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Single cell biochemistry to visualize antigen presentation and drug resistance

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Preface

Single Cell Biochemistry

Many cellular processes are studied by biochemical techniques. Usually, this involves experiments where large number of cells are lysed, protein content is subsequently isolated and studied using antibodies to detect changes in protein levels, post-translational modifications, pairing with partner molecules, etcetera. Although extremely informative in many cases, these mass population analyses often lack the time resolution to study rapid alterations in protein state, and do not allow the characterisation of highly dynamic processes. Moreover, analysis of millions of cells at once evidently shows the average response in the population of cells, thereby obscuring cell-to-cell variation and the dynamic range of a process. Finally, sub-cellular compartmentalisation of reactions is difficult to assess in these whole-cell approaches.

With the availability of microscopic techniques in combination with genetically encoded fluorescent probes, many of the

described restraints have been overcome. Highly dynamic reactions can now be studied in detail in a relatively easy manner, and in the context of a living cell, hence “single cell biochemistry”. In this way, we studied two different cellular processes, antigen presentation and drug resistance in unprecedented detail. Both parts seem at first unrelated, yet are interconnected through the use of similar techniques. Assessment of individual cells using sensitive microscopic measurements, has led to important and detailed understanding of the dynamic processes involved in both topics.

