

Developing a new simulator of the rat for laboratory animal training courses using 3D-printing

Persons, which are involved in animal experimentation, must possess the necessary knowledge and skills. These are often mediated through laboratory animal training courses, where the participants learn the basic theoretical knowledge and practical techniques such as handling, blood sampling and oral administration. These courses often involve living animals, mostly rats and mice and therefore are, according to the Directive 63/2010/EU, classified as animal experiments. As the directive additionally demands the implementation of the 3Rs, simulators of the rat and mouse were developed and intended to serve the participants as an initial training device for various techniques, prior working with live animals. Nevertheless only little is known about the simulators' frequency of use, efficiency and practical suitability. For this reason, the collaborative research project "SimulRATor evaluated all five commercially available rat and mouse simulators. In this multi-perspective approach, their strengths and weaknesses were determined and a requirement analysis was created. By doing so specifications needed for the development of a new, anatomically and haptically realistic and cost-effective 3D-printed simulator of the rat could be defined.

For the creation of the required 3D model, already existing computed tomography scans of a 12-month-old Wistar rat were used. By using software such as Slicer, Blender and CATIA V5, the anatomy, posture have been modified and functional elements were included. Most simulator parts were then produced using Multi-Jet-Modelling (MJM). This enabled the combination of different types of soft and hard materials within the building process. For the creation of the skin, a conventional casting technique by mold-modelling using silicone rubber is used as the available printer materials were not soft enough. The new simulator is nearly finished, though ongoing construction work is focusing on the implementation of a microcontroller and sensors in order to examine the quality of the training procedures and thus quantify learning success.