

Utilisation of the isobole methodology to study dietary peptide-drug and peptide-peptide interactive effects on dipeptidyl peptidase IV (DPP-IV) inhibition

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Supplementary data

Table S1: *In silico* analysis showing the occurrence of Trp-Lys, Trp-Pro, Trp-Arg, Trp-Leu and Ile-Pro-Ile-Gln-Tyr in food proteins.

Origin	Protein*	Accession number [†]	Peptide occurrence in proteins [‡]					
			Ile-Pro-Ile-Gln-Tyr	Trp-Arg	Trp-Lys	Trp-Leu	Trp-Pro	
Wheat (<i>Triticum aestivum</i>)	α' β -gliadin	P02863	0	0	0	0	0	
	Glutenin, high molecular weight subunit 12	P08488	0	0	0	0	0	
	Glutenin, low molecular weight subunit 1D1	P10386	0	0	0	0	0	
	Large subunit RuBisCO	P11383	0	1	1	0	0	
	Small subunit RuBisCO	P26667	0	0	1	0	1	
Barley (<i>Hordeum vulgare</i>)	B hordein	Q40026	0	0	0	0	1	
	D hordein	Q40054	0	0	0	0	0	
	γ -hordein-3	P80198	0	0	0	0	0	
	Large subunit RuBisCO	P05698	0	1	1	0	0	
	Small subunit RuBisCO	Q40004	0	0	1	0	1	
Oat (<i>Avena sativa</i>)	Avenin	P27919	0	1	2	0	1	
	11S globulin	Q38779	0	0	0	0	0	
	12S globulin	Q49257	0	0	0	0	1	
	Large subunit RuBisCO	P48684	0	1	1	0	0	
Corn (<i>Zea mays</i>)	Small subunit RuBisCO	Q9ZWG4	0	0	1	0	1	
	Large subunit RuBisCO	P00874	0	1	1	0	0	
	Small subunit RuBisCO	P05348	0	0	1	0	1	
Rice (<i>Oryza sativa</i> subsp. Japonica)	Large subunit RuBisCO	P0C512	0	1	1	0	0	
	Small subunit RuBisCO	P18566	0	0	1	0	1	
Sorghum (<i>Sorghum vulgare</i>)	Large subunit RuBisCO	A1E9T2	0	1	1	0	0	
	Small subunit RuBisCO	C5Y519	0	0	1	0	1	
Soybean (<i>Glycine hispida</i>)	Basic 7S	P13917	0	1	0	0	0	
	Glycinin	P04347	0	0	0	0	0	
	β -conglycinin, β -chain	P25974	0	0	0	0	0	
	β -conglycinin, α -chain	P13916	0	0	0	0	1	
	β -conglycinin, α' -chain	P11827	0	0	0	0	0	
Quinoa (<i>Chenopodium quinoa</i>)	RuBisCO large chain	K4P448	0	1	0	0	0	
Canola (<i>Brassica napus</i>)	Cruciferin	P11090	0	0	0	0	0	
	Napin small chain	P17333	0	0	0	1	0	
	Napin large chain	P17333	0	0	0	0	0	
Amaranth (<i>Amaranthus hypochondriacus</i>) <i>Palmaria palmata</i> (<i>Rhododymenia palmata</i>)	Large subunit RuBisCO	P16306	0	1	1	0	0	
	50S ribosomal protein L31, chloroplastic	Q5MIM5	0	0	0	0	0	
	PALPL Ribosomal protein 12	Q5MIL8	0	0	0	0	0	
	Allophycocyanin α chain	M1UZ22	0	1	1	0	0	
	Allophycocyanin β chain	M1VJV1	0	1	0	0	0	
	Phycocyanin α	I2FJU0	0	1	1	0	0	
	Phycocyanin β	I2FJT9	0	0	1	0	1	
	Phycocerythrin α subunit	F2ZAL8	0	0	0	0	0	
	Phycocerythrin β subunit	F2ZAL7	0	0	0	0	0	
	RuBisCO large chain	Q9THF8	0	0	0	0	0	
	RuBisCO small chain	O98734	0	0	0	0	0	
	Small subunit RuBisCO	Q9XGX5	0	0	1	0	1	
	Chicken egg (<i>Gallus gallus</i>)	Ovalbumin	P01012	0	0	0	0	0
		Ovotransferrin	P02789	0	0	0	0	0
		Ovomucoid	P01005	0	0	0	0	0
Bovine milk (<i>Bos taurus</i>)	α_{s1} -casein	P02662	0	0	0	0	0	
	α_{s2} -casein	P02663	0	0	0	0	0	
	β -casein	P02666	0	0	0	0	0	
	κ -casein	P02668	1	0	0	0	0	
	β -lactoglobulin	P02754	0	0	0	0	0	
	α -lactalbumin	P00711	0	0	0	2	0	
	Lactoferrin	P24627	0	1	1	0	0	
Bovine meat (<i>Bos taurus</i>)	BSA	P02769	0	0	0	0	0	
	Myosin-1	Q9BE40	0	1	1	2	1	
	Myosin regulatory light chain 12B	A4IF97	0	0	0	0	0	

Pig (<i>Sus scrofa</i>)	Actin, cytoplasmic 1	P60712	0	0	0	0	0
	Collagen α -1 (III) chain	P02459	0	0	1	0	0
	β -actin	Q8SPK6	0	0	0	0	0
	Actin, α skeletal muscle	P68137	0	0	0	0	0
	Myosin light chain	Q29069	0	0	0	0	0
Atlantic salmon (<i>Salmo salar</i>)	Myosin heavy chain	Q29623	0	0	0	1	0
	Actin, cytoplasmic 1	O42161	0	0	0	0	0
	Myosin regulatory light chain 2	Q7ZZN0	0	0	0	0	0
	Slow myosin heavy chain	Q2HXU3	0	0	0	1	0
Chum salmon (<i>Oncorhynchus keta</i>)	Collagen Type XI α 2	A7KE05	0	1	0	0	0
	Type 1 collagen α 2 chain	Q8UUJ4	0	0	0	0	0
	Actin	Q9PVN1	0	0	0	0	0
	β -actin	J7ID80	0	0	0	0	0
Tuna (<i>Thunnus orientalis</i>)	Myosin heavy chain	Q8JIP5	0	2	1	2	1
	β -actin	A9CM08	0	0	0	0	0
	Myosin heavy chain-1	G9M5T1	0	1	1	2	1
	Myosin heavy chain-2	G9M5T2	0	1	1	2	1

*RuBisCO: Ribulose biphosphate carboxylase; BSA bovine serum albumin

†Accession number from UniProt database, data presented within this table is relative to the mature protein sequence

*0: peptide not found within the protein sequence; 1 and 2: peptide found once or twice, respectively, within the protein sequence

Table S2: Inhibitory concentration inducing 50 % inhibition (IC₅₀) for dipeptidyl peptidase IV (DPP-IV) and type of inhibition as determined by Lineweaver and Burk analysis.

Compound	IC ₅₀ (μM) [*]	Type of inhibition [‡]
Sitagliptin	0.037 ± 0.009 ^a	competitive
Ile-Pro-Ile	3.6 ± 0.6 ^b	substrate-type, competitive
Ile-Pro-Ile-Gln-Tyr	23.3 ± 1.4 ^c	substrate-type, competitive
Trp-Lys	33.1 ± 4.0 ^d	non-competitive
Trp-Pro	33.3 ± 2.8 ^d	non-competitive
Trp-Arg	34.9 ± 6.0 ^d	non-competitive
Trp-Leu	53.9 ± 2.4 ^e	true, competitive

* Values represent the mean half maximum inhibitory concentration (IC₅₀) ± confidence interval (P=0.05). Values with different superscript letters are significantly different (P < 0.05)

[‡]Type of DPP-IV inhibition as reported elsewhere [1,2](#)

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1. A. B. Nongonierma and R. J. FitzGerald, *Food Funct.*, 2013, **4**, 1843-1849.
 2. L. Thomas, M. Eckhardt, E. Langkopf, M. Tadayyon, F. Himmelsbach and M. Mark, *Journal of Pharmacology and Experimental Therapeutics*, 2008, **325**, 175-182.