

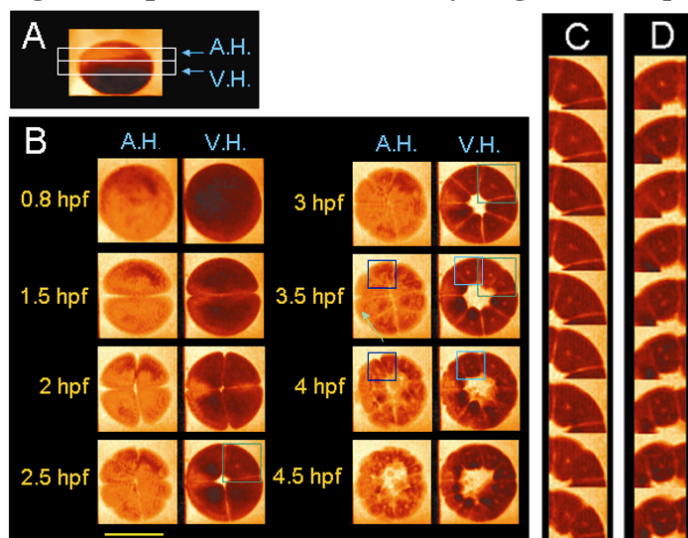
IN VIVO MR MICROSCOPY IN XENOPUS LAEVIS OOCYTES AND EMBRYOS

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In vivo magnetic resonance spectroscopy (MRS) and magnetic resonance imaging (MRI) are non-invasive techniques increasingly used to observe regions of a human or animal body in detail. Despite ongoing technological advancements, a resolution barrier so far prevented MRS from applications to different intracellular regions within a single living cell. Using a high sensitivity microscopy probe, we obtained voxel dimensions below the size of cell compartments and, for the first time, *in vivo* MR spectra of subcellular regions – from the nucleus as well as from both the animal and vegetal cytoplasm of a *Xenopus* oocyte. The spectra were quite distinct in these three compartments. Upon immersion of the oocyte in a solution containing an external drug, diminazene aceturate, uptake kinetics could be determined for each compartment. Subcellular MR imaging has so far only been reported on static cells. We applied it to a developing *Xenopus laevis* embryo and monitored dynamic intracellular features during mitotic cleavages. Moreover, entire developmental stages of a single embryo, from before the first cleavage until shortly prior to hatching, could be imaged *in vivo*.

Fig. 1 Temporal series of the early stages of *Xenopus laevis* embryonic development.



(A) Sagittal slice image of the zygote. Two slices for axial sections are indicated. The upper part is the animal region, and the lower part is the vegetal region. (B) Axial slice images from the zygote to the blastula stage. A.H.: animal hemisphere, V.H.: vegetal hemisphere. (C) Close-up of cell divisions. (D) Cell divisions in the light blue-boxed cell during 3.5 – 4.1 hpf.