Extra virgin olive oil and red wine polyphenols modulate fecal microbiota and reduce metabolic risk factors in high insulin resistant obese patients

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INTRODUCTION

- √ Beneficial effects of prebiotic food products on energy homoeostasis, satiety regulation, body weight gain and change in the composition of the gut microbiota have been analyzed, supporting the hypothesis that the gut microbiota composition may contribute to the modulation of metabolic processes associated with insulin resistance.
- √ Protective effects of polyphenols such as the modulation of vascular and platelet function, blood pressure, and an improved plasma lipid profile has been tested.
- √ The use of polyphenols may be a potential mechanism for prevention of cardiovascular and metabolic alterations associated with obesity.

OBJECTIVE

This study evaluated the prebiotic effect of a moderate intake of extra virgin olive oil (Oov) (50 g/dayl) and red wine (Rw) (270 ml /day) polyphenols on modulating the gut microbiota composition and the improvement of the metabolic risk factors in obese subjects with high insulin resistance.

METHOD

Figure 1 . PCoA analysis of bacterial communities from fecal samples subjected to 454 sequencing. Results are based on unweighted Unifrac metrics.

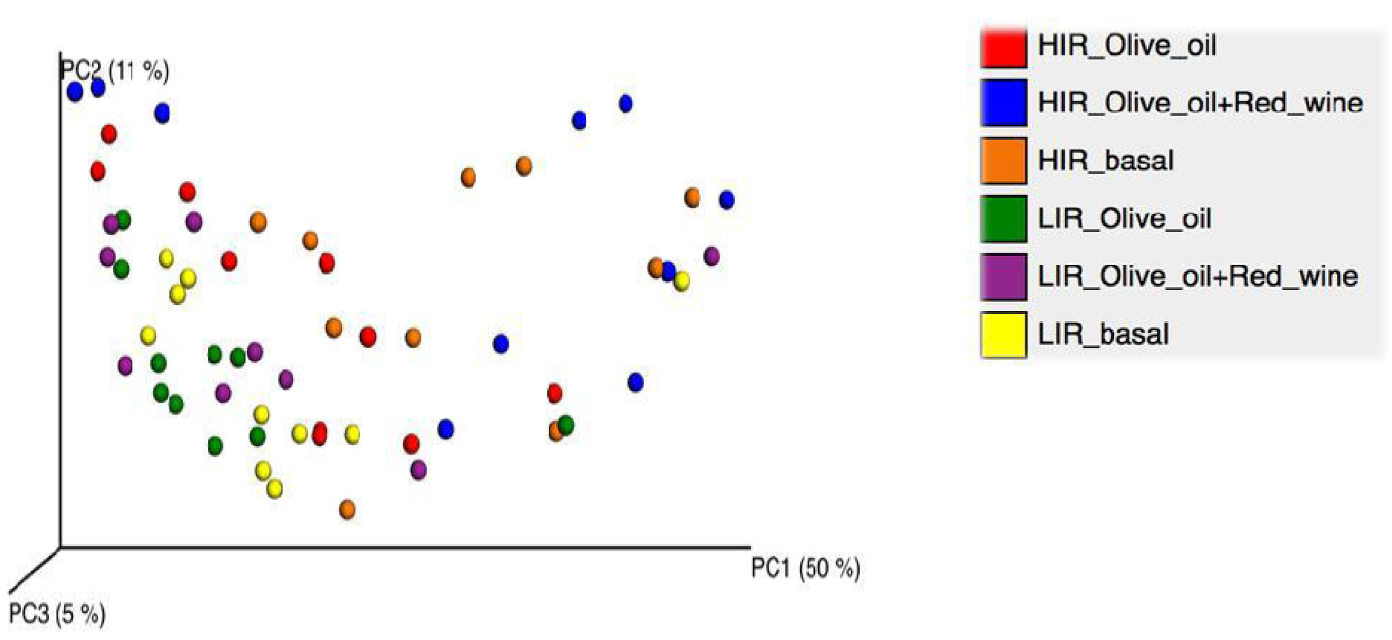
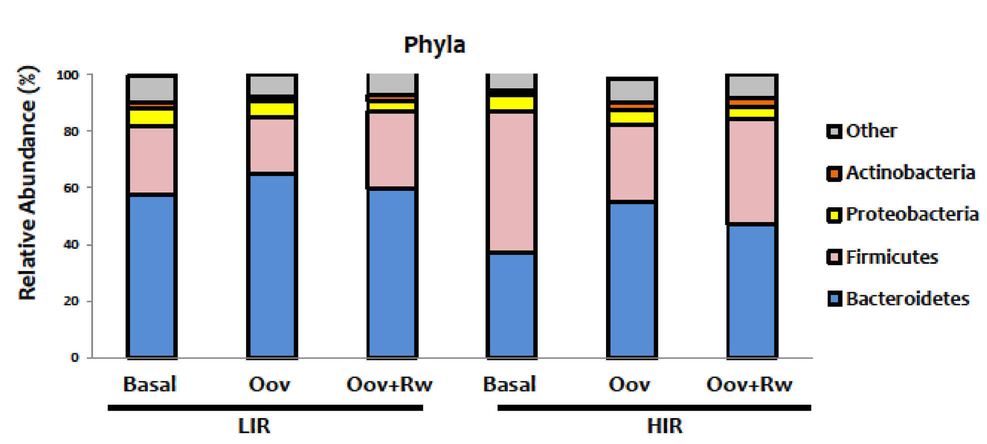


Figure 2. Pyrosequencing analysis of phyla in the LIR and HIR groups after the different intake periods.



RESULTS

Table 1. Anthropometric and biochemical variables during the study of LIR (low IR) and HIR (high IR) subjects.

	LIR (n=10) BASAL	LIR (n=10) Oov	LIR (n=10) Oov+Rw	HIR (n=10) BASAL	HIR (n=10) Oov	HIR (n=10) OoV+Rw
BMI (kg/m2)	25.37 ± 2.40^{a*}	24.86 ± 2.37$^{a\$}$	24.61 ± 2.49$^{a\$}$	38.82 ± 2.58^{a}	37.81 ± 2.22^{a}	37.61 ± 2.29^{a}
Waist (cm)	93.39 ± 6.35^{a*}	92.70 ± 6.87$^{a\$}$	92.23 ± 7.17$^{a\$}$	123.10 ± 15.39^{a}	122.05 ± 13.39^{a}	121.80 ± 13.89^{a}
Hip (cm)	104.8 ±4.94^{a*}	103.80 ± 4.33$^{a\$}$	103.00 ±5.22$^{a\$}$	128.25 ± 18.50^{a}	127.32 ±15.98^{a}	127.67 ± 14.49^{a}
DBP (mmHg)	64.80 ± 10.19^{a*}	63.40 ± 11.62^{a}	63.90 ±11.24^{a}	76.80 ± 16.94^{a}	73.0 ± 16.66^{a}	72.10 ± 17.59^{a}
SBP (mmHg)	114.70 ± 9,28^{a*}	112.70 ±12.33^{a}	111.20 ±8.28^{a}	129.20 ±18.51^{a}	123.3 ± 15.99^{a}	122.0 ± 17.62^{a}
Glucose (mg/dL)	88.40 ± 5.97^{a*}	86.10 ± 6.69$^{a\$}$	86.65 ± 6.14$^{a\$}$	137.70 ± 10.05^{a}	102.90 ± 8.43^{b}	100.5 ±8.95^{b}
Insulin (mg/dl)	9.05±1.55^{a*}	6.57 ±1.38$^{b\$}$	6.68 ±1.39$^{b\$}$	23.78 ±3.24^{a}	15.96±2.45^{b}	16.83±2.80^{b}
Uric acid (mg/dL)	4.43 ± 1.27^{a*}	4.40 ± 1.50^{a}	4.55 ± 1.31^{a}	5.76 ± 1.39^{a}	5.69 ±1.22^{a}	6.11 ± 1.53^{a}
Triglycerides (mg/dL)	101.40 ± 20.22^{a*}	96.0 ± 28.18$^{a\$}$	93.50 ± 21. 2$^{a\$}$	219.90 ± 23.96^{a}	174.10 ± 26.13^{b}	179.20 ± 24.25^{b}
Cholesterol (mg/dL)	177.70 ± 17.43^{a*}	166.5 ± 16.18^{a}	169.60 ± 15.29^{a}	224.30 ± 14.18^{a}	178.30 ± 16.43^{b}	175.00 ± 12.15^{b}
LDL cholesterol (mg/dL)	119.00 ± 22.85^{a}	109.86 ± 21.55^{a}	106.06 ± 20.86^{a}	120.26 ± 37.36^{a}	113.30 ± 34.30^{a}	111.18 ± 29.69^{a}
HDLcholesterol (mg/dL)	65.70 ± 15.50^{a*}	67.40 ± 11.56^{a}	66.40 ± 12.29^{a}	41.60 ± 11.50^{a}	52.40 ± 13.34^{b}	53.40 ± 13.05^{b}
CRP (mg/dL)	4.89 ± 1.10^{a*}	3.14 ± 1.58^{b}	3.87 ± 0.76^{b}	8.71 ± 5.40^{a}	5.43 ± 1.83^{b}	5.28 ± 1.55^{b}

Figure 2. Analysis of the diversity and similarity of microbial communities in both study groups

	HIR			LIR		
	Basal	Oov	Oov+Rw	Basal	Oov	Oov+Rw
Chao 1	169.88±56.4	164.54±42.5	157.38±27.5	168.41±45.1	162.28±32.9	159.66±41.2
Shannon	5.16±0.31	5.16±0.59	4.33±0.80	5.15±0.58	5.09±0.50	4.71±0.37

Figure 3. Family-level microbial microbial classification of bacteria from LIR and HIR stool samples during the study.

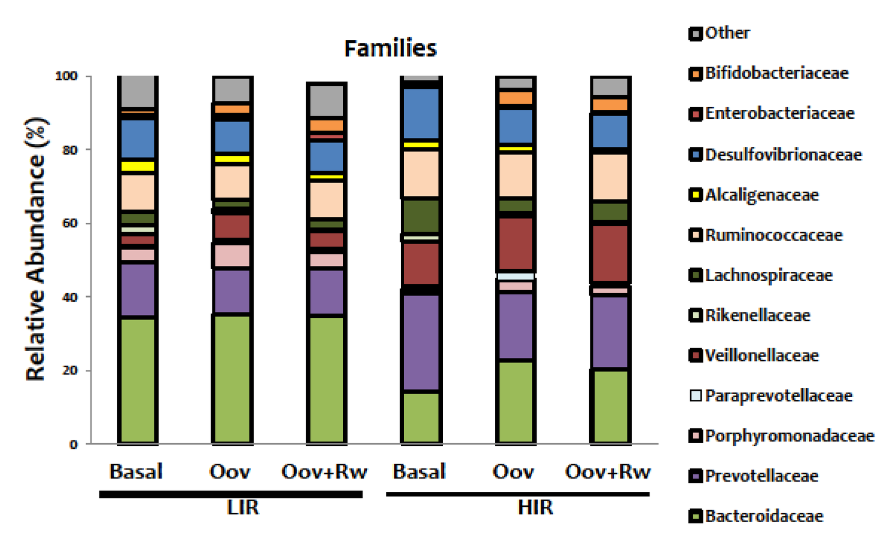
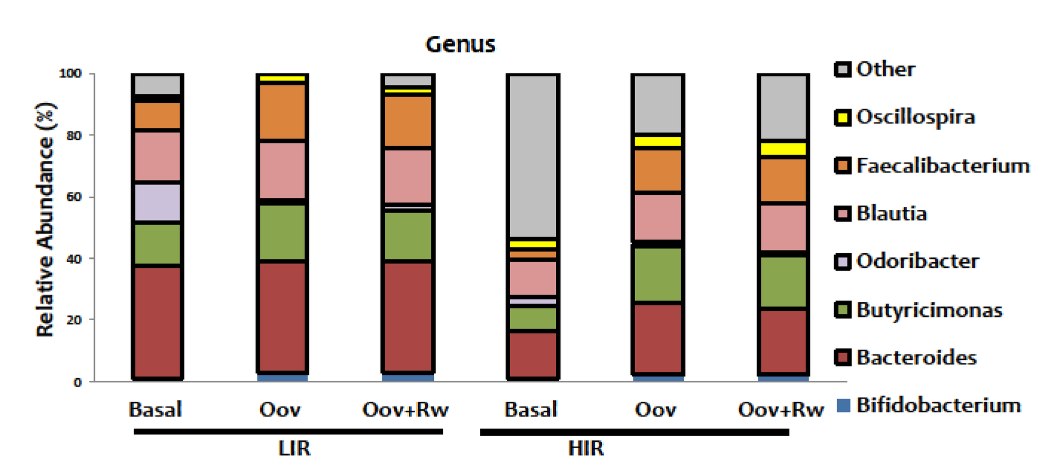


Figure 4. Relative abundance of bacterial genera in the microbiota of the LIR and HIR groups at different intake periods.



CONCLUSIONS

- √ The supply of a mediterranean diet supplemented with extra virgin olive oil and red wine polyphenols to obese patients with insulin resistance, increase HDL levels and decrease triglyceride and CRP levels, improving the cardiovascular risk associated with these patients.
- √ The changes in gut microbiota found in these HIR patients such as the increase in lactate and butyrate-producing bacteria, essential to maintain the gut integrity and the decrease in mucin-degrading bacteria, could be responsible for the improvement observed in these metabolic markers.

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Topic: Obesity