

Comparison of isoflavone absorption from soybean extract and red clover

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The absorption of isoflavones in humans is complex, highly variable and poorly studied. Measured from 24 hr urinary excretion, reported values range from < 10% to nearly 50% but are mostly 15–25% on average. Even among small groups of subjects, the inter-individual ranges may vary eight-fold. Absorption/excretion differs between isoflavones, daidzein excretion exceeding that of genistein. Isoflavones occur naturally as conjugated glycosides but are absorbed as aglycones following microbial interactions in the gut. Whether free (aglycone) isoflavones are more readily absorbed has been studied with fermented versus unfermented soybean, with equivocal results. Because foods and commercial nutraceuticals contain both conjugated and free isoflavones, we investigated their relative absorption from a similar food.

The objective was to compare the excretion in urine of isoflavones from a source of soybean (95% glycoside) and from red clover (99% aglycone). The aim was to deliver 30 mg as free isoflavone within a commercially prepared breakfast cereal, eaten once daily. Excretion was measured in a 24 hr aliquot of urine spanning the final consumption of cereal that had been eaten regularly over 21 days. A cereal virtually devoid of isoflavones served as control and was eaten in the mid 21 day period between the two isoflavone containing cereals that were eaten in random order. Fourteen subjects participated in the 11-week study that included also a two-week run-in period when all isoflavone containing foods were avoided.

The source of soy provided isoflavones in a ratio of 0.45 daidzein (D), 0.20 genistein (G). The proportions of isoflavones in red clover were: 0.48 formononetin (precursor of D), 0.33 biochanin (precursor of G), 0.03 D, 0.01 G.

Excretion was on average similar with both sources of isoflavones: 7.33 ± 3.49 mg with soy glycoside and 7.93 ± 3.55 mg with red clover aglycone. The means therefore represent approximately 25% absorption, although this would be a minimal value since the metabolites of isoflavones were not measured. The large SD indicates the inter-individual variability (25%–75% around medians: 4.31–9.74 mg with soy and 5.61–11.39 mg for red clover). However individuals who absorbed/excreted small amounts did so with both preparations as did those who absorbed/excreted larger amounts. There was a strong correlation between amounts excreted during the two phases ($r = 0.69$; $P = 0.007$). Relatively more D than G was excreted than was present in soy and substantial conversion occurred of formononetin and biochanin to D and G respectively. (Chemical analyses carried out by Novogen Ltd, North Ryde, NSW.)

In conclusion isoflavones appear to be absorbed similarly in their glycoside or aglycone state. Isoflavones of different mix appear to be similarly absorbed. Whereas we found substantial inter-individual variability, the intra-individual variability was much less. These results apply to isoflavones incorporated into a food.