

Round Table Module 1 (Probes) entitled: Emerging chemical tools, techniques, and methods for the realization of competitive biological projects

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The objective of this round table was to finalize the Module 1 “Probes” module by bringing together the workshop leaders, the module speakers and the participants particularly interested in this theme, and to offer the opportunity for informal exchanges around the challenges to come for the field and in particular the interaction between chemists and biologists. A special focus was set on the access and training to emerging chemical techniques and methods for the realization of competitive biological projects. This round table was proposed together with the national infrastructure France Bio Imaging, FBI, specifically the Work Package 3 (Probe development, Optomanipulation & Optogenetics), represented by Ludovic Jullien and Giulia Bertolin.

This round table attracted approximately 30 participants, represented by senior and junior researchers, research engineers, especially those running bioimaging platforms. We should highlight that the round table was particularly active with majority of attendees participating by sharing their opinion and experience. Several key subjects were intensively discussed:

1) **New labelling techniques for optical microscopy.** Chemical labelling of biomolecules in cells was compared with genetically encoded labelling, revealing strong and weak points. It was stressed that the small size of the label/probe is critical to minimize imaging and biological artefacts. Moreover, genetic modification, such as use of protein tags, is not always possible, especially with primary cells and, therefore, the need for innovative techniques based on chemical labelling as well as affinity-based labelling by nanobodies and aptamers was highlighted.

2) **The interaction of biologists and chemists was discussed and the ways to improve it.** On the one hand, chemists prefer to finalize their research at the proof of the concept level, while biologists would like to have robust mature tools in order to dig deeper into their specific biological problem. Therefore, it was underlined that the best strategy would be combine chemical innovation with an important application that answer a fundamental biological question.

3) **The key question was how to make the new chemical tools (probes) available for the community of biologists.** The important aspects here were visibility of the chemical tools for biologists, their ready availability and sustainability to ensure their long-term applications. In particular, the importance of their commercialization was highlighted and real examples of some probes brought to the market were described. Alternative strategy was to make the probes freely available within a generalized “probe library”, as it was done by “AddGene” for molecular biology. However, the second approach is challenging, because it would require significant investment to ensure quality of the probe, robustness and simplicity of its application, and finally interpretation of the results. The idea of creation of a large platform was discussed, which combines chemists and biologists working together on synthesis and validation of new chemical tools.

In conclusion, the round table revealed a number of key research directions in the field of new chemical tools for bioimaging as well as current needs and requirements from the biology community. It also showed the strong interest of biologists in the new probes developed by chemists. However, in this respect, it is important to ensure quality control of the probe, robustness of its application and its availability in the long term, which are generally realized by active commercialization of the new chemical tools.