Structural Biology Research Center: strategy and progress

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The Structural Biology Research Center (SBRC) was established in May, 2003. The main objective of the SBRC is to establish a center of excellence in structural biology by combining cutting edge research and state-of-the-art beamline developments. Synergy between the two is of crucial importance.

On the structural biology research side, we focus on protein transport and post-translational modification. Membrane trafficking plays crucial roles in cell functions such as post-translational modification of newly synthesized proteins, exocytosis and endocytosis, receptor recycling and autophagy. Vesicle transport mediates these trafficking events using a complex network of protein-protein interactions between proteins containing multiple domains. Their interactions are often weak and transient, but specific for correct intracellular protein transport. Results of the structural studies on membrane traffic between the trans Golgi Network and endosomes/lysosomes, and ubiquitin recognition in the receptor recycling will be presented to illustrate our approach of the on-site structural biology research program.

We employ a systems approach for developing X-ray protein crystallography beam lines at the Photon Factory. The beam lines provide state-of-the-art, user-friendly experimental environment including crystal exchange robots based on the SSRL system (SAM). To date we have installed three insertion-device MAD beam lines (PF BL5A, BL17A & PF-AR NW12A) where high quality datasets can be collected in 5~30 minutes. They are equipped with user-friendly software, highly accurate diffractometers and fast-readout CCD detectors. The original single tong design of the SAM robot has been modified to a compact double tong which allows for much faster crystal exchange, 8 to 10 seconds. The most recent projects include two new insertion device beam lines. The former, PF BL1A, is part of the new national project, Protein Target Research Program of the MEXT. Here, SPring-8, Photon Factory, Hokkaido Univ., Osaka Univ., and Kyoto Univ. are collaborating to build two complementary micro-focus beam lines and to develop techniques to facilitate user access at the two synchrotron sites, for instance, double sided cassettes usable for both SPring-8 and SAM crystal exchange robots. The other beam line PF-AR NE3A is being build for Astellas Pharma Inc.. This beam line will also be used for other demanding academic structural biology projects