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Exploring the Impact of Homocysteine Supplementation on Avian Embryonic Metabolism Through Mass Spectrometry-Based Metabolomics Analysis



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Introduction

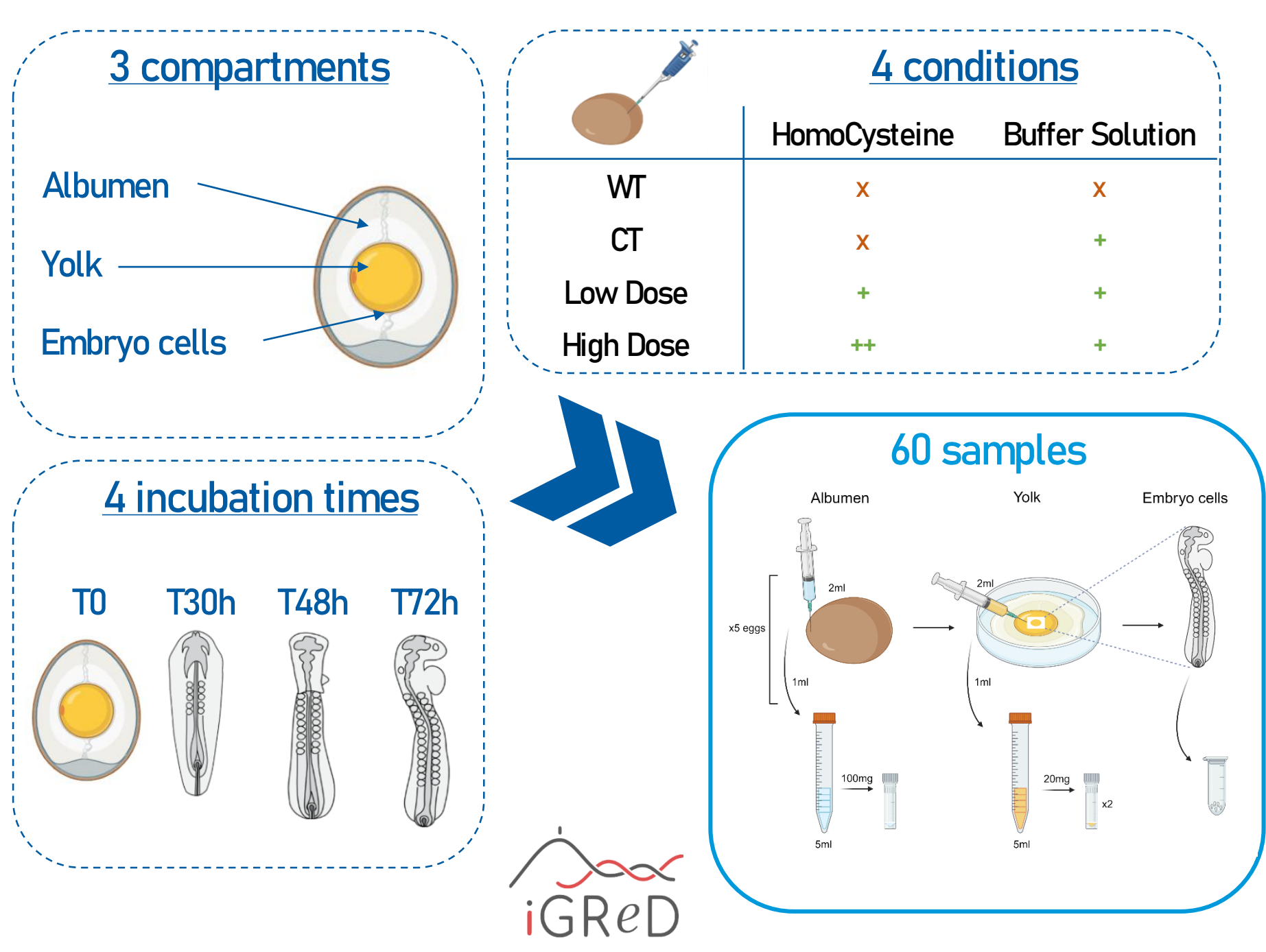
Embryonic malformations are often attributed to environmental factors, including folate deficiency. Avian models can recapitulate human folate deficiencies by adding homocysteine into the egg. However, how this treatment impacts the metabolite levels during embryonic development remains poorly understood.

This project aims to fill this gap by studying how the supplementation of homocysteine affects the metabolite composition across various matrices.

We used our expertise in mass spectrometry-based metabolomics to develop a method for sample preparation and analysis on the different parts of the egg: yolk, white, and embryo, in order to study the impact of homocysteine supplementation on metabolite profiles during embryonic development. Samples were analyzed using HILIC technology on a Vanquish-QEActive+ coupling (Thermo) in ESI-NEG and ESI-POS, full scan mode and targeted reprocessing on 150 metabolites.

Material & methods

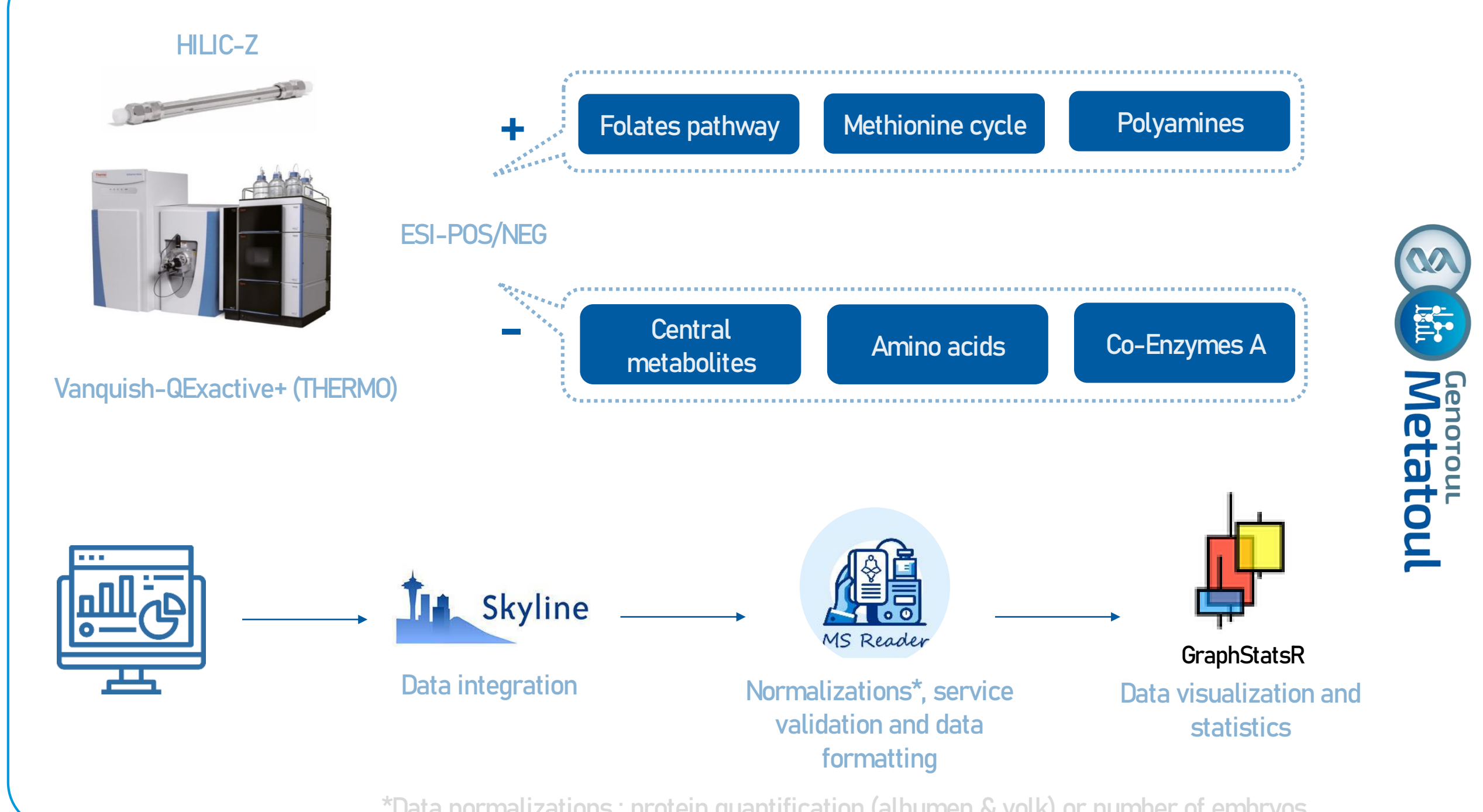
Sample collection



Sample preparation

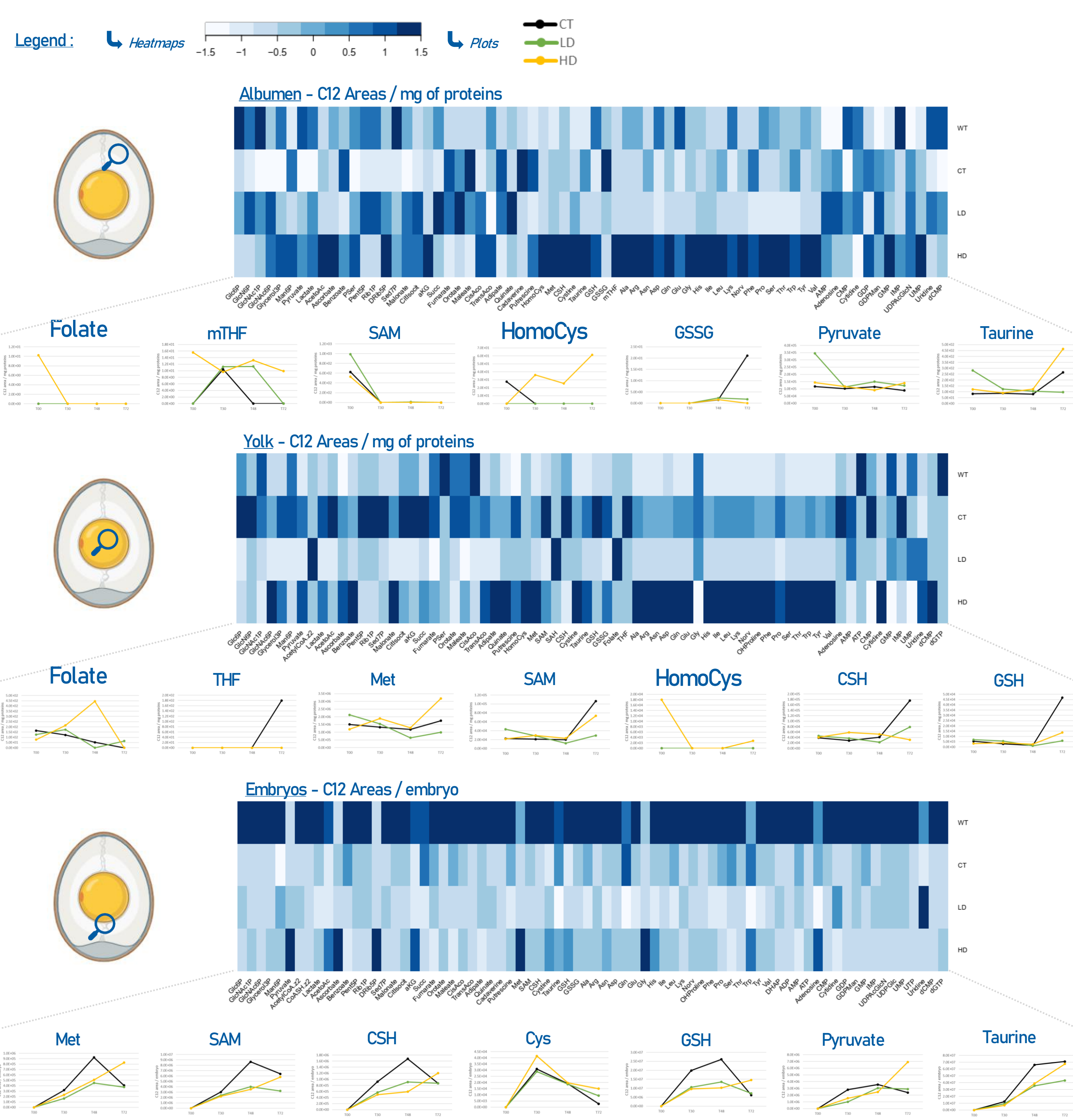


Analysis and data processing

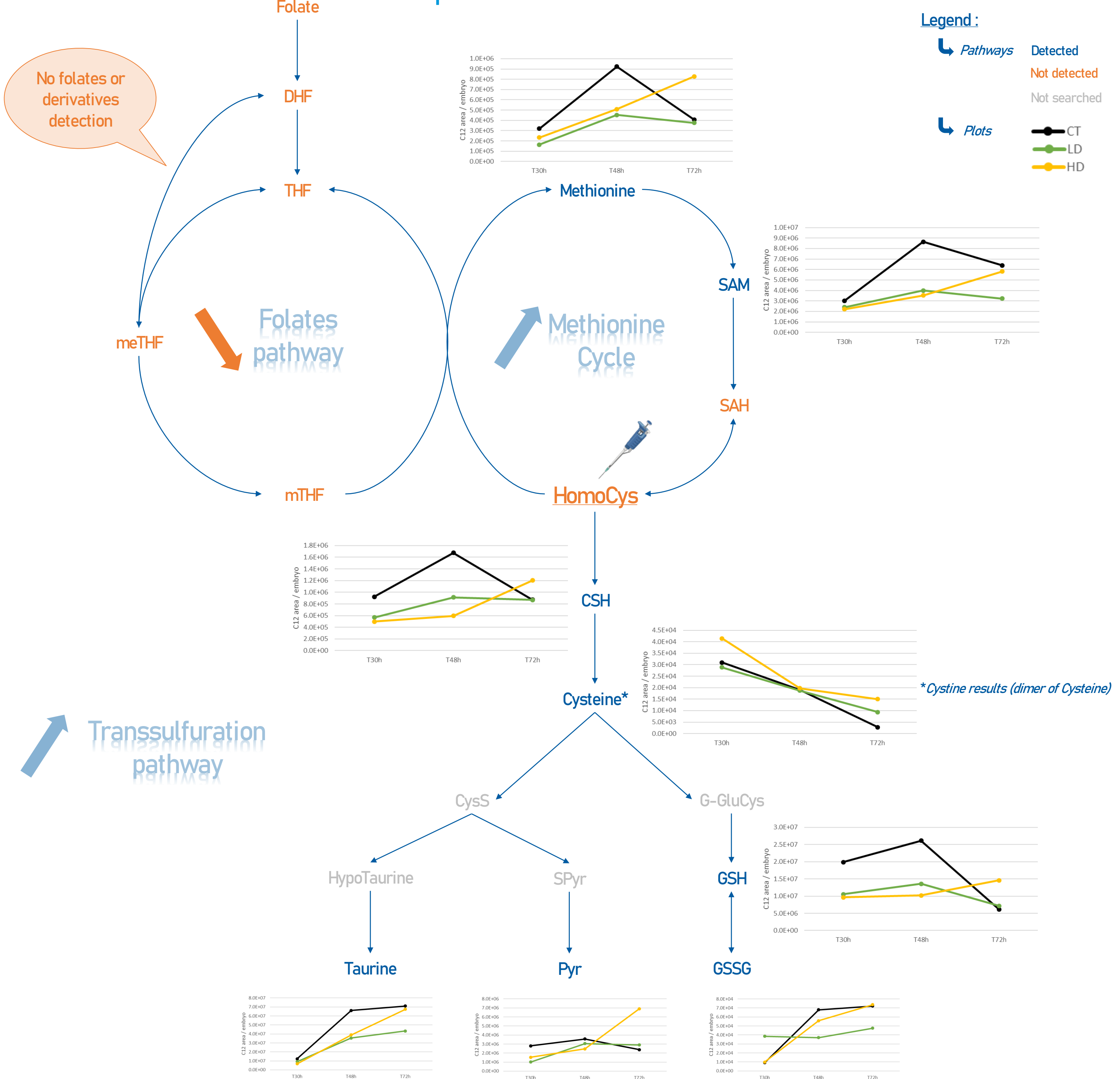


Results and discussion

Metabolic evolution in the 3 compartments at T72h of embryogenesis in different conditions



Evolution of folates, methionine and transsulfuration pathways^[4,5] in EMBRYOS during embryogenesis steps in different conditions



Conclusions & outlook

HomoCys supplementation in egg yolk at the start of embryogenesis induces metabolic changes in the 3 compartments studied. It causes folate depletion in the yolk and egg white, resulting in embryonic development anomalies, metabolically reflected by the absence of folate pathway metabolites. It appears that HomoCys supplementation increases the flow to the folate pathway and therefore depletes folate in the yolk. As a result, the embryo would not have folate to use for its development during embryogenesis.

These hypotheses remain to be verified using a C13 isotope labelling experiment. After HomoCys supplementation, we observe a disappearance of folate in the egg yolk at T72h, so we'll do a C13-labelled folic acid pulse to study its incorporation into the metabolism of the 3 compartments.

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Contact



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