

## Intake of dehydrated apple enriched by mandarin juice by vacuum impregnation reduces oxidative stress induced by tamoxifen in rats

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Fruit derived products are an emerging area within functional foods. Recently, we have developed an apple snack rich in flavonoids from mandarin juice by using vacuum impregnation and air drying technologies<sup>(1)</sup>. The product can combine the beneficial effect of both sources into one food item, or even enhance the beneficial compounds in the juice by protecting them through inclusion into a food structure. We have conducted an experimental study to evaluate the effects of this foodstuff consumption in decreasing oxidative stress mainly due to a counteraction of free radicals. With this end, we have determined the protection against tamoxifen-induced injury, one of the most commonly used anti breast cancer medications but with adverse effects, particularly liver toxicity as a result of the reactive oxygen species generated during its metabolism process.

Thirty female Wistar rats (12 weeks old) were used in this study. They had free accessing to a standard powered diet. The snack supplementation period was 28 days (each animal was eating 0.745 g of snack per day, which is equivalent to 40 g of snack consumed per day by a child of 30 kg) and the period of tamoxifen treatment (1.54 mg/kg) started one week after supplementation in the rats submitted to oxidative stress ( $n = 10$ ). The biomarkers of oxidative damage to proteins (carbonyl groups) and DNA (8-hydroxy-deoxyguanosine) were measured in liver. The rats treated with tamoxifen shown an increase in the biomarkers of oxidative stress (carbonyl groups and 8-hydroxy-deoxyguanosine). The increase in 8-hydroxy-deoxyguanosine was significantly diminished by the administration of the apple snack enriched with mandarin juice (Table).

These results suggest that the apple snack may act as a suppressor against oxidative liver stress induced by tamoxifen, mainly at the DNA level.

**Table.** Parameters of oxidative stress, DNA injury and antioxidant levels in homogenized liver

	Water ( $n = 10$ )		Snack ( $n = 10$ )		Snack + IV ( $n = 10$ )	
	Mean	SEM	Mean	SEM	Mean	SEM
Carbonyl groups (nmol/mg protein)	2.73	0.13	2.24	0.21	2.58	0.39
8OHdG (ng/mg DNA)	13.27 <sup>a</sup>	0.75	11.21	0.91	9.82 <sup>a</sup>	1.24

Water: standard diet + water; Snack: snacks without impregnation; Snack + IV: snacks impregnated with mandarin juice. Values with same alphabetical letter are different:

<sup>a</sup> $p < 0.0001$ .

1. Fito P, Chiralt A, Betoret N, *et al.* (2001) *J Food Eng* **49**, 175–183.