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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**

Luc Camoin, Lea Dasque, Damien Roussel, Clément Car, Stéphane Audebert, Samuel Granjeaud, Emilie Baudalet, André Gilles, Marie-Laure Delignette-Muller, Jean Armengaud, et al.

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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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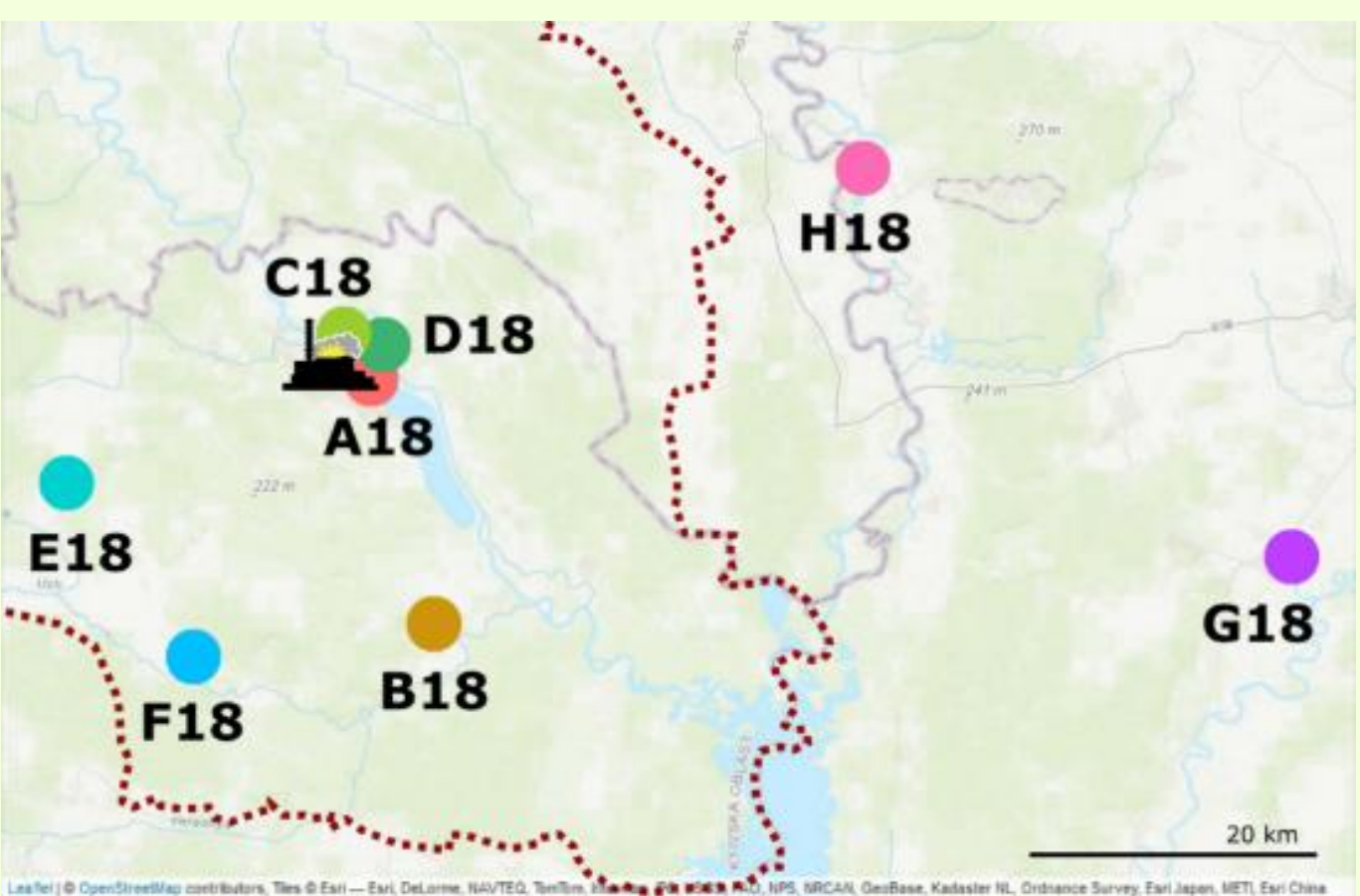
## CONTEXT - ECOLOGICAL RADIATION PROTECTION & ENVIRONMENTAL SPECIES

- Lack of knowledge on long term impact of radiocontamination on wildlife following nuclear fallouts<sup>1</sup>.
- Focus on amphibians: sentinel species for the ecosystem and human health<sup>2-6</sup> + reference animals of the International Commission for Radiological Protection<sup>7</sup>
- 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 mutations<sup>8</sup>, (ii) a modulation of genes relative to energy metabolism<sup>9</sup>, (iii) small population size with a higher affiliation rate<sup>7,9</sup>

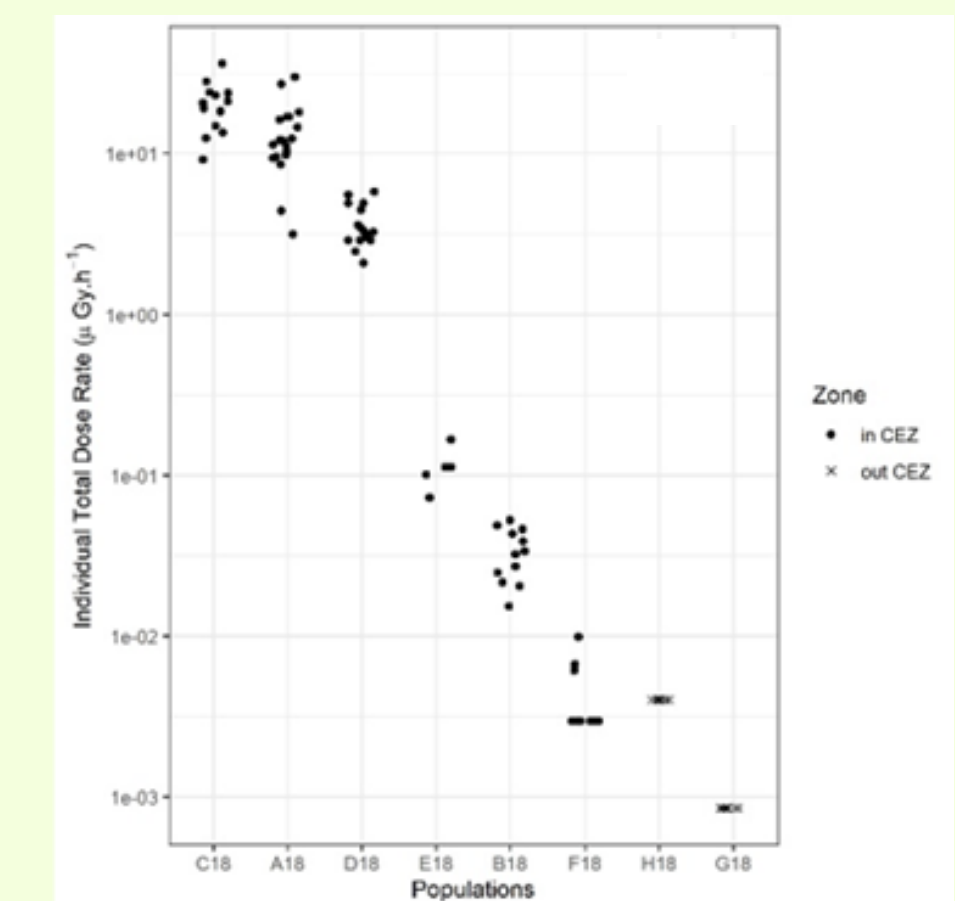


➔ Health status ?

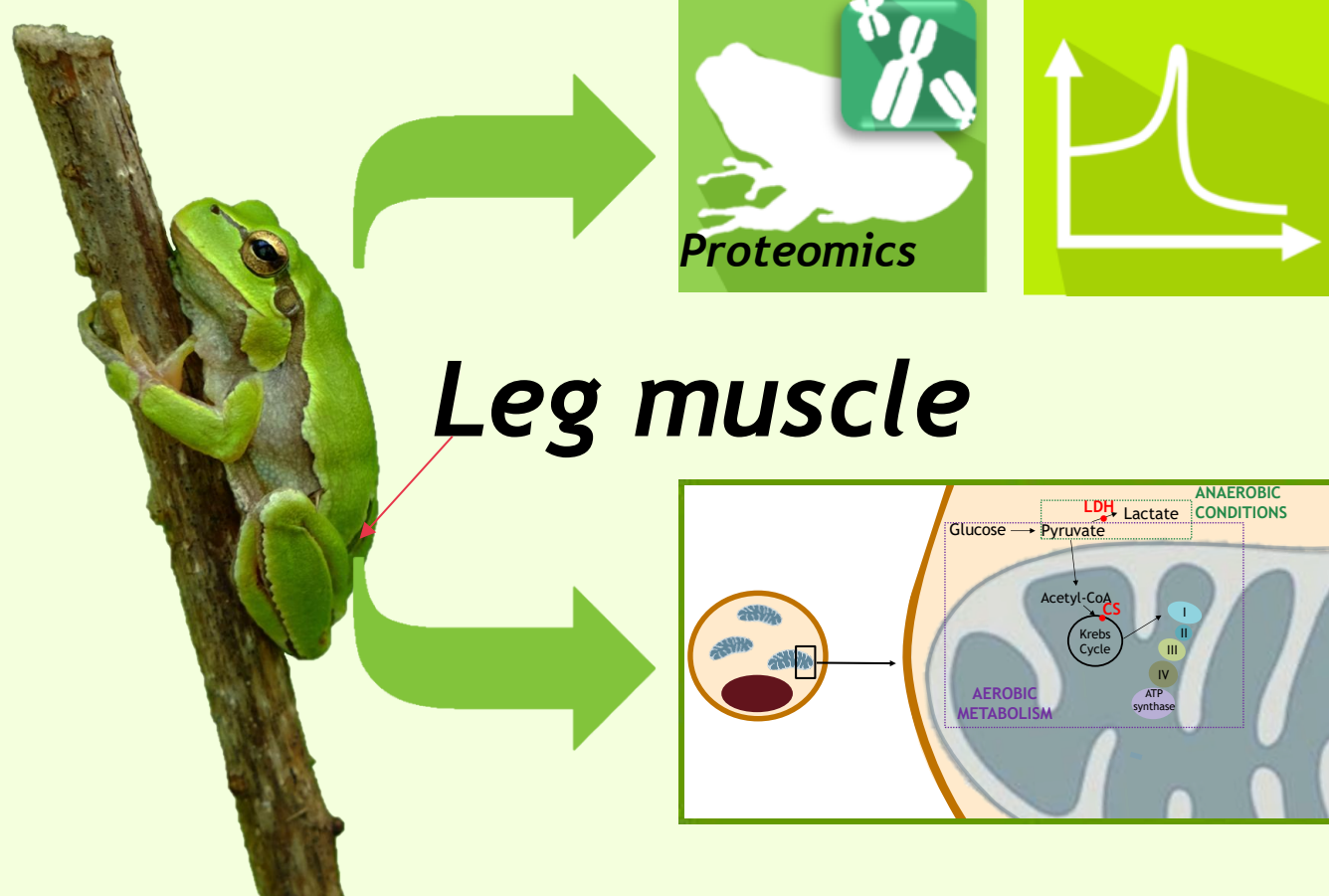
## MATERIAL & METHODS



Chernobyl exclusion zone map with sampling areas of tree frogs



Dose rate (μGy.h<sup>-1</sup>) for each individual of each site<sup>7</sup>

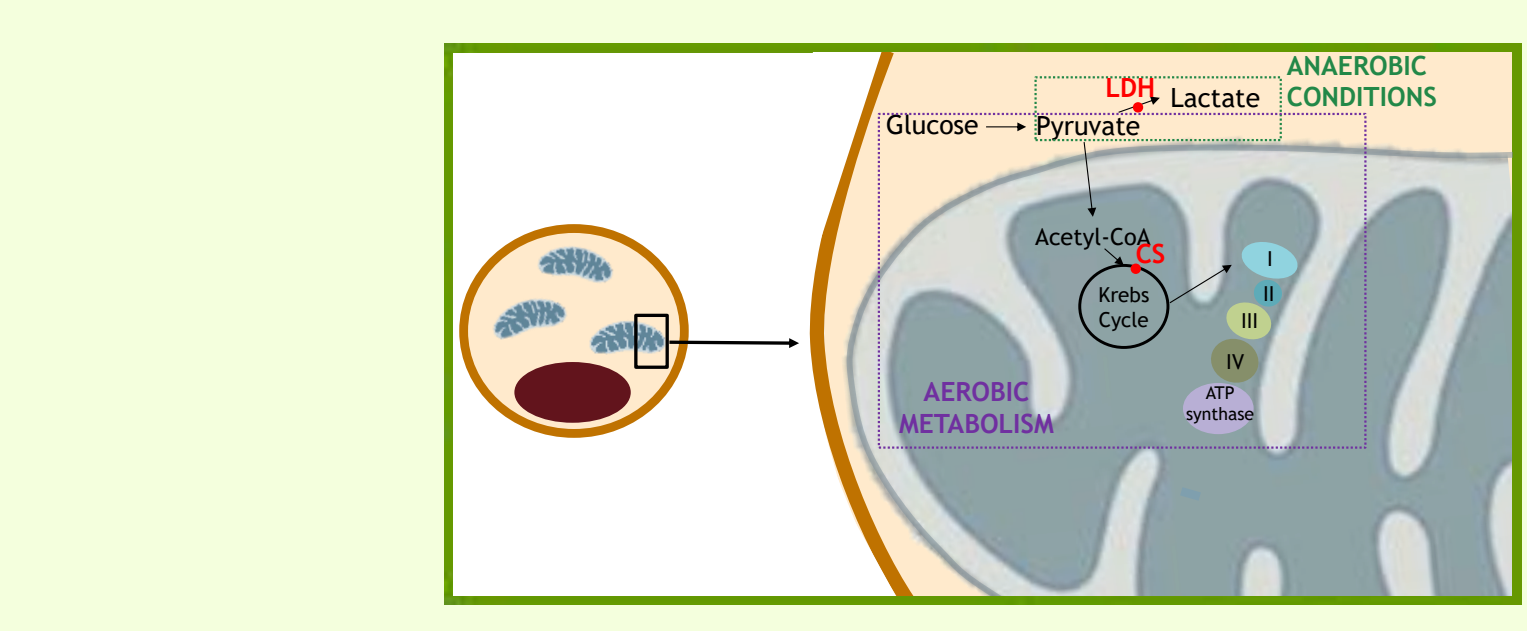


Leg muscle

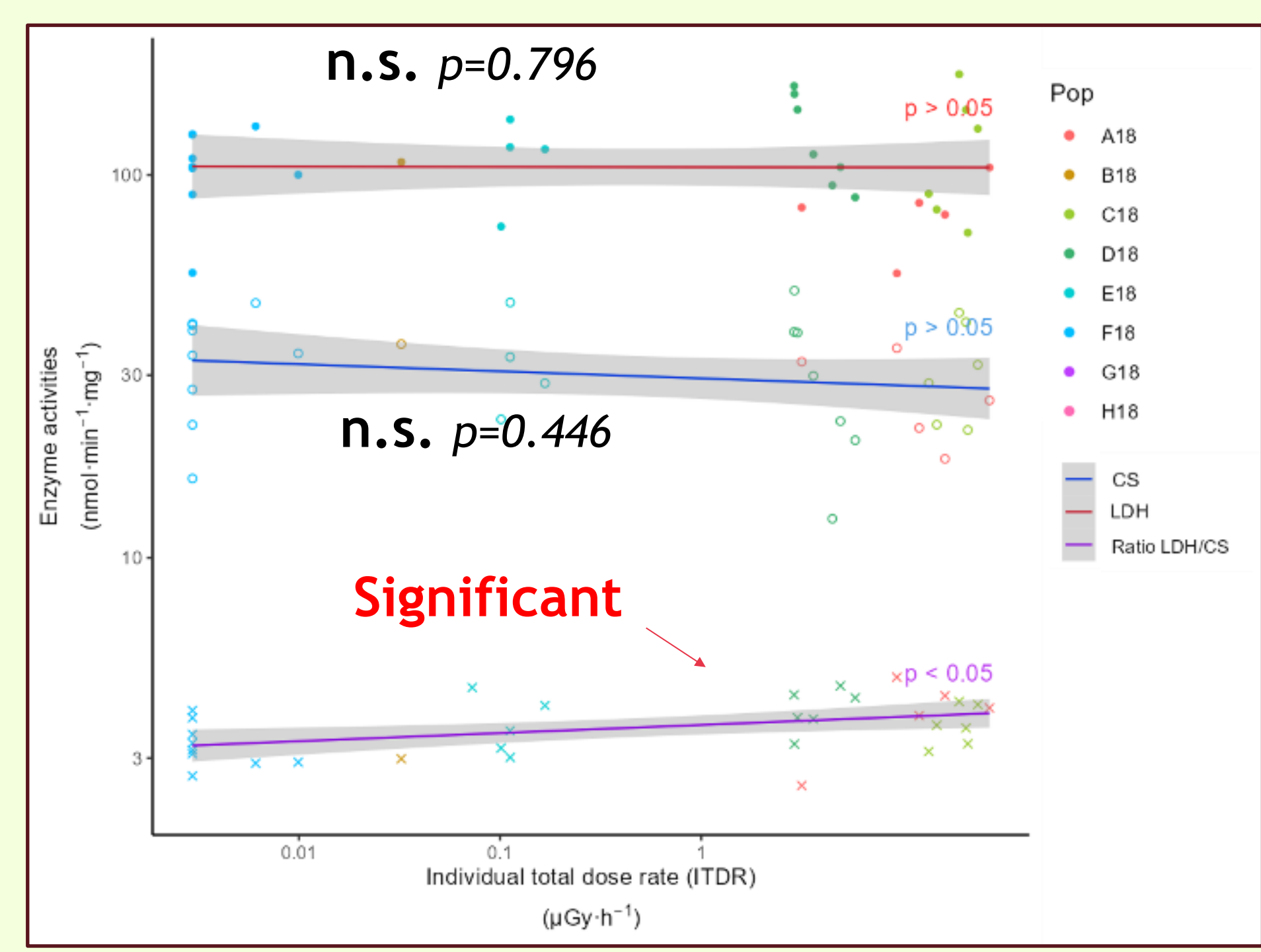
Label free proteomics of leg muscle<sup>10</sup> / Dose-response modelling<sup>11</sup>  
 DRomics <https://lbbe.univ-lyon1.fr/fr/dromics>

Ecophysiology: activity of citrate synthase<sup>12</sup> (aerobic metabolism) and lactate dehydrogenase<sup>13</sup> (anaerobic metabolism)  
 -> Regressions between activities (nmol·min<sup>-1</sup>·mg<sup>-1</sup>) and ITDR (μGy·h<sup>-1</sup>) based on linear models; tree frog age as a covariate.

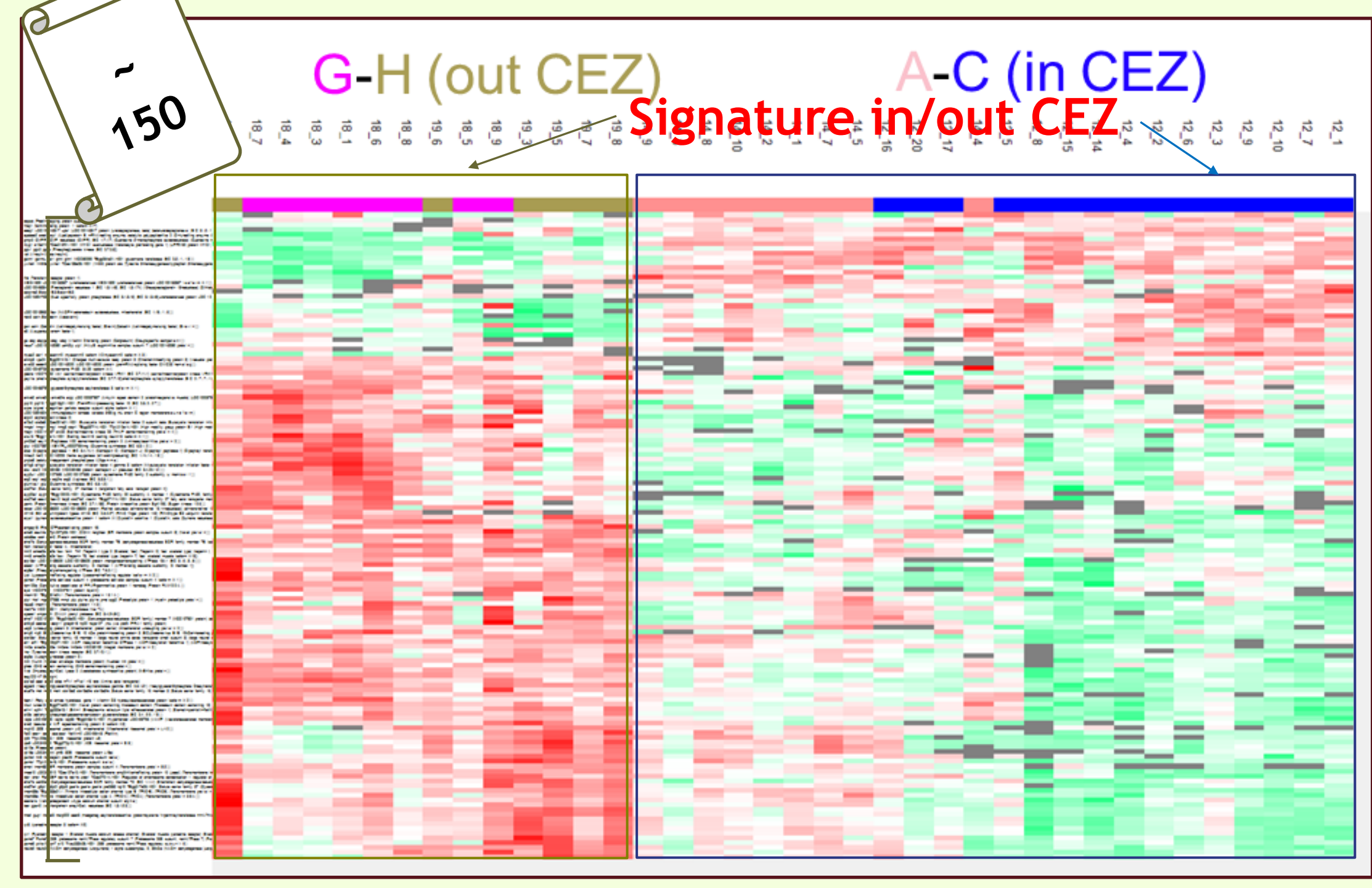
## RESULTS & CONCLUSIONS



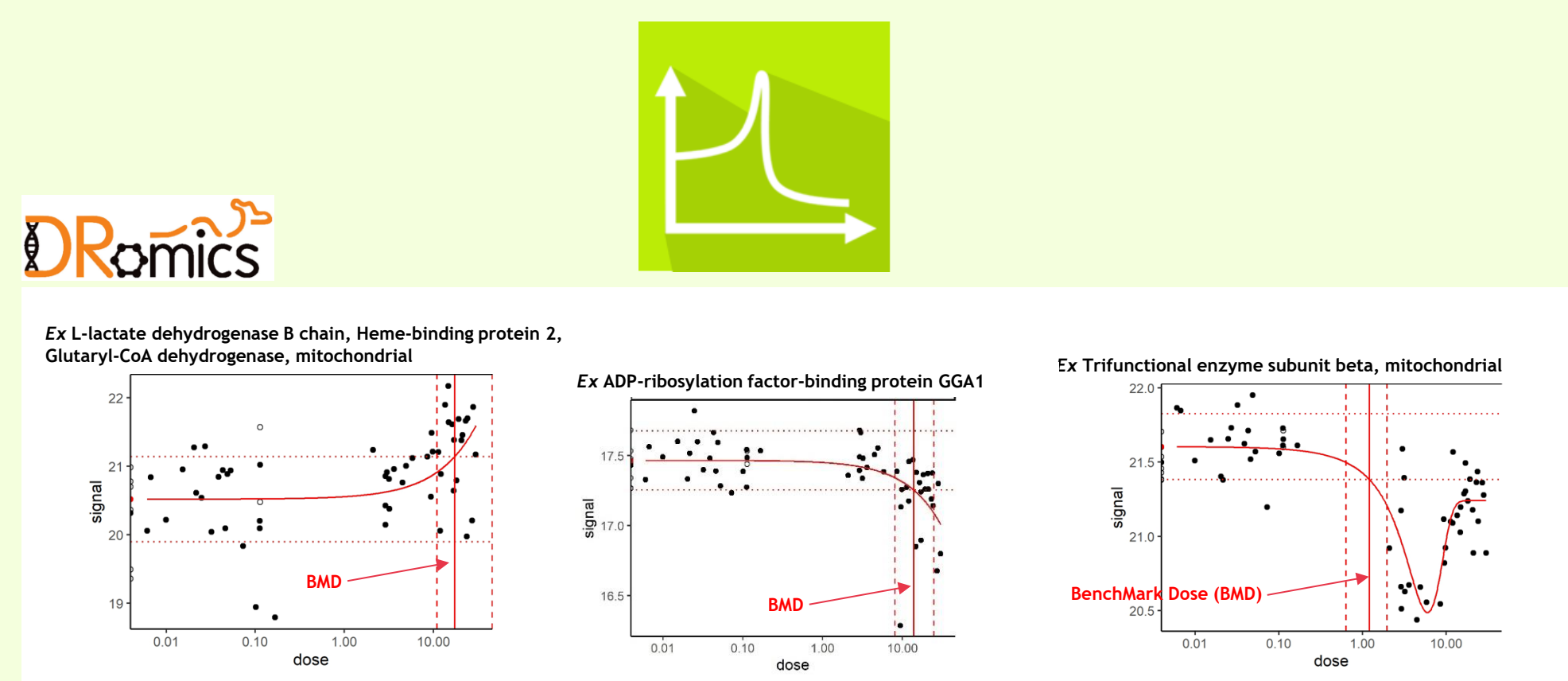
- 3600 detected proteins - 1700 proteins with 100% quantitative values (q.v.); 2370 (70% q.v.).
- Differential analysis between extrema conditions (lower (out-CEZ) vs higher (in-CEZ) dose rates)



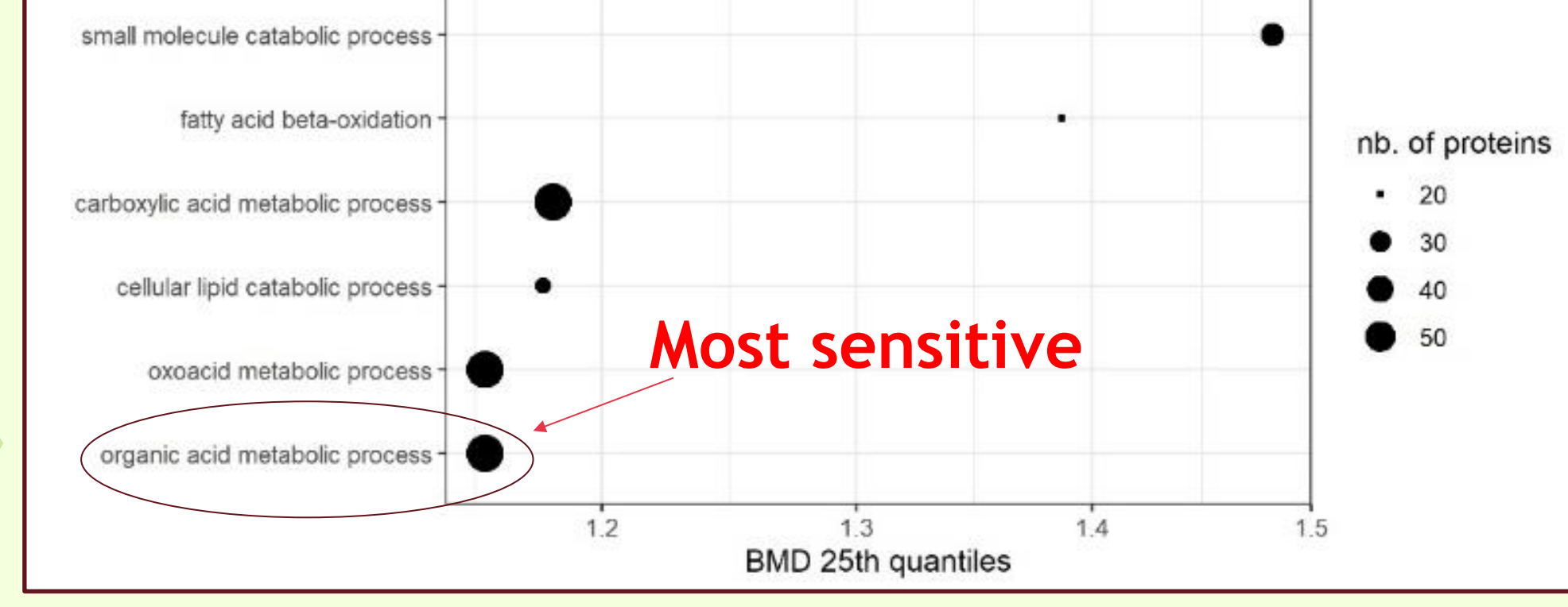
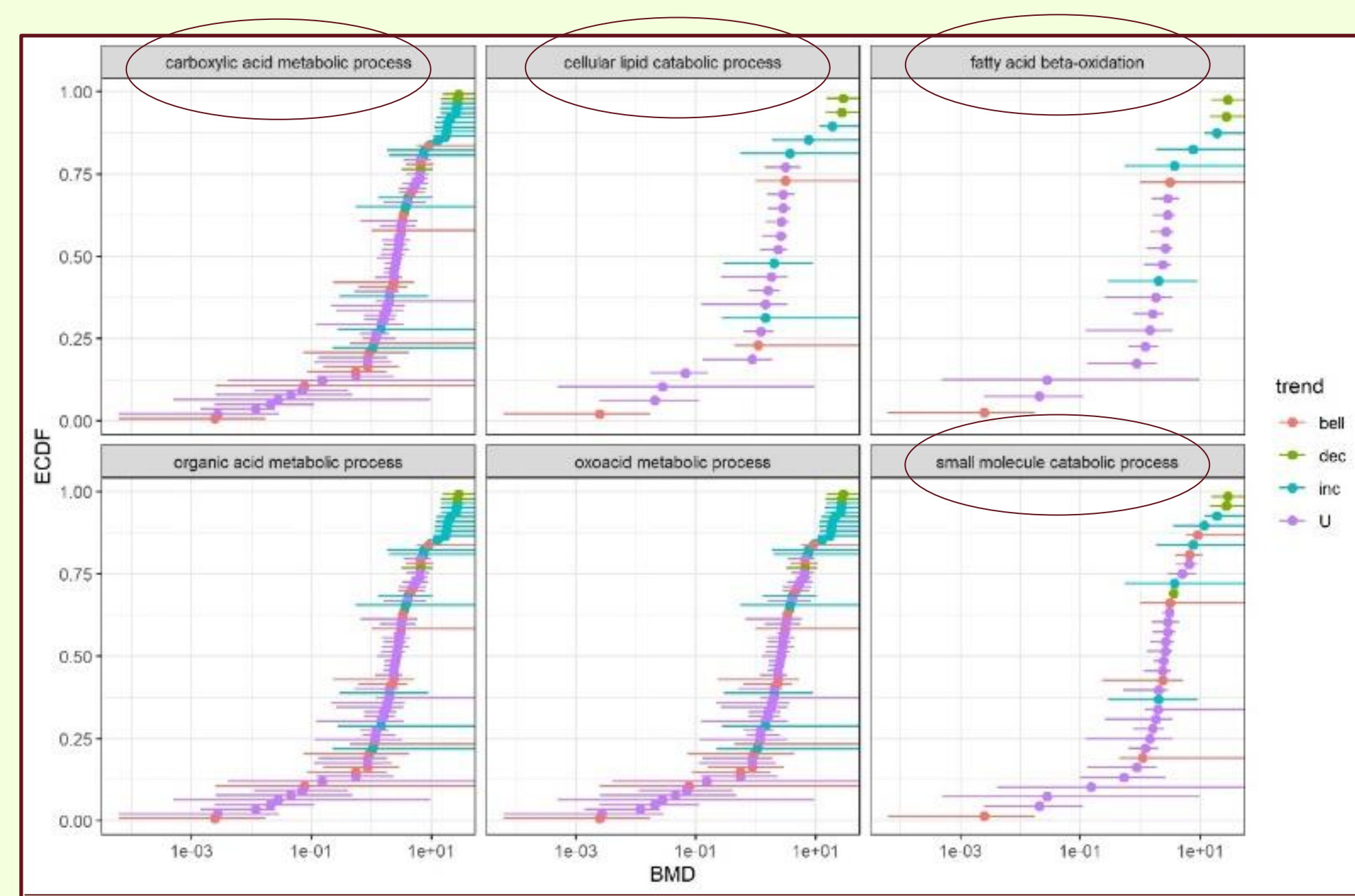
➔ Modified LDH/CS ratio <-> ➔ GO enrichment (FDR10%): “long chain fatty acid metabolic process”, “(cellular)-lipid metabolic process”



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



- 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?