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Theses of the PhD dissertation

1. Application of a catalytically inactive, Flag-ΔUNG-DsRed construct uniquely allows *in situ* microscopic visualization of uracil residues within bacterial DNA, either indirectly *via* immunocytochemistry against the Flag tag or directly *via* the fluorescent DsRed signal. This labeling method has the potential to be further extended for detection of uracils within the highly complex chromatin of human cells.
2. The dUTPase encoding *dut* gene can be successfully targeted by CRISPR/Cas9-mediated gene editing to study the effects of dUTPase deficiency *in vivo* in mice.
3. Using CRISPR/Cas9 system in mice, only heterozygous *dut* +/- offspring could be achieved, while viable homozygous *dut* -/- offspring could never be found, implying that dUTPase deficiency lead to prenatally lethal phenotype.
4. Investigation of dissected embryos at different developmental stages, showed that homozygous *dut* -/- mutant embryos exist only in blastocyst stage, but not at later stages, suggesting early embryonic lethality in the absence of dUTPase in mice.
5. *In vitro* outgrowth assays demonstrated that both ICM and TE formation are significantly impaired in *dut* -/- blastocysts, indicating that lack of dUTPase may cause developmental defects leading to lethality around implantation into the uterus.
6. Examination by Western blots showed that *dut* +/- heterozygous embryos contain significantly reduced dUTPase protein level as compared to WT embryos, which difference might also apply for adult animals.