

Learning Scenario 6. Non-Animal Approaches in Science: Challenges and Future Directions (Summer School)

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 and how those can be applied in regulatory safety assessment and biochemical research.

Subject	Non-Animal Approaches in Science: Challenges and Future Directions – JRC Summer School
Author/owner/ possible copyright issues	European Commission Joint Research Centre, Unit F.3 Chemicals Safety and Alternative Methods incorporating the EU Reference Laboratory for alternatives to animal testing (EURL ECVAM). JRC-F3-SUMMER-SCHOOL@ec.europa.eu
Topics	Legal obligations, strengths and limitations of animal and alternative methods, alternative (<i>in vitro</i> and <i>in silico</i>) methods and integrated approaches, future challenges.
Eligible student level	Postgraduate students and early-career scientists (max. four years after Master/PhD).
Teaching time	25 hours divided over four days. 13h are dedicated to networking activities.
Examples of online teaching material	Sli.do (audience interaction tool).
Examples of offline teaching material	Flipcharts. Slides prepared by the lecturers. USB key with relevant background material.
Helpful resources	The JRC Summer School booklet including programme, bio sketches, contacts, lecture and poster abstracts.
Licenses, certification or accreditation	A certificate of attendance is provided to the students who attend the whole course.
Integration in curriculum	This summer school has been developed as a stand-alone course. Students that are already enrolled in a Master or doctoral programme can attend it.
Examination	No examination
Aims and learning objectives / outcomes	<p><i>Subject-specific outcomes:</i></p> <ul style="list-style-type: none"> • Examine the legal obligations and state of play of replacing animals for scientific purposes in the European Union and North America. • Compare strengths and limitations of animal vs alternative approaches. • Discover novel applications of <i>in vitro</i> methods (e.g. developmental neurotoxicity testing, animal-free cultures, 3D cultures and organ-on-chip systems). • Apply computational methods to specific cases (e.g. Predictive toxicology and drug development, threshold of (eco-)toxicological concern for aquatic toxicity, biokinetic modelling, human <i>in silico</i> clinical trials). • Combine non-animal methods into integrated solutions (e.g. Biomarkers and mode of action in pharma development, high

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	<p>throughput methodologies, adverse outcome pathways, regulatory uptake of combined methods for skin sensitisation).</p> <ul style="list-style-type: none"> • Consider the future challenges of alternative methods (e.g. Genomics data for chemical safety, alternatives to respiratory tract disease, endocrine disruptors, links between diseases and chemicals in the environment). • Identify some activities carried out in a lab where non-animal approaches are used. • Defend an argument in a public debate and learning by preparing arguments (specific arguments were: a) are legal obligations necessary to support the Three Rs? b) can computational methods provide stand-alone solutions? c) do adverse outcome pathways have a future for regulatory toxicology? d) can we do science without animal experiments?). <p><i>Core academic outcomes:</i></p> <ul style="list-style-type: none"> • Communicate your own research to peers. • Communicate your ideas and solutions effectively. • Produce a poster. • Think critically. • Apply learning. • Create a professional international network. <p><i>Personal skills outcomes:</i></p> <ul style="list-style-type: none"> • Work in a team. • Time and resource management. • Conflict resolution. • Demonstrate respect for others' opinions.
Activities/ programme	<p>The programme of the summer school is publicly available. The activities can be carried out over several days. See the following detailed table.</p>
Assignment	<p><i>Individual pre-assignment:</i> Students are asked to bring a poster describing their own studies, interests or work area related to the topics of the Summer School. Some of the poster abstracts are selected for flash oral presentations. No mark is assigned.</p> <p><i>Continuous assessment:</i> Some lectures use a quiz to assess students' knowledge. No mark is assigned.</p> <p><i>Group assignment:</i> A debate session is held with students divided into groups. Assisted by their coaches, they have to research topics, prepare for the debate with their team, and be ready to respond to any arguments while they practice public speaking. No mark is assigned.</p>
Student and teacher feedback	<p>Students are asked to fill in a feedback form on:</p> <ul style="list-style-type: none"> • The appropriateness of time, quality and information provided by the presented topics. • Expectations of the course. • Logistics and organisation.

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	<ul style="list-style-type: none">• Suggestions for improvements.• What they liked and did not like.
Helpful Resources	