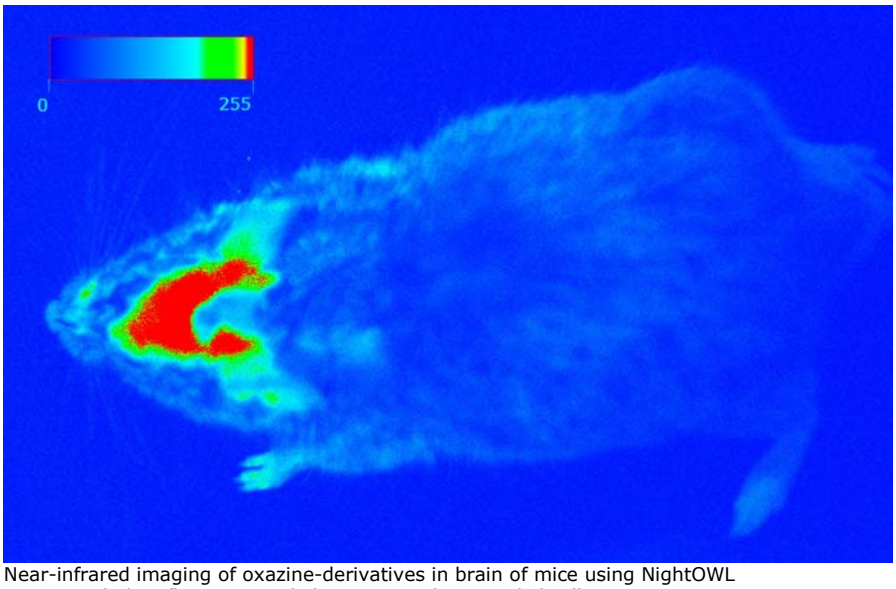
NIR fluorescence In vivo Imaging of amyloid-beta deposits caused by Alzheimer disease.

As Alzheimer's disease pathogenesis is associated with the formation of insoluble aggregates of amyloid beta-peptide, approaches allowing the direct, non-invasive visualization of plaque growth in vivo would be beneficial for biomedical research. Nowadays this is possible with new synthesised near-infrared fluorescence oxazine dyes, which readily penetrate the intact blood-brain barrier and bind to amyloid plaques. Using near-infrared fluorescence imaging, specific interaction of these dyes with amyloid plaques in transgenic mice in vivo was shown and confirmed by postmortem analysis of brain slices. Quantitative analysis revealed increasing fluorescence signal intensity with increasing plaque load of the animals, and significant binding of such oxazine dyes was observed. Thus, oxazine dyes are an attractive probe to non-invasively monitor disease progression in animal models of Alzheimer disease and to evaluate effects of potential Alzheimer disease drugs on the plaque load.

NightOWL LB 981 with fluorescence light source can be used for such fluorescence detection in-vivo. For even excitation illumination a ring light was used for epi-illumination, mounted 15 cm above the mice. For excitation a 630 nm (20 nm) filter, for emission a 750 nm (60 nm) was used. Exposure time was 200 ms for the image below.



Near-infrared imaging of oxazine-derivatives in brain of mice using NightOWL LB 981 including fluorescence light option and epi-ringlight-illumination.

Since the excitation light source is always in the same height, the excitation energy will be constant for easier comparison of fluorescence emission. With WinLight the images can be evaluated quantitative. Pseudocoloring was used in the image above to show the fluorescence location more clearly.

The light energy of quartz tungsten halogen lamps with integral reflector is high enough in the infra-red region to excitate the dyes strongly. Exposure times with the NightOWLcam NC 320 are normally between 30 ms and 500 ms. The camera resolution with 2184 x 1472 pixels is excellent, resulting in a total resolution better than 50 µm (sample size 100 mm).

In the near future more oxazine derivatives or other fluorescence dyes will be sythesised and characterised for the near infrared region. NightOWL imaging system can be adjusted to these new dyes using appropriate filter combinations.