Summary of Probes and Biosensors break-out session

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Participants:

Name	Affiliation
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Discussion:

1. Present state

Even though recent probe development is central for the ongoing remarkable advances in research and medical imaging, there is still plenty of room for probe improvements. In general, optimal probes have good sensitivity, target-specificity, and signal-to-noise ratio. Depending on the application, specificity may be for a cellular/tissue structure/type, or a disease. In addition, the probe has to be able to reach its target but it should not affect the activity of the molecule it binds.

Poor cell membrane and tissue penetration of present probes is a serious problem for live cell and in vivo imaging. For long-term imaging, improved photostability of fluorescent probes is needed. None of the probes currently available are ideal for tracing cell lineage. In high-resolution imaging, there is a demand for brighter, smaller, and more photostable probes. Ideally, probes should allow multimodal imaging.

Translational and clinical research would benefit from probes that could be translated from lab to clinic and patient use. At present, there are very few probes that are approved for human use and the regulatory requirements for testing and manufacturing any such new probe are far too heavy for any one laboratory. For example, lack of suitable probes makes it difficult to apply in vivo fibre-optic confocal microscopy to clinical use.

Probes are usually made by chemists but used by biomedical researchers. As these two groups do not generally interact much, improving probes is sometimes difficult; biologists do not know how to design and synthesize probes and chemists do not get feedback from the researchers who use the probes.

2. What is needed

Lack of connectivity between chemists, biologists, as well as translational, pharmaceutical, and medical researchers is a major concern for probe development:

scientists are not aware what is needed or available in other fields. Collecting and/or helping researchers finding relevant information is important. Also, courses and meetings are necessary for cross-disciplinary training and networking.

Several commonly used fluorescent probes are discarded drug candidates from drug discovery screens. Compound mining of previous screening projects of pharmaceutical companies is a promising new tool of finding new probes.

3. Action points

Helping researchers finding relevant information

There are a couple of listservs in which probes used in imaging are discussed. Confocal list (http://lists.umn.edu/cgi-bin/wa?A0=confocalmicroscopy) is an email list for light microscopy, and cytometry list is for flow and image cytometry (https://lists.purdue.edu/mailman/listinfo/cytometry).

The BioImagingUK web site should include these links and other information on probes.

Collecting probe information

Tony Gee (King's College) is Chair of the BioImagingUK Probes and Biosensors Working Group. Everyone is encouraged to send information on probes and biosensors to Tony (antony.gee@kcl.ac.uk) who will collect the information on the BioImagingUK web site.

Information is needed on e.g. what kind of probes are available, problems with probes, and imaging platforms where probes are used. Platforms include light microscopy, Raman, magnetic resonance (MR), ultrasound, micro computed tomography (microCT), electron microscopy (EM), and positron emission tomography (PET) imaging. Information on probes that can be used for correlative imaging across platforms is especially valuable.

Having reviews on probes would also be useful – did the probe work or not, under what conditions etc. User ratings, similar to the ones used by online stores, could be helpful as well.

Connectivity

An informal meeting where researchers across disciplines will get together and discuss probes and biosensors should be held. Networking may also enhance collaborative efforts and lead to grant proposals for probe design. BioImagingUK Probes and Biosensors Working Group should take an active role in planning the meeting.