

Effect of Post-Prandial Hyperlipidaemia on Cerebrovascular Function: Gender

Difference?

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Background: The consumption of a high-fat meal is characterised by a state of post-prandial hyperlipidaemia (PPH) with an exaggerated increase in triglycerides (Tg) that peaks at 4 hours¹. We recently demonstrated that PPH was associated with impaired cerebrovascular reactivity in aged, but not young males². However, to what extent PPH impacts the cerebral circulation in females, who are more prone to cognitive decline and dementia in later life³, remains to be established.

Methods: Eighteen males (age: 24 ± 6 years; body mass index (BMI): 23.2 ± 3.6 kg.m²) and 8 females (age: 21 ± 2 years; BMI: 23.7 ± 3.1 kg.m²) participated in the study. Cerebrovascular function and Tg were assessed prior to, and 4 hours after the consumption of a standardised high-fat meal¹. Middle cerebral artery velocity (MCAv; transcranial Doppler ultrasound), mean arterial pressure (MAP; finger photoplethysmography) and end-tidal CO₂ (capnography) were continuously recorded throughout each testing session. Serum Tg were determined via established methods from venous samples obtained from an indwelling cannula. MCAv and MAP were assessed following 5 minutes of seated rest. Cerebrovascular reactivity to carbon dioxide was assessed in response to 3 minutes of breathing 5% CO₂ (balanced air; CVR_{CO₂HYP}) and following 3 minutes of controlled hyperventilation (15 breaths per minute; CVR_{CO₂HYP}). Cerebrovascular range (CVR_{CO₂RANGE}) was calculated as CVR_{CO₂HYP} + CVR_{CO₂HYP}. Data were analysed using a 2-way repeated measures ANOVA and Bonferonni corrected paired sample *t*-tests and independent sample *t*-tests. Significance was established at $P < 0.05$ and data are expressed as mean \pm SD.

Results: At baseline, females were characterised by elevated MCAv, CVR_{CO₂HYP}, CVR_{CO₂HYP} and CVR_{CO₂RANGE} compared to the males (Table; all $P < 0.05$). During PPH, Tg increased relative to baseline in both groups and was associated with impaired CVR_{CO₂HYP} and CVR_{CO₂RANGE} (Table; $P < 0.05$). Though this was independent of gender (Table; $P > 0.05$). Furthermore, PPH did not influence changes in resting MCAv or MAP (Table; $P > 0.05$).

Conclusion: Contrary to our previous findings², PPH has the capacity to impair cerebrovascular function in young adults. Though, it appears to be independent of gender. These observations are important given that a reduction in CVR_{CO₂} may enhance the risk of stroke and neurodegenerative disease⁴.

References

¹Patsch *et al.* (1983) *PNAS*; **80**, 1449-1453.

²Marley *et al.* (2017) *Clin Sci*; **131**, 2807-2812.

³Andersen *et al.* (1999) *Neurology*; **53**, 1992-1997.

⁴Gupta *et al.* (2012) *Stroke*; **43**, 2884-2891.

Table 1. Changes in metabolic and cerebrovascular function following a high-fat meal.

Gender	Males (<i>n</i> = 18)		Females (<i>n</i> = 8)		<i>P</i> Values		
	Pre-meal	Post-meal	Pre-meal	Post-meal	Gender	Meal	Interaction
Triglycerides (mmol.L)	0.88 ± 0.50	2.32 ± 1.49*	0.97 ± 0.43	1.48 ± 0.34*	0.30	0.00	0.03
MCAv (cm.s⁻¹)	62 ± 13	61 ± 10	73 ± 11	71 ± 10	0.04	0.45	0.71
MAP (mmHg)	88 ± 9	86 ± 7	80 ± 11	81 ± 11	0.09	0.73	0.39
CVR_{CO2HYPER} (%.mmHg⁻¹)	2.77 ± 0.77	2.40 ± 0.85	3.80 ± 0.96	3.19 ± 0.66	0.01	0.01	0.52
CVR_{CO2HYPO} (%.mmHg⁻¹)	2.47 ± 0.46	2.05 ± 0.50	3.45 ± 0.94	3.39 ± 0.76	0.00	0.24	0.36
CVR_{CO2RANGE} (%.mmHg⁻¹)	5.24 ± 0.87	4.45 ± 1.13	7.24 ± 1.77	6.59 ± 0.98	0.00	0.01	0.81

Values are mean ± SD; * = *P* < 0.05 vs. pre-meal.

