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Protein expression patterns and activities of two metabolic enzymes (CS and LDH) highlight a disturbance in the metabolic pathways of tree frogs living in the Chernobyl Exclusion Zone

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#282 - PROTEIN EXPRESSION PATTERNS AND ACTIVITIES OF TWO METABOLIC ENZYMES HIGHLIGHT A DISTURBANCE IN THE METABOLIC PATHWAYS OF TREE FROGS LIVING IN THE CHORNOBYL EXCLUSION ZONE.

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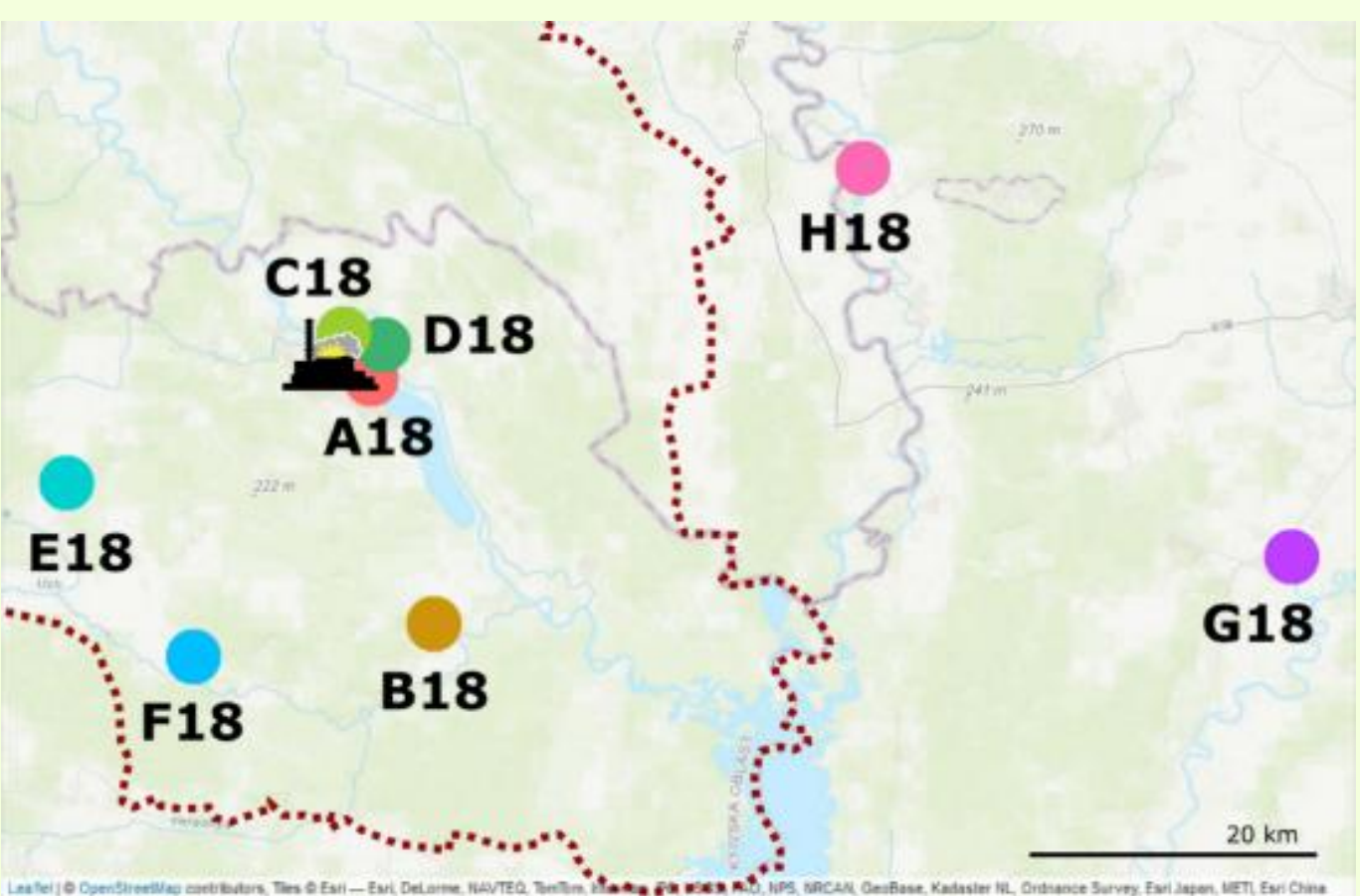
CONTEXT - ECOLOGICAL RADIATION PROTECTION & ENVIRONMENTAL SPECIES

- Lack of knowledge on long term impact of radiocontamination on wildlife following nuclear fallouts¹.
- Focus on amphibians: sentinel species for the ecosystem and human health²⁻⁶ + reference animals of the International Commission for Radiological Protection⁷
- Comprehensive population health study of *Hyla orientalis* (males) living in different Chernobyl areas for 15 generations showed in the most radio-contaminated areas: (i) a high rate of mitochondrial mutations⁸, (ii) a modulation of genes relative to energy metabolism⁹, (iii) small population size with a higher affiliation rate^{7,9}

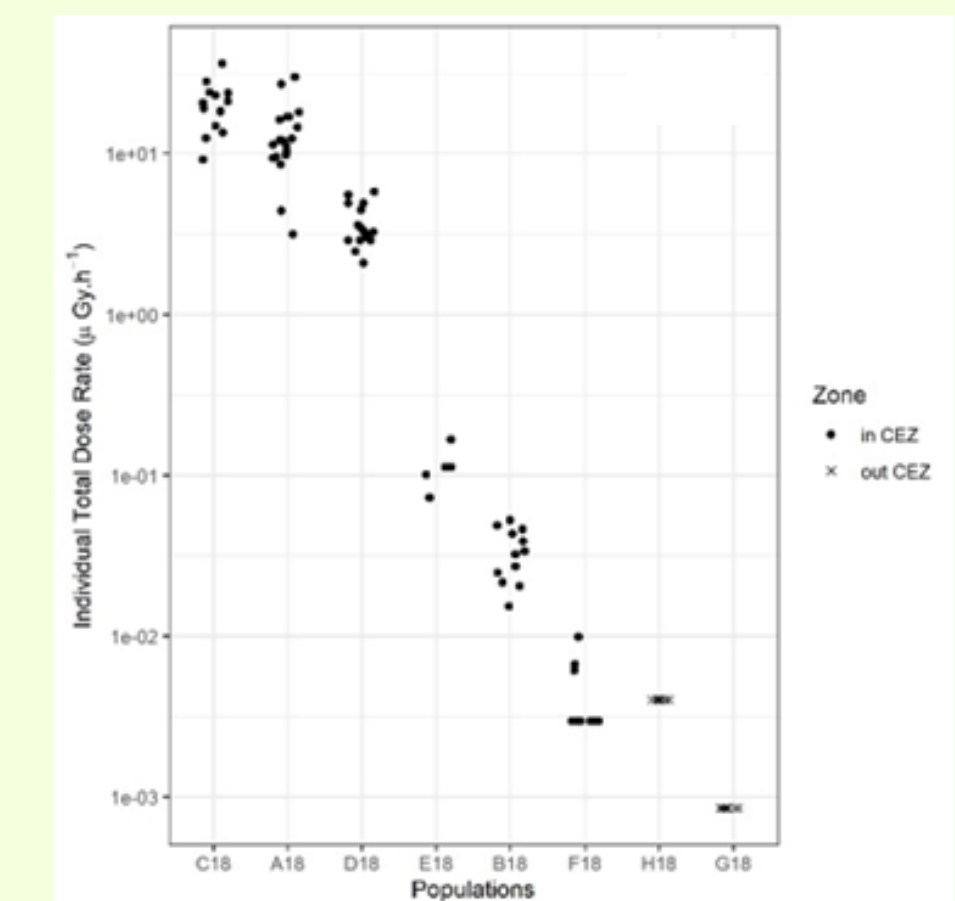


➔ Health status ?

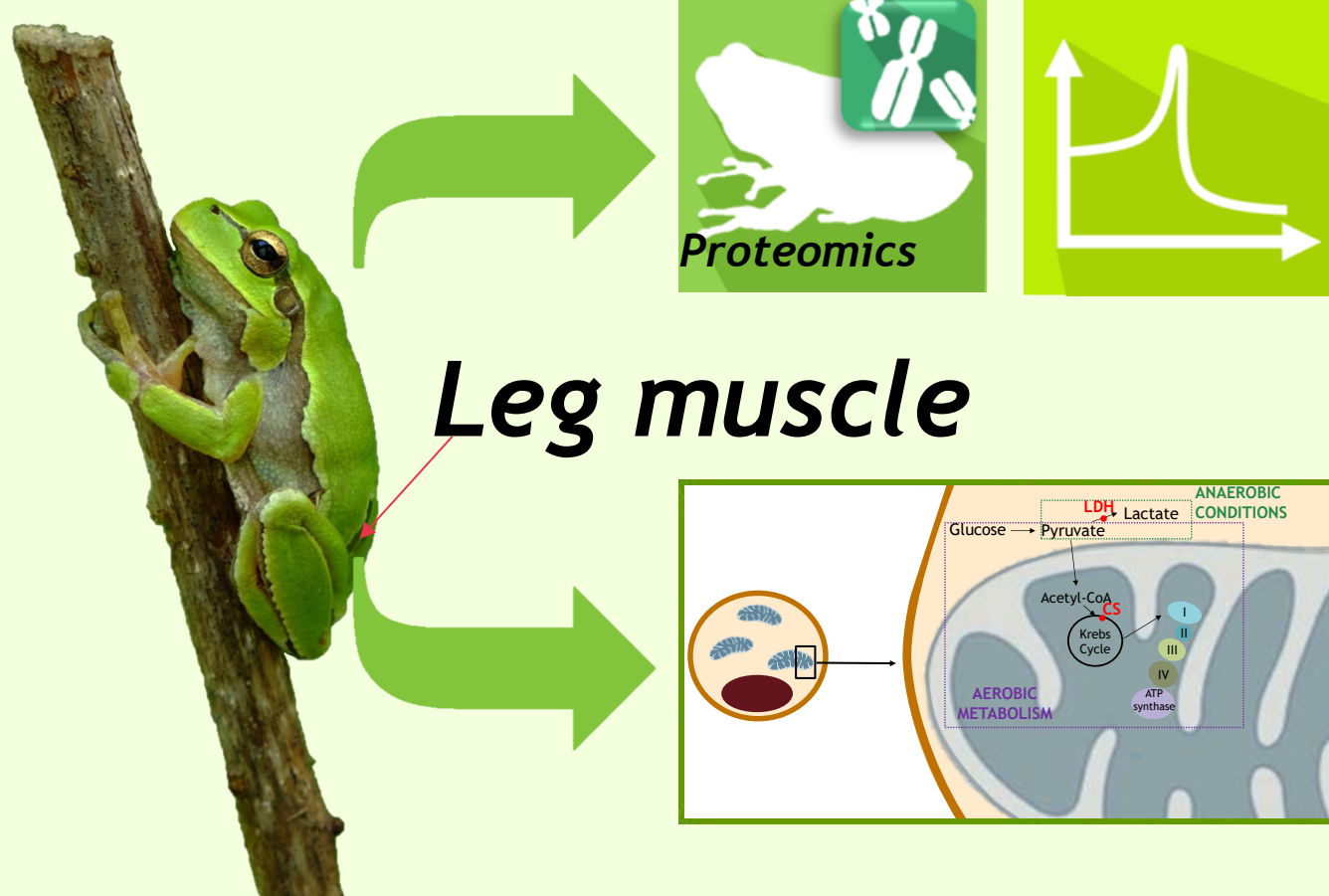
MATERIAL & METHODS



Chernobyl exclusion zone map with sampling areas of tree frogs



Dose rate (μGy.h⁻¹) for each individual of each site⁷

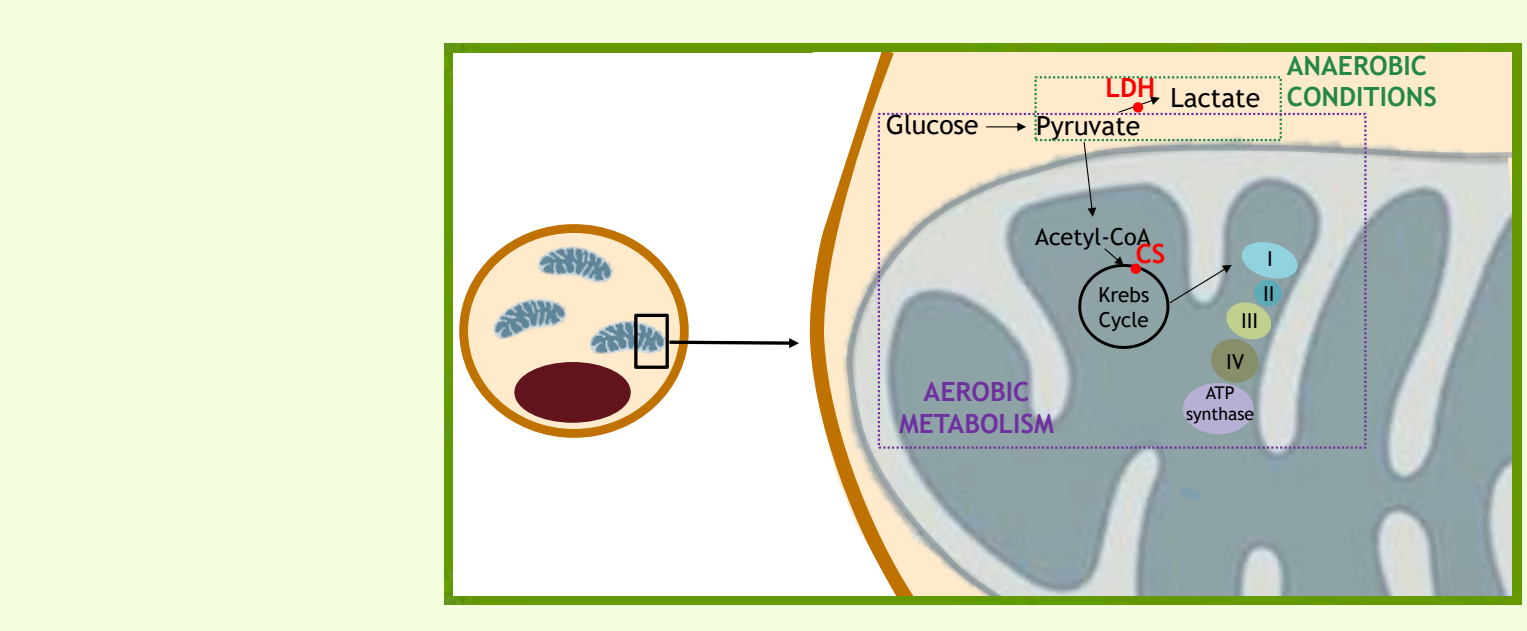


Leg muscle

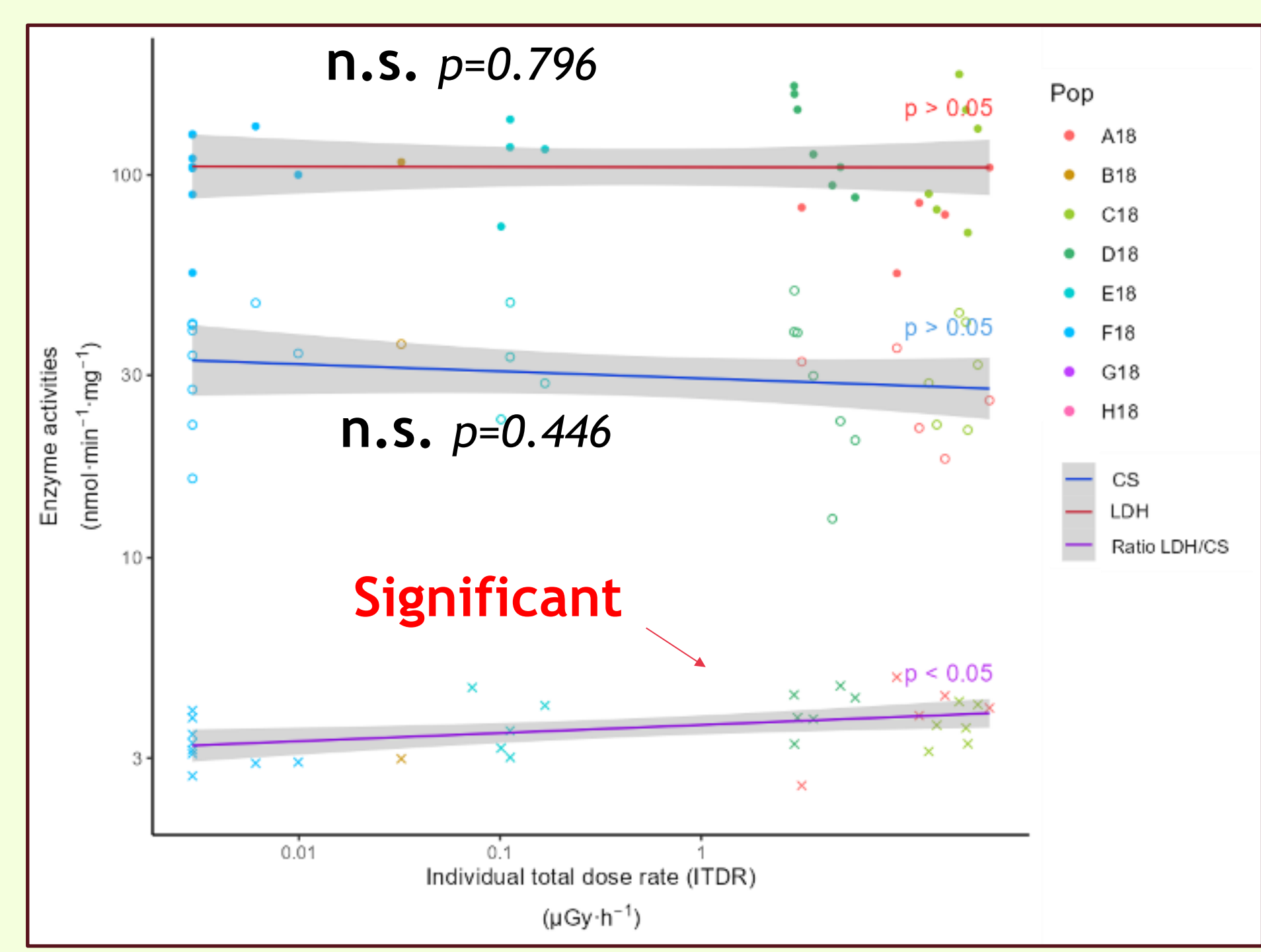
Label free proteomics of leg muscle¹⁰ / Dose-response modelling¹¹
 DRomics <https://lbbe.univ-lyon1.fr/fr/dromics>

Ecophysiology: activity of citrate synthase¹² (aerobic metabolism) and lactate dehydrogenase¹³ (anaerobic metabolism)
 -> Regressions between activities (nmol·min⁻¹·mg⁻¹) and ITDR (μGy·h⁻¹) based on linear models; tree frog age as a covariate.

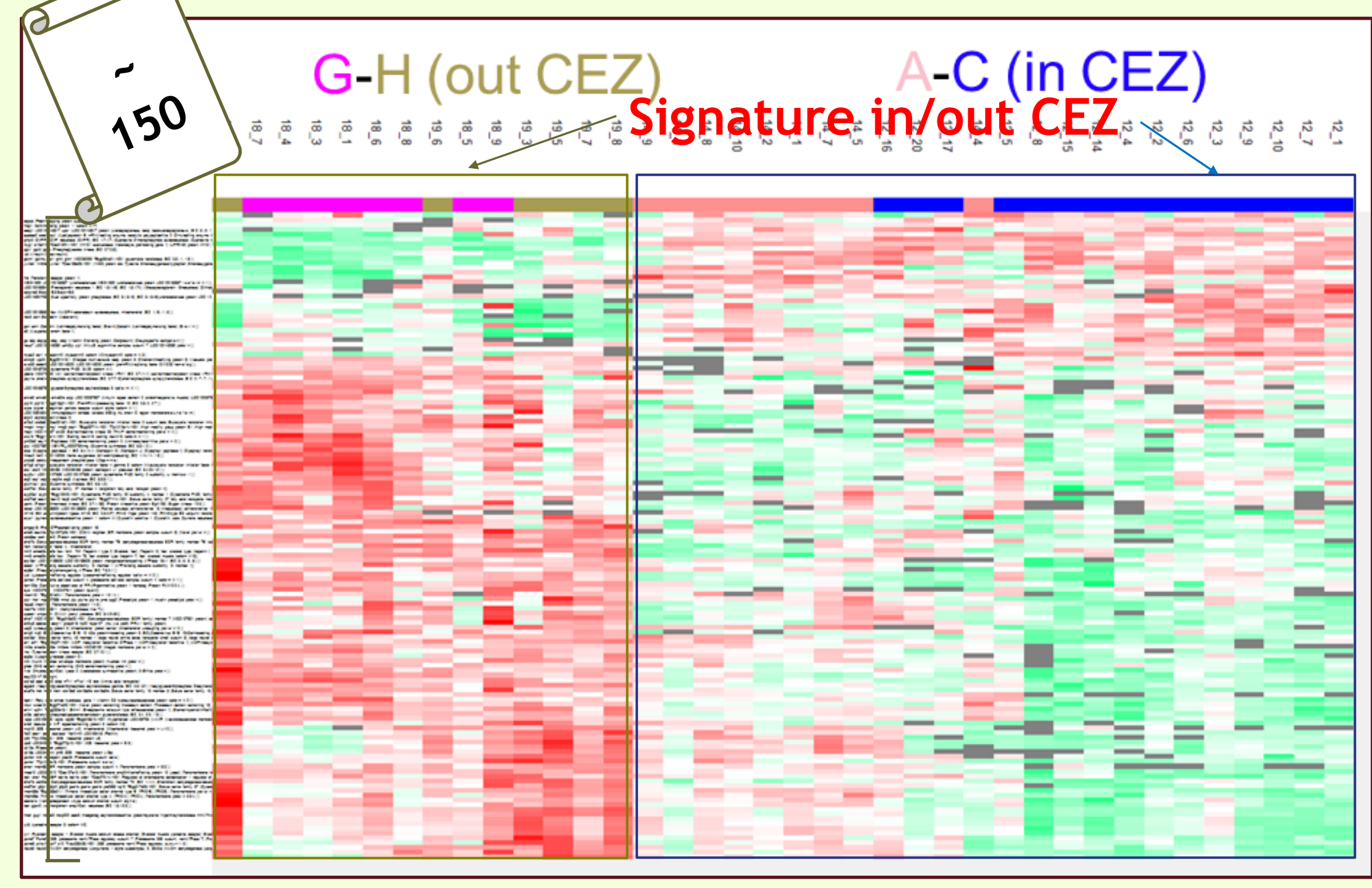
RESULTS & CONCLUSIONS



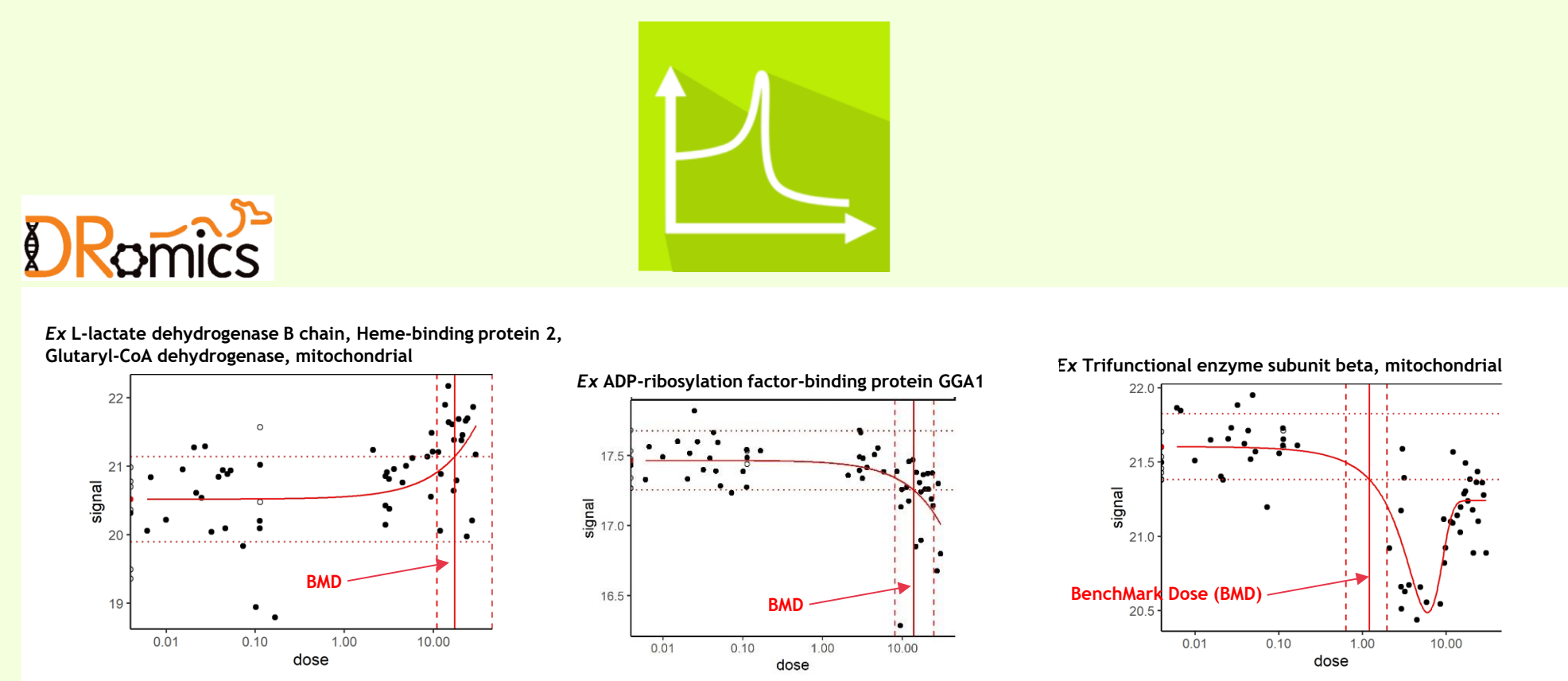
- 3600 detected proteins - 1700 proteins with 100% quantitative values (q.v.); 2370 (70% q.v.).
- Differential analysis between extrema conditions (lower (out-CEZ) vs higher (in-CEZ) dose rates)



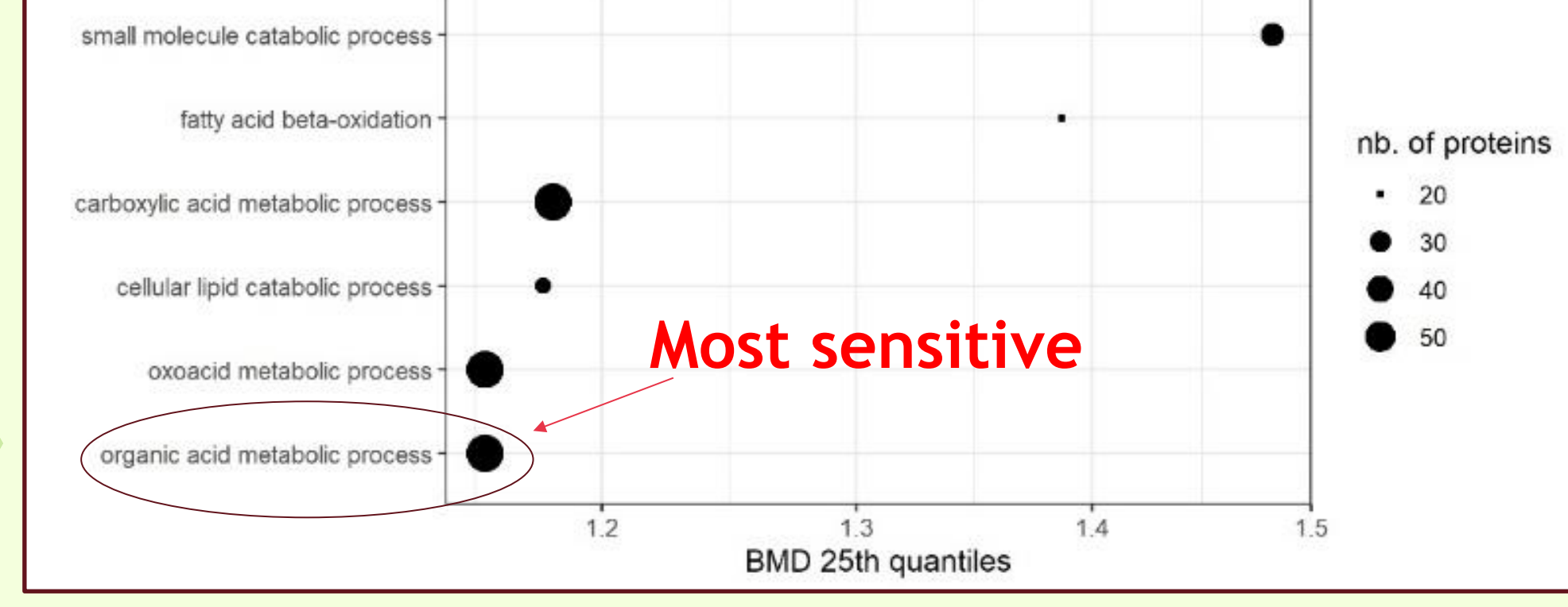
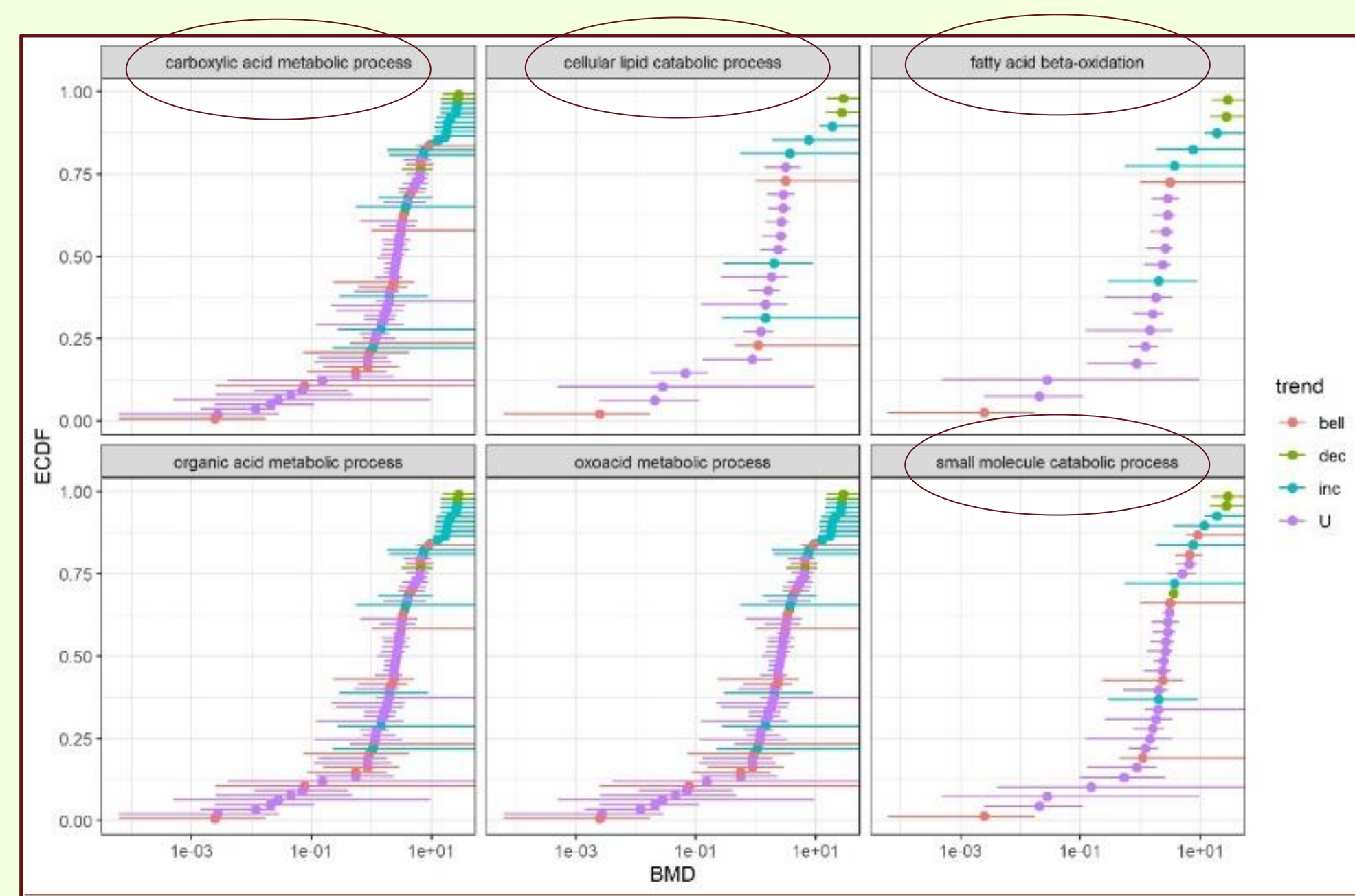
➔ Modified LDH/CS ratio <-> ➔ Modulation of anaerobic and aerobic metabolisms



➔ GO enrichment (FDR10%): “long chain fatty acid metabolic process”, “(cellular)-lipid metabolic process”



- 325 significant protein dose-modelled + BenchMark Dose (BMD) determined
- GO enrichment (FDR5%) - Sensitivity curves



- ✓ Energetic metabolism modulated along the dose rate gradient
- ✓ Lipid metabolism highlighted <-> link with BCI & LDH/CS increase?