CELLPAT CENTRE FOR CELLULAR SIGNAL PATTERNS

Danmarks Grundforskningsfond
Danish National Research Foundation

Annual Report 2018 - Highlights

About the centre:
CellPAT was inaugurated on Nov 1st 2017 with Jørgen Kjems (iNANO, AU), Duncan Sutherland (iNANO, AU), Steffen Thiel (Biomedicine, AU), Fiona Watt (KCL, London) and Ralf Jungmann (MPI/LMU, Munich) as founding members. The aim of the centre is to establish a fundamental understanding of how cells receive and process complex instructions through multiple weak interactions (multivalency) arranged in specific patterns (pattern recognition).

Top events in 2018:

-> CellPAT held its first annual meeting at Kaløvig Badehotel; 26 participants from the five partner labs enjoyed a dense program of scientific presentations and networking.

-> 6 new PhD students were hired across the 5 partner labs

-> CellPAT centre leader Jørgen Kjems received the 2018 Novo Nordisk Prize for his contributions to RNA research. This was celebrated with a 1-day prize symposium held in Copenhagen in November 2018.

Research highlights 2018:

-> A paper from Ralf Jungmann's lab described how nanobodies and aptamers can be used to increase resolution and target molecule range for super-resolution microscopy (Strauss et al 2018, Nature Methods). This technique allows highly accurate localisation of specific molecules within cells and forms the basis for several ongoing and future projects in CellPAT.

-> The Kjems lab has developed a macromolecular structure (termed a Holiday Junction or HJ) made from modified RNA oligo-nucleotides. The HJ structure can be functionalised with different types of drugs and ligands, allowing LEGO-style construction of a complex that can target cells with a specific number of ligands with distances controlled at nanoscale (Andersen et al 2019, Theranostics).

-> CellPAT partner Fiona Watt studies how stem cells develop to support the formation of healthy skin. Her lab recently published a paper that describes how nano-structures in the environment can affect mobility and differentiation of skin stem cells (Zijl et al 2018, Acta Biomaterials).

-> One of the most famous examples of specificity and recognition in biology is found in immunology where both the innate and the adaptive immune system help the body distinguish between self and non-self. In 2018, the Thiel/Degn labs established a genetically-modified mouse model that will be used to study how immune signalling is initiated in a specialised cell type, called B-cells. In addition, the HJ construct developed by the Kjems lab can now be used to test how the frequency and orientation of specific ligand molecules, normally found on the surface of bacterial pathogens, determine the strength of the immune response.