar with by now: group work. The groups were named after different cell types, and we received a pin with a picture of the cell type to recognize our group members. Half of the groups were planning a 3R exercise, essentially a course, that they will present in front of all on Thursday. The other half of the groups were collecting their arguments for debate on Friday. The debate topics are related to animal use and new approach methodologies (NAMs) in science.



Since we have been working on these topics in groups during our ToxMaster's program, we are quite familiar with many of them and it was nice to continue these discussions at the Summer School.

15.00 – 17.30 SESSION 2: Non-animal approaches as interdisciplinary tools in science

(Chair: Joao Barroso, JRC)

Session 2 began with Dr. **Charu Chandrasekera**, **3R Centre Canada**, who gave an inspiring talk on the topic “**Fit-for-Purpose & Fit-for-All: New Approach Methods as Interdisciplinary Tools**”. Here she reminded us of the fact that there are few one to one replacements, and often a battery of different assays are required to replace a specific animal test. She also emphasized the need to make human biology the gold standard. The take-home message of the talk can be summarized by this quote “The difficulty lies, not in the new ideas, but in escaping from the old ones” by John Maynard Keynes (1883-1946).



The second talk from the session was by **Tilo Weber**, **German Animal Welfare Federation**, on “**Animals in the (petri) dish - Towards a Truly Animal-free Laboratory**”. He outlined the ethical, safety and reproducibility concerns of using animal derived materials in *in vitro* systems. This talk reminded us that *in vitro* methods often are not strictly animal-free and many scientists are not aware of the alternatives available.

The last talk of the session was by and **Eleonora Chinchio and Antonio Franco**, **JRC** who gave a talk on “**Humans: the ultimate animal model**”, which was focused on the use of human biomonitoring and epidemiology. They highlighted the benefits of performing studies based on human data. Human biomonitoring provides the possibility to investigate realistic exposure, aggregated exposure (from multiple sources & pathways of exposure) and combined exposure. An additional benefit of human biomonitoring and epidemiology is the potential of reduced need for extrapolation from animal models. They concluded that human biomonitoring and epidemiology should be a key tool in policy making and for integrating research.



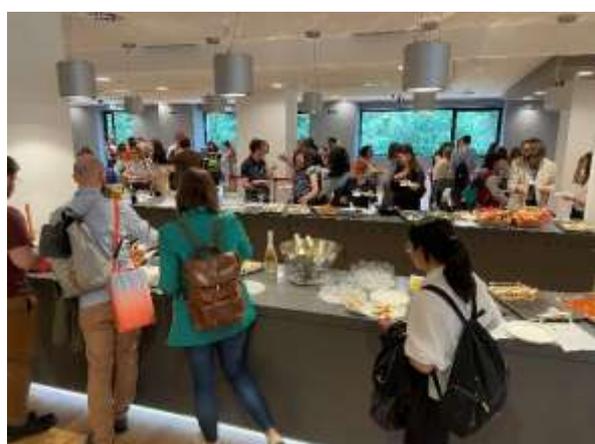
16.00 – 17.30: Coffee break & World café

After the second session we enjoyed an Italian “fika” with coffee and croissants/fruit followed by the **World café** which gave us the opportunity to ask questions to the speakers of the session as well as interact with fellow participants attending the summer school.



17.30 -18.30 Aperitivo

JRC offered us a delicious aperitivo to end our first day of the Summer School which provided a great opportunity to discuss fascinating lectures and network with experts in the field. We enjoyed the sun and made the most of the fantastic food on offer. Great selection of stuzzichini. As you can tell, prosecco was good too. A nice end to the first busy day at the JRC.





Evening

In the evening many of the students and faculty members had dinner at Damino, a very nice Pizzeria restaurant by the lake.



5. Wednesday 24 May

After having recovered from a bit failure to speak Italian by combining Spanish and Greek at Damino restaurant, the following day started earlier, as the first lecture was at 9:30.



9.30 – 12.30 SESSION 3: Innovation in biomedical sciences: a sustainable perspective

(Chair: Laura Gribaldo, JRC)

First Lecture of the day titled “**Human health and animal welfare: the ONE wellbeing concept**”, was delivered by **Laura Gribaldo, JRC**. The highlight of her presentation was the existence of a repository database of non-animal based models gathered from literature that can be used as alternatives. She also mentioned plans to use artificial intelligence to update the database as new studies are published.

The second lecture, titled “**Are new approach methodologies sustainable?**” was given by **Marco Staccia, FRESCI**. In his presentation important questions were raised that have to be taken into account now to avoid future problems. The issues highlighted include sustainability of NAMs related to ethical, economic, biological limitations.



The 3rd lecture was delivered by **Josep Maria Canals, University of Barcelona**, which was titled **“Using human pluripotent stem cells for modelling neurodegenerative diseases”**. His lecture highlighted the importance of standardization for a robust method and generation of reproducible results.

The final lecture **“Studying the role of amyloidogenic proteins in misfolding diseases”** of the day was delivered by **Louise Serpell, University of Sussex**. In her presentation she demonstrated the use of a human brain with Alzheimer's to model an *in vitro* system that can be used to understand the mechanism of action and find possible targets to treat or slow down Alzheimer's disease.



The presentations were followed by a Q&A session.

11.00 – 12.30 Coffee break and World Café

We had coffee in the sun and discussed together with the speakers from the morning session.



13.30 – 15.20 POSTER SESSION I

13.30 – 14.00: 10 Flash presentations in Plenary

(Chairs: Lars Wiklund, KI, & Lucia Self Aspiroz, JRC)

After the world café and lunch we listened to 10 flash presentations. **Frazer Boyd, KI**, who represents our toxicology students presented his poster which focuses on mouse cell based endocrine toxicity testing. We also learn a lot from other presenters. One presenter, **Elisa Monti**, used Organs on chip platforms to investigate drug-related cardiotoxic side effects upon hepatic metabolism. **Martina Lulini** showed how to use NAMs to address PFAS immunotoxicity.

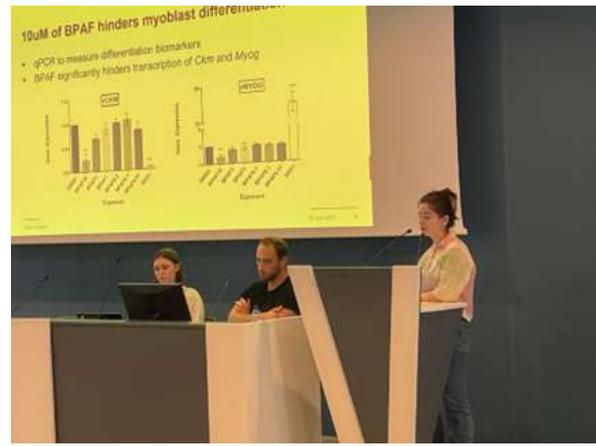


14.10 to 14.40: Flash presentations in break-out groups (students divided into 5 groups)

After the flash presentations in Plenary, the rest of the presentations were done in groups of students at various locations. The whole class was excited to present and share their project work with the other students and researchers.

A wide range of posters presentations were displayed, it certainly offered great insight into different toxicological studies. It was also interesting to notice that numerous projects focused on the development of new research models and enhancing the existing ones. Today's student in poster session 1 had **Yiwei, Shenyu, Matthieu, Taran and Foteini** as the presenters from our ToxMaster class at KI along with the other presenters in their groups. Like always, they were great! Ben fatto future Toxicologists!





15.40 – 18.00 Visit to ECVAM

Following the great poster presentations, we all walked across the beautiful site at Ispra to the ECVAM building.

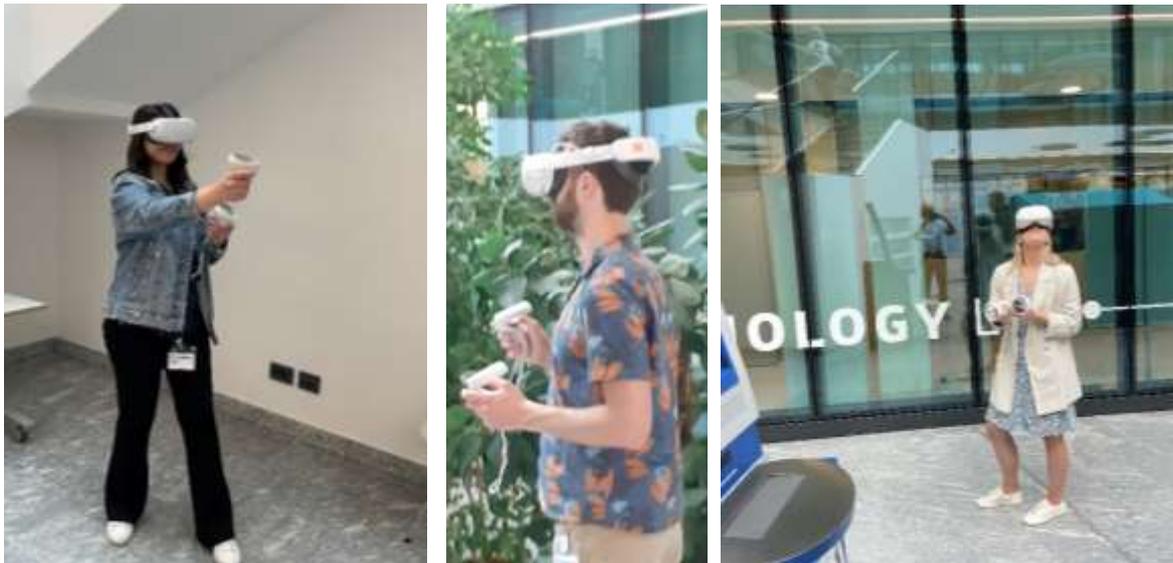


We were separated into our debate/presentation groups for a staggered tour around the site. When not visiting the site, we worked on our debates or presentations in our groups, with some great discussions and group work occurring. This also represented time to further expand our network and get to know our fellow attendees.



During the visit, we got the opportunity to see the state-of-the-art facilities at ECVAM, including their automated high-throughput screening setup and imaging robots, a great view into the future of science. This visit also gave us the opportunity to explore some NAMs, including organs on a chip, and some potential future avenues for science such as virtual reality (VR). This visit really gave us a good perspective on the future of science and toxicology, and the work the EU is doing to push the boundaries of current methods.





Wednesday Evening - Quiz Night

A great thank you to **Maria** and **Frazer** for organizing this exciting and meaningful event! It gave us a chance to remember the 2-year toxicology life. From Finnhamn to Angera, we experienced a lot and we still remember that the potential toxicant in the liver PBL was aflatoxin. It is also happy to know **Kristian** had a pet mouse named Elvis, **Lars** likes rosé wine. Meanwhile, it was so interesting to see everyone's picture from their childhood!





6. Thursday 25 May

The third day of the summer school started with heavy rain and a session on Innovation in regulatory toxicology.



09.30 – 12.30 SESSION 4: Innovation in regulatory toxicology

(Chair: Antonio Franco, JRC)

The session was kicked off by **Stefan Scholz** of the **Helmholtz Centre for Environmental Research – UFZ** giving a presentation on zebrafish embryo models and their implementation in a regulatory context “**The zebrafish embryo model as a versatile high-content screening approach**”. In his presentation, he gave an overview on the zebrafish models used at the Helmholtz Centre, possible improvements on currently used methods, and combinations of endpoints for toxicity testing. He concluded by stressing the importance of data science, IATA, and WoE methods.

He was followed up by **Ester Papa** from **University of Insubria, Varese**, and her introduction of QSAR and their use in regulation “**QSAR from A to Z, making a long story short, and how it serves regulatory purposes**”. This was mostly a refresher for us KI toxmaster students, especially for those that took the “in silico” track, as we had already enjoyed a comprehensive introduction to QSAR during our programme. Nonetheless, it was interesting to hear about the regulatory use of QSAR.



The next presenter, **Carl Westmoreland** of **Unilever**, in this session provided an industry perspective on regulatory topics "**Assuring safety without animal testing – Unilever's experience**". His focus was mostly on the implementation of methods of cosmetic safety testing, an interesting and challenging topic, as animal testing for cosmetic purposes is banned in the EU.

The final presentation of the session was given by **Andrew Worth** and **Elisabeth Berggren** of **JRC** "**Chemicals 2.0: a long-term vision for EU chemicals legislation**". Their presentation focused on the challenges posed by the sheer amount of chemicals humanity releases into the environment and the challenges this poses in a regulatory context. Focus was given on how the EU is working to tackle those challenges and how to apply NAMs in classification and restriction of chemicals.



In classic JRC fashion, after the presentations, there was time set aside for **coffee**, networking and in-depth discussion of the presentations in the **Q&A session** and **World Café**.

12.30 – 13.30 Lunch

Poster session 2

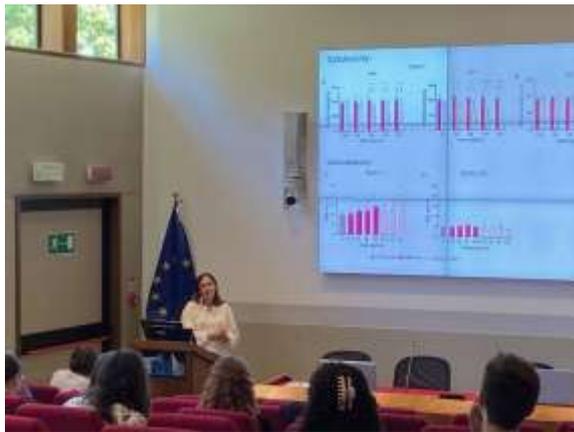
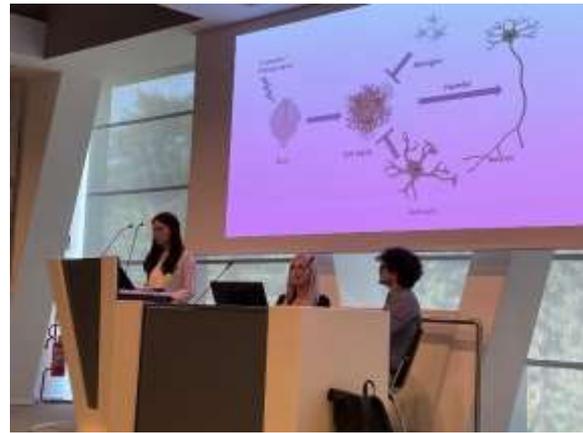
13.30 – 14.00 10 Flash presentations in Plenary

(Chairs: Lars Wiklund, KI, & Lucia Selfa Aspiroz, JRC)

14.10 – 14.40 10 Flash presentations in break-out groups (students divided into 5 groups)

14.40 – 15.30 Poster discussions (free format) & Coffee Break

After lunch it was the second day to hear 10 flash presentations on some selected posters in plenary, and then flash presentations in break-out groups.



Afterwards, we were free to mingle with the presenters to ask them more things about their work!

Career session & Activity fair

15.30-16.30 Careers in non-animal approaches in science: panel discussion

(Chair: Julia Malinowska, JRC)

Panel members: Jarrod Bailey, Charu Chandrasekera, Raffaella Corvi, Paola Occhetta, Stefan Scholz, Tilo Weber

After the poster presentations, several scientists that presented in the morning had a panel discussion about their career paths in science and what advice they would give to junior scientists.



This was a great chance to listen to different perspectives from professionals in academia and in the industry. Several topics were discussed for instance, does everyone need a PhD? Can we change career paths at anytime? How can we find new job opportunities?

Based on their expertise, the scientists gave different answers but they all agreed that there is no rush to find a specific career, we should be open minded and explore different scientific disciplines and that we should always have a goal in mind when starting a new position or project.

16.30-18.00 Activity fair

- Students are invited to network with career panel members
- 4 presentations by student groups on **3R Lessons**
(Coaches: **Annika Hanberg, KI, Pierre Deceuninck, Laura Gribaldo & Annalisa Gastaldello, JRC**)
- **Organ-on-Chip Fair**
 - BiomimX, Milano (**Erika Ferrari, Stefano Piazza**)
 - React4Life, Genova (**Maurizio Aiello, Silvia Scaglione**)
 - ECVAM TissUse device (**Monica Piergiovanni, Emilio Mendoza**)

We also had the opportunity to attend a short career fair where biotech companies along with other entities presented their work and projects which focused on alternative methods. We had the opportunity to learn about different innovative technological devices as well as to network with excellent experts in their field.

One example was a biotech startup company called BiomimX, which developed beating organs-on-a-chip, the uBeat. This device integrates a 3D environment and mechanical stimulation in order to better mimic the physiological elements of most human organs as well as diseased states. It has a broad applicability domain, including precision medicine, drug development and safety among others. Some examples of disease models developed are cartilage and cardiac pathologies.

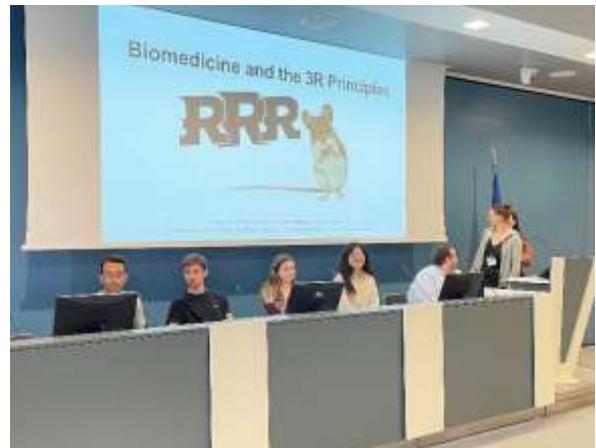


3R Lessons

In parallel with the career fair, several groups presented their weekly assignment which focused on the design of a “**Learning scenario about the application of the 3Rs in either Toxicology or Biomedicine**”. For this task, each group had to create a university-level course about the 3Rs in the field of Toxicology or Biomedicine. To do this, they had to think about what theoretical and practical modules they would like to include, as well as the teaching material that would be used, types of assignments, activities in the programme and learning outcomes of the course (among other aspects).

Overall, all groups came up with creative and innovative education plans for their respective 3Rs courses. Some relevant aspects that were raised was the need to implement better collaboration and networks between universities and students. This way students can have a broader scope of the 3Rs, by accessing teaching material from other universities and also, have the opportunity to explore fields they are interested in as well as build a contact network.

Another interesting aspect was the need for practical laboratory sessions to allow the students to apply their knowledge and learn more about alternative methods.



18.30 – 21.00 Social dinner

After the whole day of learning and discussing with the experts in the career fair session, we went to **Tenuta La Quassa** for networking & social dinner. The place was cosy and spacious with a luxurious dining hall and an endless lawn (normally used for wedding events). The garden was beautiful with trees and flower arrangements. We started the night outside with an aperitivo consisting of prosecco, bright red fruit juice and finger foods, before seating ourselves inside in the dining hall.



The same as any other feast, the dinner had three courses (not counting the aperitivo). The first course had multiple small dishes to pick and choose from in a buffet: grilled vegetables, crispy fried polenta, buns with mozzarella filling and nachos with hummus to mention a few. Of course, since we were in Italy, an assortment of wines was available: sparkling rosé, red and white wine. Lars and Kristian came to our table, and we toasted for our happiness and feeling of fulfilment: "Cheers!". For the main course, we had a warm delicious creamy risotto, which tasted extra good after lunch, that as usual only had chilled dishes. For dessert, a citrus sorbet was served in glasses with a thick straw to drink it with. It was very refreshing! At this point, the dinner moved outside into the garden again, where we mingled until the sun went down and the buses were ready to take us back to Hotel Lido.



The main dish risotto alla Milanese was offered from the restaurant, honouring the incredible Italian cuisine. With either a glass of wine, or prosecco, or juice, we then all headed outside to enjoy the beautiful venue. Relaxed conversations related to summer holidays can describe the general mood, while having a full stomach; what else could we ask for?





7. Friday 26 May

Today is the last day for the summer school journey.

We packed all our stuff and went to the last session of interesting debates!



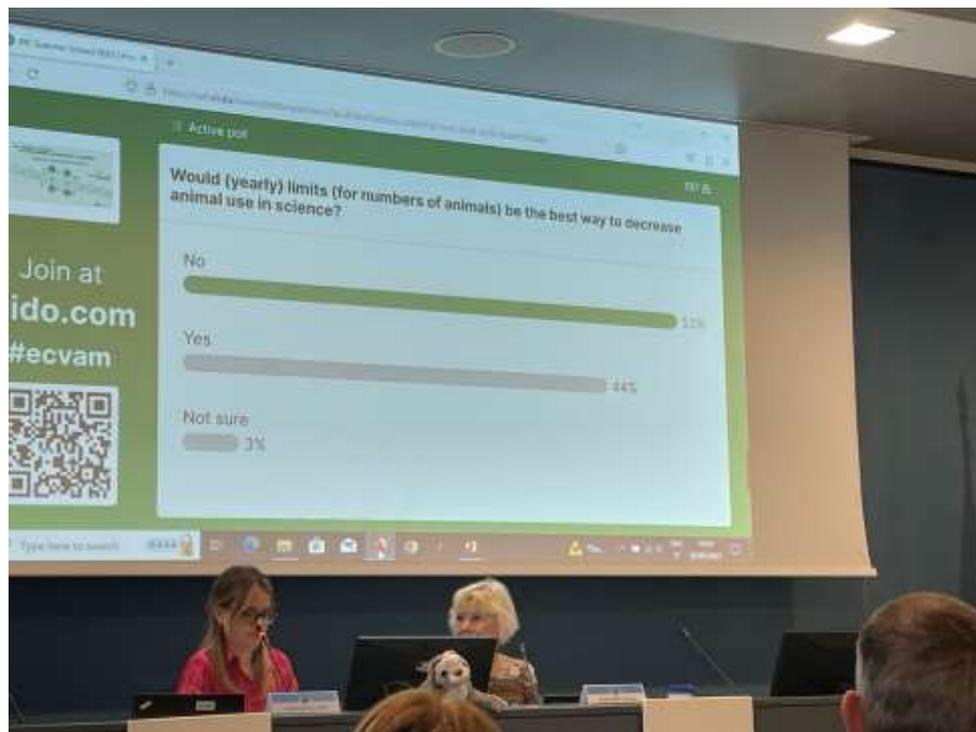
09.00 – 12.35 SESSION 5: Debates

(Chair: Stavroula Sampani & Elisabet Berggren, JRC)

The first topic was **Animals & non-animal approaches in science** and the question to debate was ***“Would (yearly) limits (for number of animals) be the best way to decrease animal use in science?”***

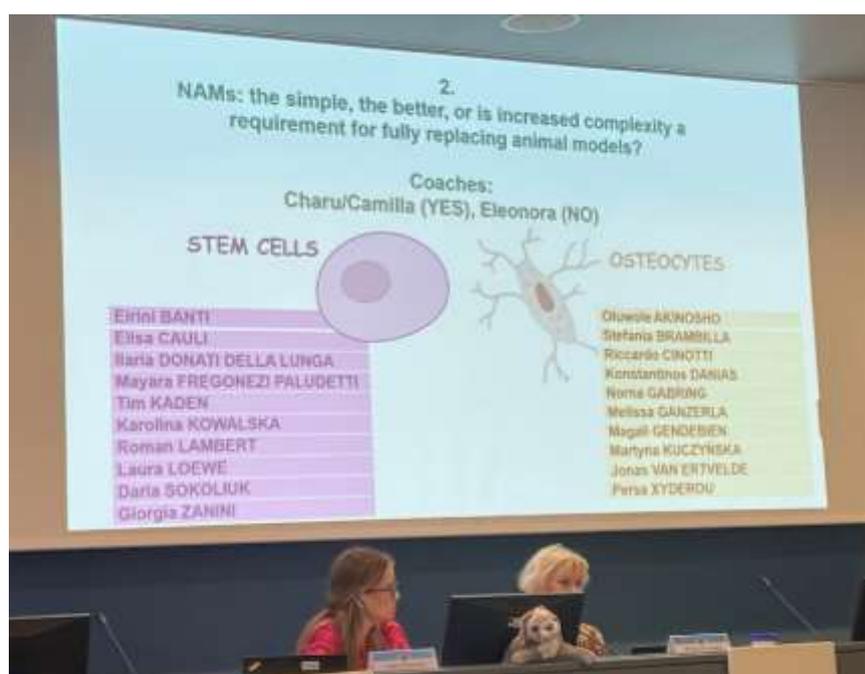
A majority of the audience (69%) hold an opinion on NO in the first voting round. The Yes group stated that making policy is a strong push in the process of reducing animal use in science, since there are already multiple existing measures that were carried out to decrease animal use but no big changes were made. However, the NO group think the best way cannot be putting a number on top of everything and sanction will cause push back, to make researchers and industries willingly change and hold positive opinion to NAMs is the key point. Besides, money and economic situations are the key role of making changes. In the end, audiences who used to be not sure about the topic tend to agree with the YES group and the voting had a quite even result (53% no, 44% yes and 3% not sure).

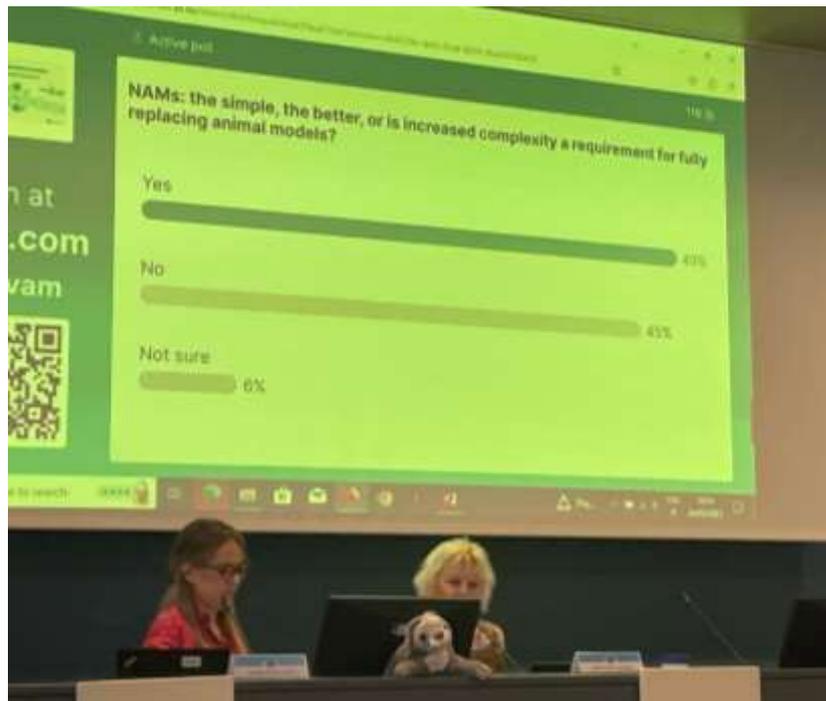




The second debate was regarding **Non-animal approaches as interdisciplinary tools in science** and focused on the necessity to increase the complexity for non-animal approaches ***“NAMs, the simple, the better, or is increased complexity a requirement for fully replacing animal models?”***

The Yes group suggested both the complexity of our body itself and the personalized requirement, where for example, gender and sex, should be considered. The accuracy is another advantage for complex systems. The No group suggested the efficiency for scanning as many chemicals as possible with simple models. The applicability for simple methods in different countries is another advantage for the simple methods. **Konstantinos, KI** answered the question raised by the audience with the idea that a complex method in the future will be a simple one. At the beginning more of the audience thought complexity is necessary for non-animal approaches. In the end the ratio for audience supporting yes or no was the same.





The third debate theme was **Innovation in biomedical sciences: a sustainable perspective**, and the topic of this debate was **“Are NAMs ethically sustainable in the long-term?”**

3. Are NAMs ethically sustainable in the long term?

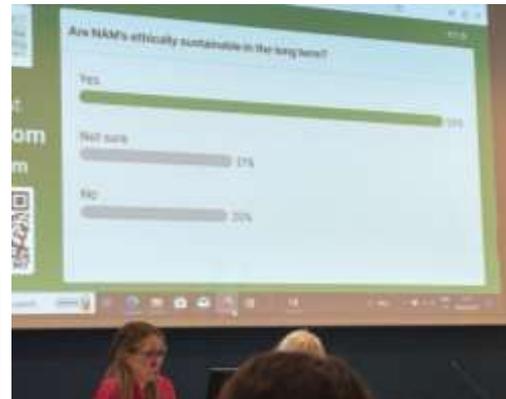
Coaches:
Milena (YES), Marco (NO)

NEURONS	CARDIOMYOCYTES
Alessandro CORDIALE	Gabriele ADDARIO
Melissa FINLAY	Frazer BOYD
Lumeng LI	Shenyu CHEN
Safaa MAWAS	Karol KUGIJKO
Aisté PUIPIŪTĒ	Elisa MONTI
Weiping QIN	Christlan NOVELLO
Angelica SQUARZONI	Ilaria PARODI
Theano TSİKARI	Alexandru SCARLAT
Foteini TZIOUFA	Jessica SZAWARA
Christos VOGIATZAKIS	Jasmin UHLHORN

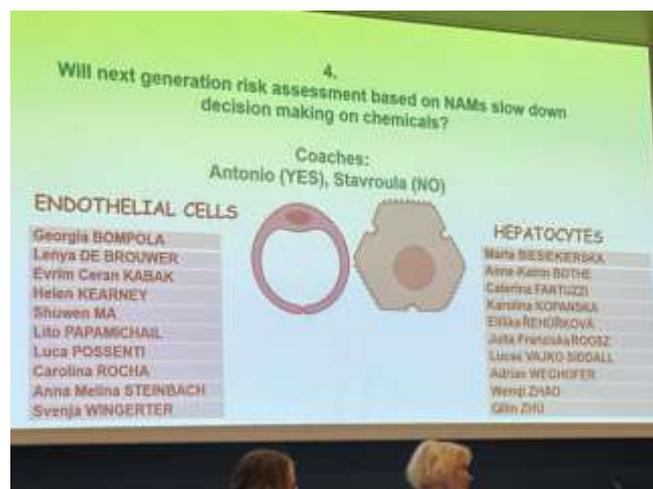
The group of YES elaborated from four aspects, animals, human-centric medical research, social equality and environmental stability in the long term. In detail, they suggested that the development of NAMs promotes the reduction of animal's use. NAMs generally uses human tissues instead of other experimental animals to set up the experiments and get more accurate results and high level of evidence. The absence of animals of *in-silico* approaches minimises the carbon emission as these methods do not need animals and relevant husbandry facilities and conditions, reduce some resources to some extent.

In contrast, the NO group stated emphasized possible privacy problem of individuals when they use these data for *in-silico* modelling (e.g., how the researchers could guarantee the data they use for modelling will not be spread and leaked). On the other hand, most human tissue comes from one area or region, which increases the difficulty to extrapolate these results and conclusions based on the tissues to assess the health risk for the general population.

Most of the audience choose "YES" finally.



Then we continue with **the fourth debate**, and the theme was **Innovation in regulatory toxicology**. They discussed the question **"Will next generation risk assessment based on NAMs slow down decision making on chemicals?"**



Before the argument, most of the audience voted for the “no” option, which was predictable since it was in accordance with the theme of our Summer School. But after the three-round debate, the “yes” side turned the tables and won the battle. Just like their conclusion said, NAMs will be the future and win this game eventually for sure, but the reason is not because of the time, but because of the higher precision, accuracy and optimal complexity.



All the debates today impressed and inspired us about where we are and where to go about NAMs.

12.40-13.00 Poster awards ceremony & closing remarks
(Maurice Whelan & Elisabet Berggren, JRC)



13:30-14:15 Lunch

After the debates and the poster awards ceremony & concluding remarks, we had a nice lunch and enjoyed the warm weather.



14:30 Bus departures to Milan airports, Milan Central Station and hotels

After lunch it was time to leave for Milan, to station di Milano Centrale (Milan Central train station) for us KI ToxMaster's students. Then by underground (Metro) to Lodi Tibb and to our hotel. The bus trip gave some of the students a good opportunity to read, prepare for the thesis defences during the coming week, or get some rest after a few days of hard work.

Afternoon & evening - exploring Milan

After the bus trip from JRC to Milan central train station we made our way to **Hotel Major** by metro where we all took a couple of hours to freshen up and rest before heading out to discover some parts of Milan.



Walking around in the city enjoying some gelato we ended up at Il Duomo, a spectacular looking cathedral that is an absolute must when visiting the city of Milan.



After continuing to stroll for quite a while it was dinner time. Finally, **Madeleine** and **Klara** got to eat a gluten free pizza, thereby completing the full Italian experience! If you are looking for gluten free options (or other allergens really) we highly recommend Peperino e Milano, as they had a “normal” menu as well as a gluten free menu.



Annika, Anna, Kristian and **Lars** went to the *Naviglio canal district* for dinner at a nice restaurant.



8. Saturday 27 May

Last day - Return to Stockholm

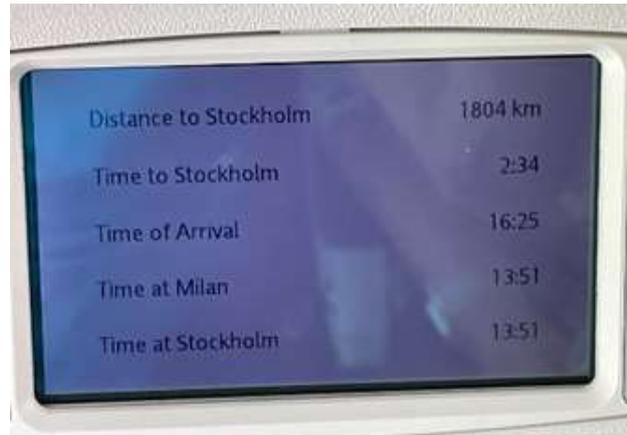
The following day we had breakfast at the hotel and had to leave from the hotel at 9.30.





We took the metro and then the bus in order to arrive at the **airport Linate** on time.





The flight was delayed for approximately 45 minutes, but in the end, we arrived safely to Stockholm Arlanda airport, full of new experiences and wonderful memories that we will never forget.

The end.....



JRC SUMMER SCHOOL ON NON-ANIMAL APPROACHES IN SCIENCE

Towards sustainable innovation



23-26 MAY 2023
JRC ISPRA
FINAL AGENDA

DAY 1 - TUESDAY, 23 MAY 2023

Welcome session

(Chair: Elisabet Berggren, JRC)

10:00-10:10 Welcome to the JRC Summer School (Guy van den Eede, Director Health and Food, JRC)

10:10-10:20 Setting the scene (Maurice Whelan, Head of Unit Systems Toxicology, JRC)

10:20-10:30 Programme & activities (Eva Åhs & Debora Valsesia, JRC)

Session 1: Animals & non-animal approaches in science

(Chair: Pierre Deceuninck, JRC)

10:30-10:45 Legal obligations and state of play in the European Union (Susanna Louhimies, DG ENV)

10:45-11:00 Animals used for scientific purposes: facts and figures (Pierre Deceuninck, JRC)

11:00-11:20 Coffee break

11:20-11:40 Encouraging a shift toward more human-focused biomedical research
(Jarrod Bailey, Animal Free Research UK)

11:40-12:00 Can we do good science without proper consideration of its methods and protocols?
(Sofia Batista Leite, EFSA & Annalisa Gastaldello, JRC)

12:00-13:00 World café - discuss together with the speakers

13:00-14:00 Lunch break

14:00-15:00 Student groups with coaches to prepare Thursday 3R lessons & Friday debates

Session 2: Non-animal approaches as interdisciplinary tools in science

(Chair: Joao Barroso, JRC)

15:00-15:20 Fit-for-Purpose & Fit-for-All: New Approach Methods as Interdisciplinary Tools
(Charu Chandrasekera, 3R Centre Canada)

15:20-15:40 Animals in the (petri) dish: Towards a truly animal-free laboratory
(Tilo Weber, German Animal Welfare Federation)

15:40-16:00 Humans: the ultimate animal model (Eleonora Chinchio & Antonio Franco, JRC)

16:00-16:30 Coffee Break

16:30-17:30 World café - discuss together with the speakers

17:30-18:30 Aperitivo



DAY 2 - WEDNESDAY, 24 MAY 2023

Session 3: Innovation in biomedical sciences: a sustainable perspective (Chair: Laura Gribaldo, JRC)

09:30-09:50 Human health and animal welfare: the ONE wellbeing concept (Laura Gribaldo, JRC)

09:50-10:10 Are new approach methodologies sustainable? (Marco Straccia, FRESCI)

10:10-10:30 Using human pluripotent stem cells for modelling neurodegenerative diseases
(Josep Maria Canals, University of Barcelona)

10:30-10:50 Studying the role of amyloidogenic proteins in misfolding diseases
(Louise Serpell, University of Sussex)

10:50-11:00 Q&A

11:00-11:30 Coffee break

11:30-12:30 World café - discuss together with the speakers

12:30-13:30 Lunch break

Poster session 1

13:30-14:00 10 Flash presentations in Plenary (Chairs: Lars Wiklund, KI, & Lucia Selfa Aspiroz, JRC)

14:10-14:40 10 Flash presentations in break-out groups (students divided into 5 groups)

14:40-15:20 Poster discussions (free format) & *Coffee Break*

Visit to ECVAM

15:40-18:00 In vitro facility visits (3 times 40 minutes) including the following activities:

- High Throughput Screening (Taina Palosaari, Anne Milcamps)
- High Content Screening (Peter Macko)
- Organ-on-Chip (Monica Piergiovanni) or Micro-electrode arrays (Emilio Mendoza)
- Virtual lab tour (Alberto Cusinato, Anne Milcamps, Emanuele Bonfanti)
or 'Omics (Julia Malinowska, Donatella Carpi)

In parallel: group meetings to prepare Thursday 3R lessons & Friday debates

DAY 3 - THURSDAY, 25 MAY 2023

Session 4: Innovation in regulatory toxicology

(Chair: Antonio Franco, JRC)

- 09:30-09:50 The zebrafish embryo model as a versatile high-content screening approach
(Stefan Scholz, Helmholtz Centre for Environmental Research - UFZ)
- 09:50-10:10 QSAR from A to Z, making a long story short, and how it serves regulatory purposes
(Ester Papa, University of Insubria, Varese)
- 10:10- 10:30 Assuring safety without animal testing – Unilever’s experience (Carl Westmoreland, Unilever)
- 10:30- 10:50 Chemicals 2.0: a long-term vision for EU chemicals legislation
(Andrew Worth & Elisabet Berggren, JRC)
- 10:50- 11:00 Q&A
- 11:00-11:30 Coffee break*
- 11:30-12:30 World café - discuss together with the speakers
- 12:30-13:30 Lunch break*

Poster session 2

- 13:30-14:00 10 Flash presentations in Plenary (Chairs: Lars Wiklund, KI, & Lucia Selfa Aspiroz, JRC)
- 14:10-14:40 10 Flash presentations in break-out groups (students divided into 5 groups)
- 14:40-15:30 Poster discussions (free format) & *Coffee Break*

Career session & Activity fair

15:30-16:30 Careers in non-animal approaches in science: panel discussion (Chair: Julia Malinowska, JRC)

Panel members: Jarrod Bailey, Charu Chandrasekera, Raffaella Corvi, Paola Occhetta, Stefan Scholz, Tilo Weber

16:30-18:00 Activity fair

- Students are invited to network with career panel members
- 4 presentations by student groups on 3Rs lessons
(coaches: Annika Hanberg, KI, Pierre Deceuninck, Laura Gribaldo & Annalisa Gastaldello, JRC)
- Organ-on-Chip Fair
 - Biomimix, Milano (Erika Ferrari, Stefano Piazza)
 - React4Life, Genova (Maurizio Aiello, Silvia Scaglione)
 - ECVAM TissUse device (Monica Piergiovanni, Emilio Mendoza)

18:30 Networking & Social dinner

DAY 4 - FRIDAY, 26 MAY 2023

Session 5: Debates*

(Chair: Stavroula Sampani & Elisabet Berggren, JRC)

09:00-09:05 Introduction and how we make this work

09:05-09:50 Debate 1: Animals & non-animal approaches in science

(coaches: Jarrod Bailey, Animal Free Research UK, Lucia Selfa Aspiroz & Valérie Zuang, JRC)

09:55-10:40 Debate 2: Non-animal approaches as interdisciplinary tools in science

(coaches: Charu Chandrasekera, 3R Centre Canada, Camilla Moia & Eleonora Chinchio, JRC)

10:40-11:00 *Coffee Break*

11:00-11:45 Debate 3: Innovation in biomedical sciences: a sustainable perspective

(coaches: Milena Mennecozi, JRC, & Marco Straccia, FRESCI)

11:50-12:35 Debate 4: Innovation in regulatory toxicology

(coaches: Ingrid Langezaal and Stavroula Sampani, JRC)

12:40-13:00 **Poster awards ceremony & closing remarks (Maurice Whelan & Elisabet Berggren, JRC)**

* 45 minutes Debate Format:

- 5' Introduction by the chair and initial voting by the audience
- 5' Argument for the motion (student 1, YES)
- 5' Argument against the motion (student 1, NO)
- 3' Rebuttal advocate (student 2, YES)
- 3' Rebuttal opponent (student 2, NO)
- 14' Discussion; each question or comment should be answered by both debaters.
- 3' Final conclusion by the advocate (student 3, YES)
- 3' Final conclusion by the opponent (student 3, NO)
- 4' Final voting by the audience