

A maternal diet during pregestational, gestational or lactational impacts differently on intestinal gene expression: role of fiber and polyphenols

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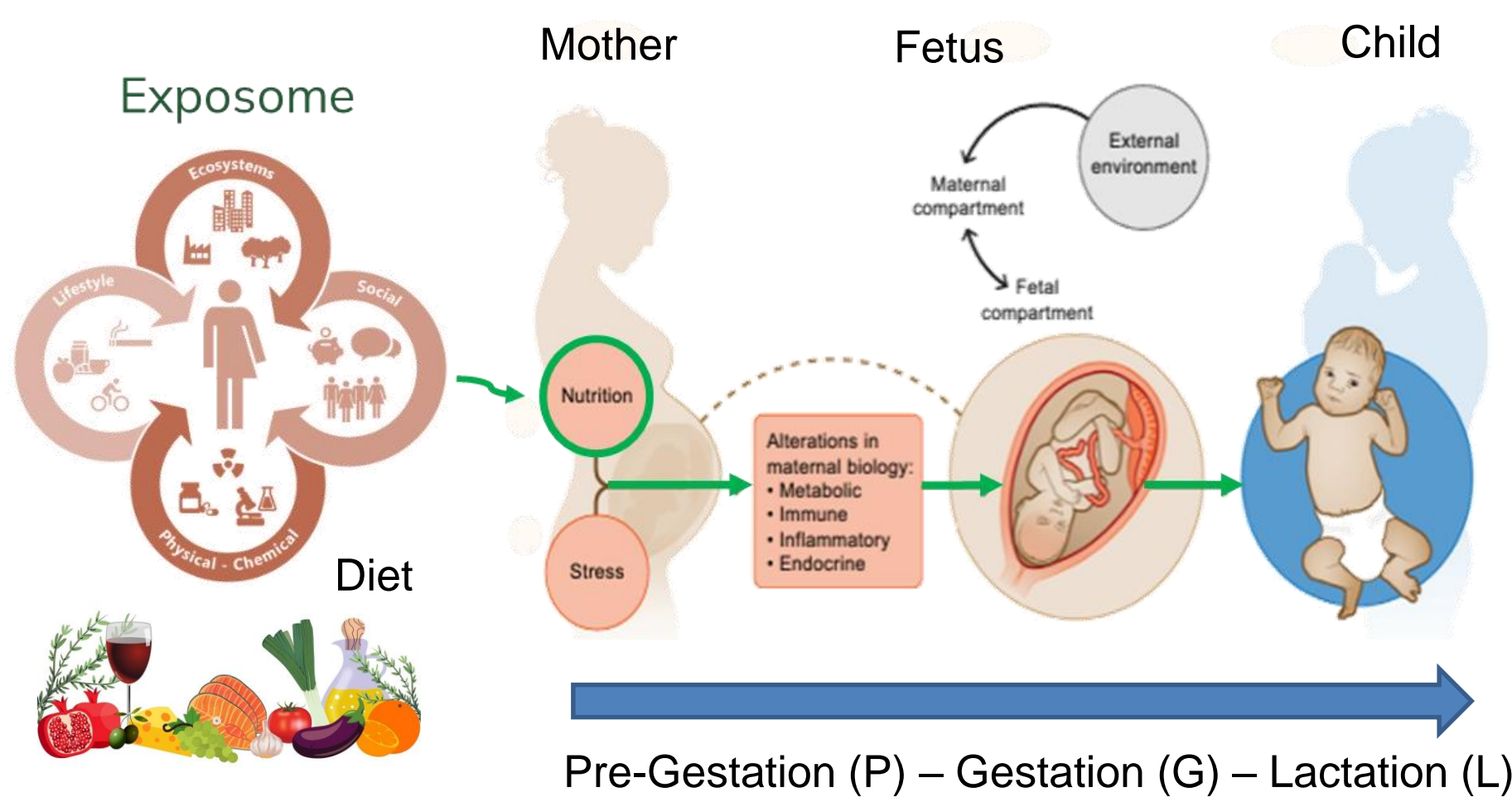
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INTRODUCTION & AIM

Diet composition, as a part of the **maternal exposome**, is important for health, particularly during critical periods such as pre-gestation (P), gestation (G), or lactation (L), due to its potential impact on both the mother and the offspring.



Mediterranean Diet includes daily intake of whole grains, olive oil, fruits, vegetables, beans and other legumes, nuts, herbs, and spices. These components are rich sources of polyphenols and fiber, both with high biological activities (1,2).

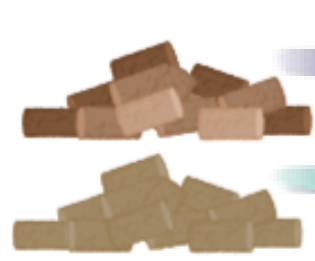
OBJECTIVE

The present preclinical study assessed the impact of a diet rich in fiber and polyphenols (HFP diet) during pre-gestation, gestation and lactation, that in rat correspond to 3-weeks each on intestinal gene expression.

METHOD

INTERVENTION

Control diet (REF); based on the AIN-93G diet.

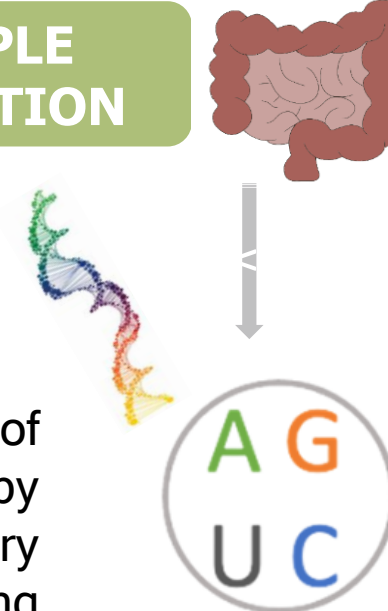


- REF group** (Control diet during P, G and L)
- P group** (HFP diet only during Pregestation)
- G group** (HFP diet only during Gestation)
- L group** (HFP diet only during Lactation)

Experimental Diet (HFP); a fiber- and flavonoid-enriched diet which was derived from the AIN-93G diet with the inclusion of flavonoids such as catechin, epicatechin, hesperidin, naringenin, quercetin, and dietary fiber inulin and pectin.

RNA GENE EXPRESSION

Gene expression analysis was performed at the end of lactation by the mRNA two step PCR amplification by random primers and poly-T, followed by library generation and HiSeq X-Ten Illumina sequencing (Seqplexing).



REFERENCES

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- Rio-Aige, K.; Azagra-Boronat, I.; Massot-Cladera, M.; Selma-Royo, M.; Parra-Llorca, A.; González, S.; García-Mantrana, I.; Castell, M.; Rodríguez-Lagunas, M.J.; Collado, M.C.; et al. Association of Maternal Microbiota and Diet in Cord Blood Cytokine and Immunoglobulin Profiles (2021). *Int. J. Mol. Sci.* 22, 1778.

ACKNOWLEDGEMENTS

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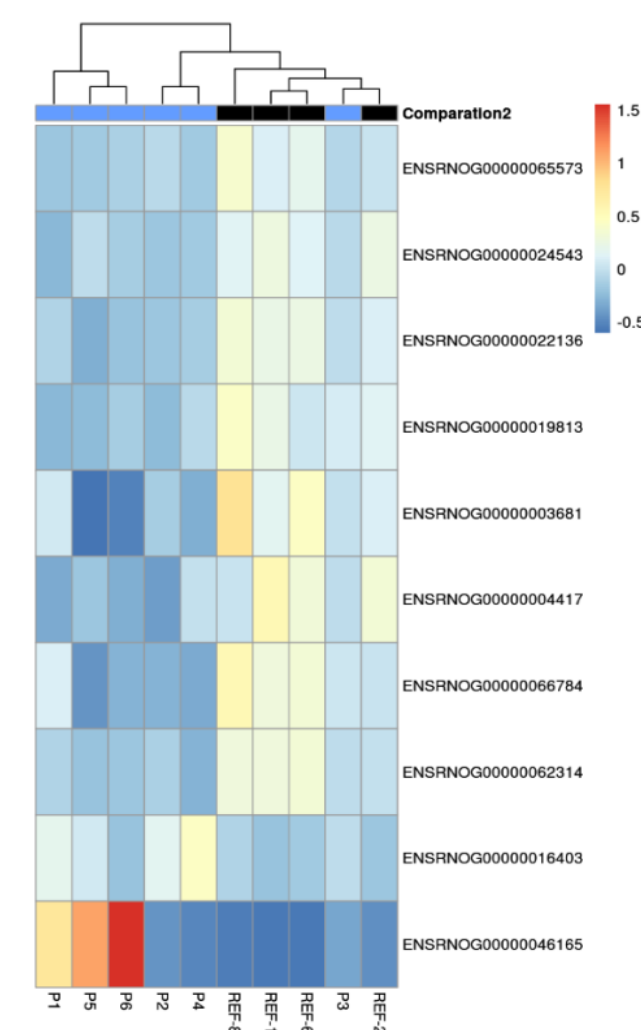


RESULTS & DISCUSSION

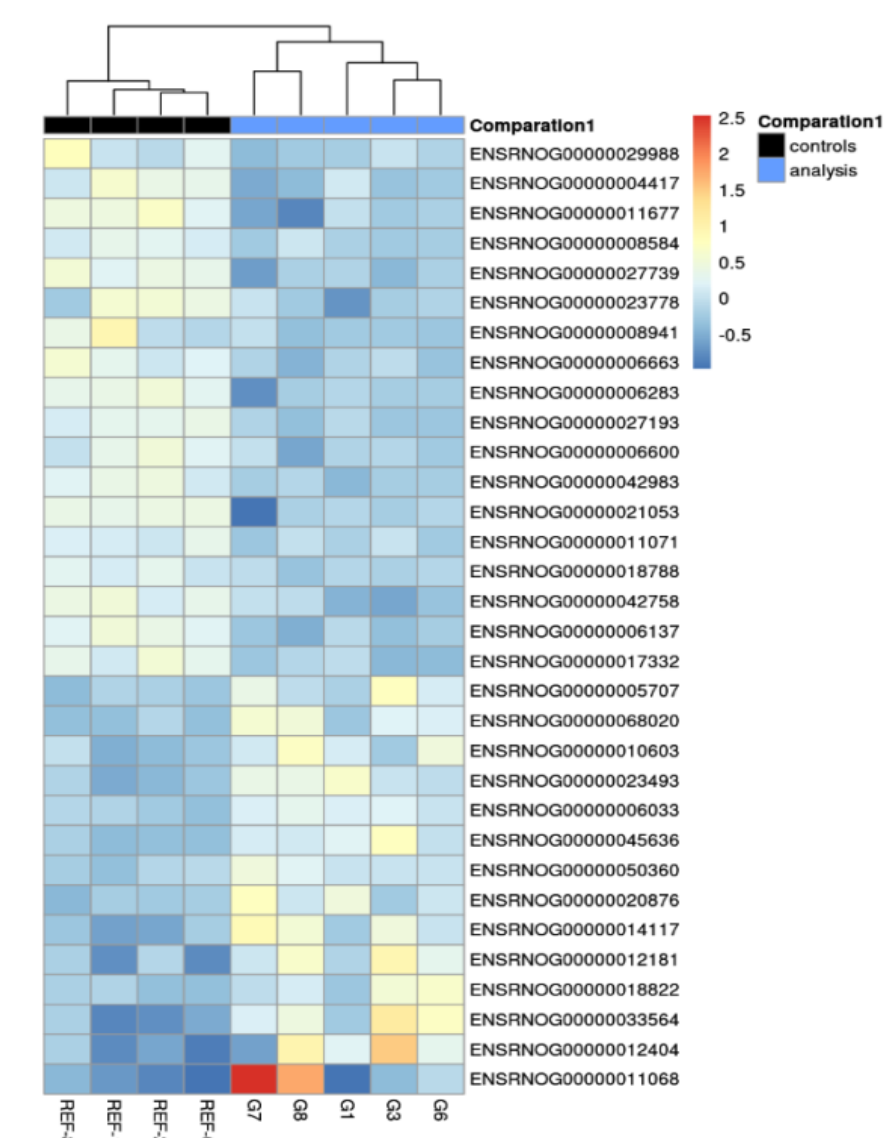
The results showed that a broad number of genes were significantly modulated after the HFP diet compared to a reference diet, with a higher number of genes modulated when the supplementing period was closer to the analysis day (L>G>P).

Number of genes	Total	Up	Down
P vs REF	10	2	8
G vs REF	32	14	18
L vs REF	161	75	86

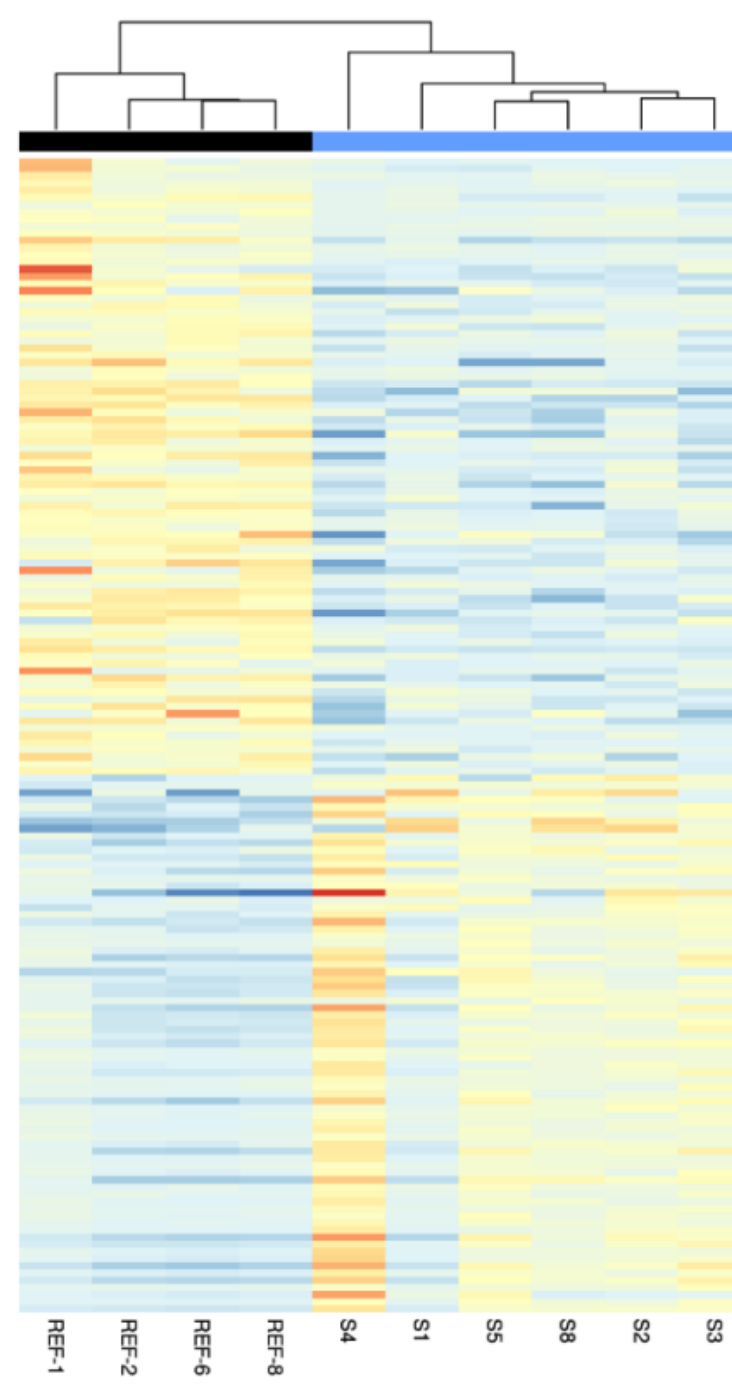
P vs REF



G vs REF



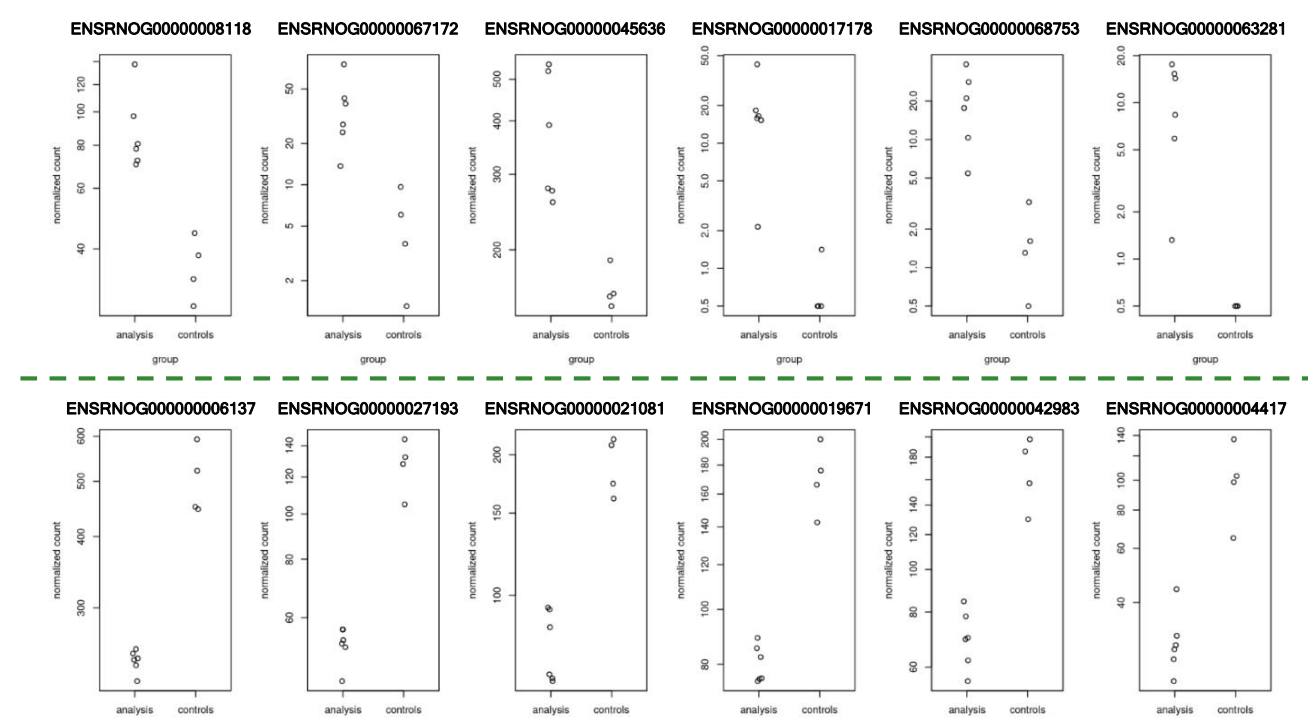
L vs REF



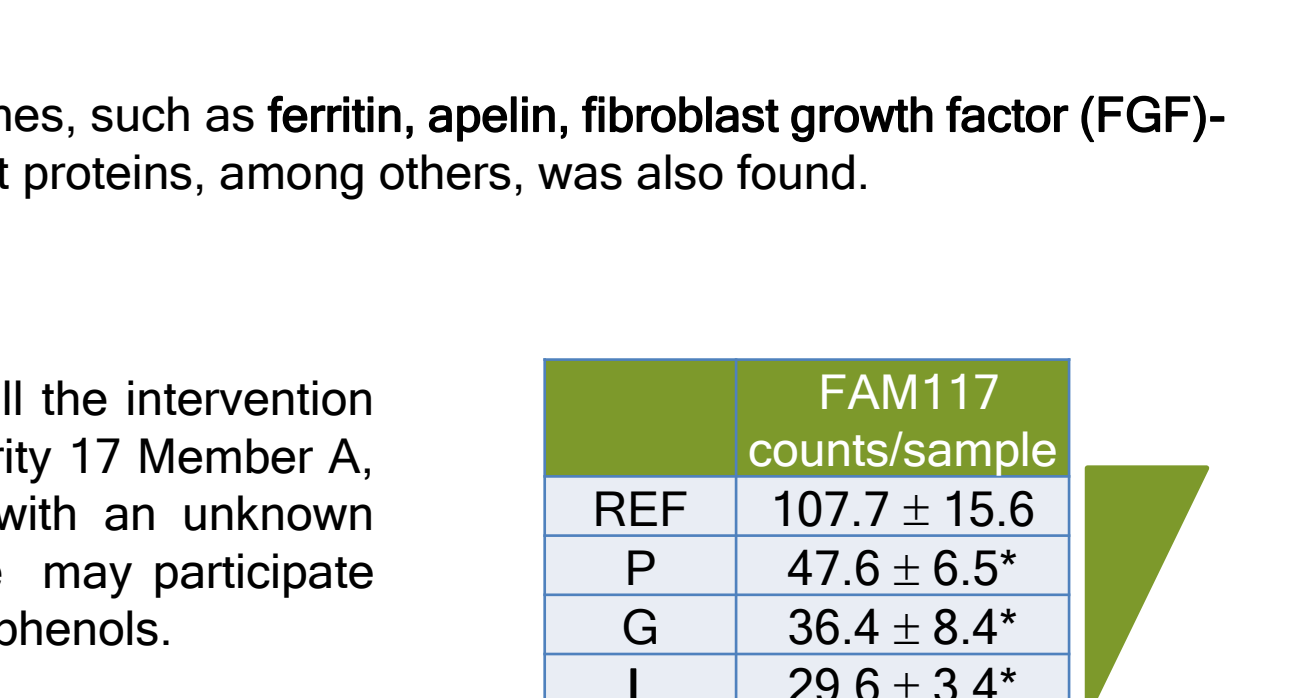
Notably, genes significantly affected by the HFP dietary intervention were found to be involved in several important pathways, such as:

- immune signaling
- intestinal absorption
- cell growth

Top 6 up-regulated genes



Top 6 down-regulated genes



Diet modified the expression of key genes, such as ferritin, apelin, fibroblast growth factor (FGF)-12, interleukin (IL)-17, and complement proteins, among others, was also found.

A unique gene was also modified in all the intervention periods (Family with Sequence Similarity 17 Member A, **FAM17A** which encodes a protein with an unknown function), indicating that this molecule may participate in the effects induced by fiber and polyphenols.

	FAM117 counts/sample
REF	107.7 ± 15.6
P	47.6 ± 6.5*
G	36.4 ± 8.4*
L	29.6 ± 3.4*

*p<0.05 vs REF

CONCLUSION

Overall, the influence of a high fiber and polyphenol diet during a 3-week period (P, G or L) in rats is able to modulate the intestinal gene expression, and consequently, maternal health, which ultimately can have an indirect impact on the offspring.