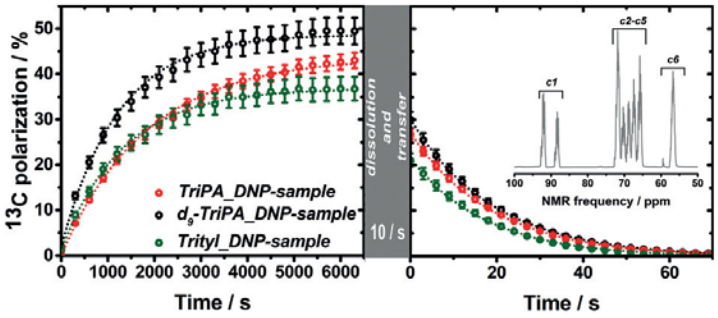
Highlights in 2018

The short lifetime of the hyperpolarized signal restricts novel, valuable applications for the enhanced MR signal in research and the clinic. The center experiences great momentum with a promising mitigation method; free radicals generated by UV-light irradiation may allow us to maintain a hyperpolarized signal for significantly longer, and to store and transport hyperpolarized samples. We have previously published record-high polarization with UV-radicals on pyruvate, the commonly used contrast agent. In 2018, we were first to demonstrate UV-radicals on another contrast agent than pyruvate, glucose, again with high polarization (32%). Glucose is a highly interesting substrate as it is central for both energy metabolism and anabolic reactions. (Capozzi et al, Angewandte Chemie 57, 2018).



We published our design for a novel polarizer platform with superior performance and usability (Ardenkjær-Larsen et al, Magnetic Resonance in Medicine 81, 3). The first experiments demonstrate very high polarization (70%) as well as opportunities for further optimization. The polarizer system has been built to support the HYPERMAG center's specific research activities, but meets a number of key requirements for in vitro, preclinical and clinical applications, which has sparked interest in the hyperpolarization field. Recognizing that the new design fills a gap in the research community, Center Leader Jan Ardenkjær-Larsen has established a start-up company, *Polarize*, to produce and market duplicate systems for preclinical applications of hyperpolarized MR.

Infectious diseases are caused by bacterial pathogens, which invade the living host and affect its health. The metabolism of pathogens is recognized to be a fundamental aspect of host-pathogen interaction, but it remains very poorly understood. We have exploited the vast signal enhancement of hyperpolarization to obtain our first results from infected host cells with the intracellular pathogen *shigella flexneri,* which causes life-threatening bloody diarrhea. In initial studies, using hyperpolarized glucose as metabolic contrast agent, we are able to observe highly interesting differences in the metabolic fingerprint of the isolated pathogen and the pathogen in the infected host cell (changes in levels of acetate, formate, pyruvate and lactate). This can give us new detailed information about the interaction between pathogen and host during infection and may ultimately lead to novel antimicrobial targets.