

RESISTANCE ELEMENTS — DAY 8			
Time	Activity Description	Intended Learning Outcomes	Relevance
		<i>After completion, trainees will (be able to):</i>	<i>Why this is important for you as:</i>
0930-1100	Mobile Genetic Elements: Plasmids (Alessandra Carattoli)	<p>Comprehend the structure, diversity, and evolutionary dynamics of plasmids,</p> <p>Understand plasmids' role in transmission of antibiotic resistance genes, and the emergence of clinically significant plasmid variants</p>	<p><b>Bioinformaticians</b> will learn about plasmid structure, diversity, and evolutionary mechanisms, which will represent a foundational knowledge when learning which bioinformatic tools to employ for their identification and characterization, aiding in large-scale genomic analyses and contributing to our understanding of plasmid-mediated gene transfer and dissemination.</p> <p><b>Microbiologists</b> will deepen their knowledge about the structure and diversity of medically-relevant plasmids, in particular those spreading antibiotic resistance, and how to support epidemiologists in establishing effective control measures for AMR spread..</p> <p><b>Epidemiologists</b> will learn the significance of plasmids in the spread of AMR genes in outbreaks and healthcare settings, thereby mitigating the impact of plasmid-mediated antibiotic resistance in public health.</p>
1110-1240	Plasmids detection tools (Gabriele Arcari)	Practical exercises with tools for plasmid detection, and classification	<p><b>Bioinformaticians</b> will acquire knowledge on the best computational tools for plasmid detection, typing and classification.</p> <p><b>Microbiologists and epidemiologists</b> will learn how plasmids can be detected bioinformatically and linked to medically-relevant characteristics such as AMR genes and virulence genes, and how genomics can support phenotypic and epidemiological observations.</p>
1400-1530	Case study: Plasmids outbreak (Gabriele Arcari)	Hands-on experience on analysis of medically relevant plasmids, including plasmid typing and classification, and plasmid structure	<p><b>Bioinformaticians</b> will develop their expertise on medically-relevant plasmids with hands-on exercises.</p> <p><b>Microbiologists and epidemiologists</b> will apply their knowledge on medically-relevant plasmids with hands-on exercises.</p>

## Details

### MGE - Plasmids part 1

The course on "MGE I - Plasmids" provides a comprehensive theoretical training on the structure, diversity, and evolutionary dynamics of plasmids, and will be useful to participants with diverse backgrounds, including bioinformaticians, microbiologists, and epidemiologists. Participants will delve into the intricate mechanisms underlying plasmid structure and diversity, exploring their role in bacterial adaptation and the dissemination of antibiotic resistance genes. Participants will gain insights into the evolution and recombination of plasmids, focusing on medically important variants. By the end of the course, participants will have acquired essential knowledge and skills to interpret plasmid genomic data, enabling them to contribute effectively to research and public health efforts targeting plasmid-mediated antibiotic resistance.

#### Mobile genetic elements – Plasmids detection tools

This course offers participants an in-depth hands-on exploration of plasmid sequences. We will delve into plasmid detection methods using one or two tools (such as mPlasmids, pATLAS, PLSDB) and plasmid assembly. Participants will also learn the practicalities behind plasmid typing tools (such as PlasmidFinder, MOB), enabling them to analyze plasmid populations and their impact on microbial communities.

This course offers comprehensive training in using local alignment and linear comparison tools for genomic analysis. Through an interactive session and hands-on exercises, participants will learn to use tools like EasyFig and clinker for local alignment to conduct detailed comparisons of genomic sequences. By the end of the course, participants will acquire essential skills in genomic visualization, enabling them to interpret genomic data effectively and apply it to their respective fields, thereby advancing research and public health efforts.

#### Case study: Plasmids outbreak

This hands-on course provides participants with practical experience in analyzing medically relevant plasmids, encompassing plasmid typing, classification, and structural analysis. Through this case study on medically-relevant plasmid outbreaks, participants will gain valuable insights into the genetic determinants underlying microbial pathogenicity and antimicrobial resistance.