Experimental Design practical: Gene expression profile of wild and mutant HHEX in brain and liver development

Hematopoietically Expressed Homeobox (HHEX) is a transcription factor, which, plays an important role in the proper development of brain and liver in mouse. A mutant HHEX (where all Serine and Tyrosine residues are mutated to Alanine) is hyperactive and induces fetal death in mutant homozygous mice. We are interested in identifying gene expression changes in brain and liver and in determining key pathways involved, in response to hyperactivity of HHEX gene. Note that, samples are collected from 15 day-old fetuses that are homozygous wildtype (Wt/Wt), heterozygous mutant (Wt/Mt) and homozygous mutant (Mt/Mt), which manifest distinguishing morphological characteristics.

Experimental design related questions:

1. What are the scientific questions of interest in this experiment?

2. What are you measuring?

3. What controls samples should be included in this experiment? Why is control needed in the experiment?

4. How many replicates you need to include for each group? Discuss what factors might have influence in selecting the number of replicates?

5. Which experimental groups will be included?

6. How will any findings be validated?

7. What contrasts (sample group comparisons) you make with the data?

8. What are possible sources of bias and confounding variables in the experiment?

9. How can these sources of bias and confounding be controlled?