

Effect of phosphorus on the oral glucose tolerance test

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Phosphate infusion under euglycemic conditions have been reported to influence insulin sensitivity, with an increased rate of glucose disposal⁽¹⁾. While hypophosphatemia was found to be associated with insulin insensitivity and impaired glucose tolerance⁽²⁾. It was also reported that healthy non-diabetic individuals with low serum phosphate levels tend to have elevated blood glucose levels and reduced insulin sensitivity in the 2 h postprandial period⁽³⁾. The rise in insulin levels is known to reduce serum phosphate due to the shift of extracellular phosphate to the intracellular region. In view of the increased intake poor dietary P (refined cereals, sugar and sweeteners), it became questionable whether phosphate can affect the postprandial glycaemia. The objectives of the study were to determine the effect of phosphate on postprandial glycaemia, insulinemia and insulin sensitivity in an oral glucose tolerance test (OGTT).

Eight healthy male subjects of normal BMI were recruited. Each subject was exposed in random order to two experimental solutions: (1) glucose solution containing 75 g glucose; (2) glucose and phosphate solution, containing 75 g glucose and 500 mg P. Blood samples were collected at fasting, and after drinking the solutions at 15, 30, 60, 90, 120, 180 and 240 min. Serum insulin, glucose, total phosphate and inorganic phosphate were measured. Homeostatic model assessment (HOMA) was calculated to determine insulin sensitivity.

Time(min)	0	15	30	60	90	120	180	240	Pooled sd	ANOVA
Total phosphate (mg/dl)										
– P	4.21	3.91	3.76*	3.46*	3.30*	3.38*	3.65*	4.03*	0.828	0.299
+ P	4.01	3.99	3.99	4.11	4.34	4.50	4.48	4.63	0.623	0.226
Inorganic phosphate (mg/dl)										
– P	3.10	3.04	2.86*	2.45*	2.59*	2.51*	2.67*	3.04	0.651	0.275
+ P	3.14	2.99	3.17	3.28	3.26	3.34	3.51	3.42	0.705	0.875
Glucose (mg/dl)										
– P	87.88	124.25	142.8	127.8	99.25	84.88	59.25	74.75	23.17	0.000
+ P	85.88	124.00	132.6	105.1	88.5	92.12	62.38	77.63	17.93	0.000
Insulin, (μU/ml)										
– P	8.86	43.37	76.5	84.6*	8.9	32.4	8.54	7.634	27.49	0.000
+ P	8.18	45.20	72.9	54.6	32.22	24.61	7.29	7.169	24.27	0.000
HOMA										
– P	1.93	13.75	28.66	30.14*	13.85	7.68	1.21	1.41	11.92	0.000
+ P	1.74	14.87	25.48	16.54	7.75	5.95	1.11	1.37	9.59	0.000

Values are means plus pooled sd. One way ANOVA was used for within group analysis and paired *t* test for between group analyses. **P*<0.05 (paired *t* test).

Results showed that the inclusion of phosphate into OGTT was able to prevent the reduction in both total and inorganic phosphates. At the same time, phosphate addition was able to reduce both insulin and HOMA at 60 min. Thus phosphate seems to improve insulin sensitivity after an oral glucose load.

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