

# The contribution of oocytes and follicular fluid to pig fertility

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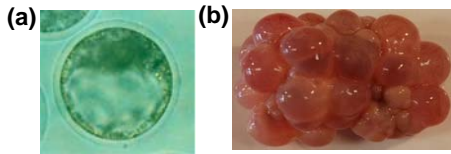
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## Background

A high fibre diet fed to pigs is associated with several reproductive benefits which include pigs with oocytes that produce blastocysts (FIGURE 1(a)) with higher cell counts following *in vitro* fertilisation (IVF)<sup>1</sup>.

We hypothesise that the diet alters the protein composition of porcine follicular fluid (pFF, FIGURE 1(b)) and that this confers the reproductive advantages.

**FIGURE 1: (a) Blastocyst; (b) Pig ovary with mature fluid filled follicles.**



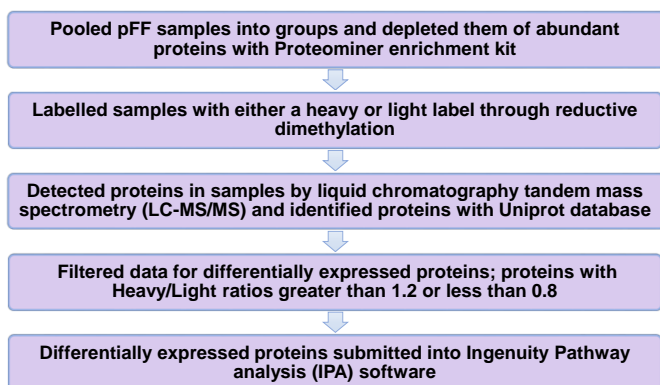
## Aims

- Identify whether the high fibre diet alters the protein composition of pFF
- Identify molecular mechanisms that may be involved in nutritionally mediated reproductive benefits.

## Materials and Methods

- The proteomic workflow (FIGURE 2) was carried out on pFF from 12 control (C) and 12 high fibre (HF) fed gilts
- In each feeding group, six gilts had oocytes that produced blastocysts following IVF (C-BI and HF-BI) and six gilts that did not (C-NoBI and HF-NoBI).

**FIGURE 2: Proteomic workflow (carried out in duplicate) to detect differentially expressed proteins in pFF samples.**

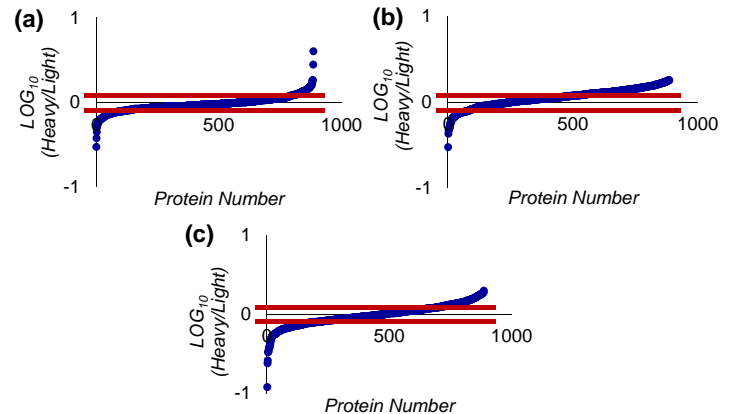


## Results

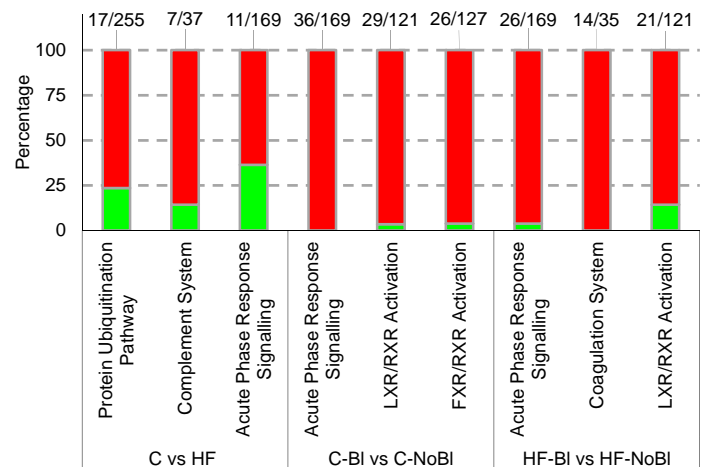
- Over 140 differentially expressed proteins were detected by LC-MS/MS between control and high fibre pFF samples (FIGURE 3a).
- Several of these proteins were also differentially expressed in the blastocyst versus no blastocyst analyses (FIGURE 3b and FIGURE 3c).
- The top canonical pathways associated with the differentially expressed proteins are shown in FIGURE 4.

## Results

**FIGURE 3: Scatter plots of the proteomics data from the (a) C vs HF (b) C-BI vs C-NoBI and (c) HF-BI vs HF-NoBI analyses. Red lines show the cut-off points (Heavy/Light ratios higher than 1.2 and lower than 0.8). Outliers of these are differentially expressed proteins.**



**FIGURE 4: The top 3 pathways in each analysis and the upregulated (red) or downregulated (green) pathway proteins detected in the proteomics data, given as a percentage. Numbers at the top are the number of differentially expressed proteins in that pathway that were detected.**



## Conclusions and Further Work

- Differences in pFF protein composition were detected between nutritional regimens and IVF outcome
- Western blotting is being carried out to confirm proteomics data and molecular mechanisms involved in nutritionally dependent reproductive benefits
- These mechanisms can then be inhibited or activated either through the addition of chemicals to *in vitro* culture systems or through the refinement of the diet.

## References

1. Ashworth et al., 2008 Nutritional insights into the origins of embryonic loss in the pig. *Proceedings of a Workshop on Embryonic and fetal nutrition, Ravello, Italy, May 2006*. Havemeyer Foundation Monograph Series No. 21, pp. 27-29 Suffolk: R&W Communications.