

Creation of an Antibody-based Subcellular Protein Atlas

Protein localization on a subcellular level is essential to map and characterize the human proteome and to better understand the cellular functions of proteins. Confocal microscopy is a powerful method for studying the subcellular distribution of proteins, yielding high-resolution images of the most intricate cellular substructures.

Antibodies produced in the Human Protein Atlas project are used to systematically localize proteins in three human cell lines of functionally different origin^{1,2}. Four-color images of the protein of interest and markers for nuclei, microtubules, and endoplasmic reticulum are acquired using high-resolution confocal microscopy. All images are manually annotated in terms of protein distribution, staining intensity, and characteristics. In total, 17 different subcellular locations are annotated.

We will discuss the development and progression of a subcellular protein atlas, as part of the Human Protein Atlas portal (proteinatlas.org). Currently, the subcellular data comprises >50,000 high-resolution, annotated confocal images corresponding to the analysis of over 8,000 proteins in the three human cell lines. A global analysis reveals that 85% of the examined proteins are clearly localized, indicating that antibody-based subcellular profiling is a viable approach³. As much as 35% of proteins localize to multiple subcellular compartments, reflecting the dynamic behavior of cells. Hierarchical clustering reveals distinct organelle proteomes, common for all three cell lines and a strong correlation to protein function. Further, we present the development of a platform for systematic validation of antibody specificity and protein subcellular location using siRNA. The presented atlas aims to provide publicly available information on subcellular information for all human proteins with the ultimate aim to facilitate functional studies of proteins.

References

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2. Barbe L, et al. Toward a confocal subcellular atlas of the human proteome. *Mol Cell Proteomics* 2008;7(3):499-508.
3. Fagerberg L, et al. Mapping the subcellular protein distribution in three human cell lines. *J Proteome Res* 2011;10(8):3766-3777.



About Dr. Lundberg

Dr. Emma Lundberg is the current head of the Subcellular Profiling group within the Human Protein Atlas project at the Royal Institute of Technology, Sweden. Additionally, she serves as manager of the Cell Profiling facility at the new Science for Life Laboratory Research Center in Stockholm since 2010. Dr. Lundberg received her Ph.D. in Biotechnology in 2008 and holds a M.Sc. in Biotechnological Engineering, both from the Royal Institute of Technology. The primary focus of her research is the development and use of techniques for studying protein expression, localization, and function in human cells based on the use of specific affinity reagents and microscopy.

