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Multifunctional peptides from food industry by-products

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Introduction: by-products up-cycling

Industry

By-product

Fraction

Protein

Meat

Blood

Serum albumin

Dairy

Whey

β -lactoglobulin

**Bioactive
peptides**





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Introduction: fight against diseases

- Global concern: chronic/degenerative diseases:
 - Diabetes: high prevalence (366M people affected by 2030), closely related with other diseases
 - Oxidative mechanisms: influence these diseases
- Short protein fragments that have a positive impact on body functions and conditions
- Wide range of bioactivities: antioxidant, antidiabetic, antimicrobial, antihypertensive, immunomodulatory ...





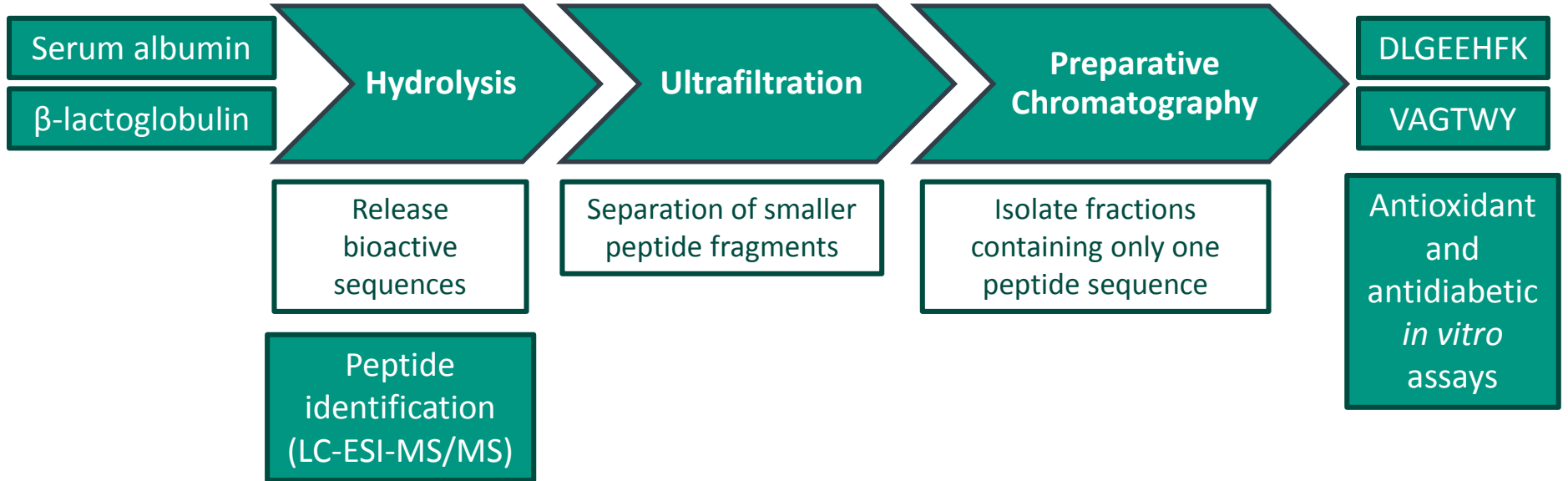
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Objectives

- Develop a simple procedure that could be scaled-up
- Obtain multifunctional bioactive peptides from by-product-derived proteins
- Obtain multifunctional bioactive peptides against diabetes and oxidative stress



Methodology



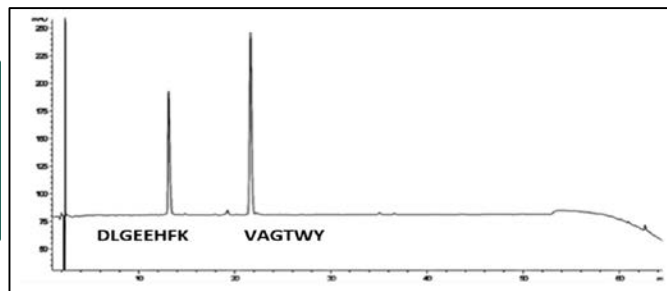
Results: protein hydrolysis and peptide purification

Peptide sequences detected in the β -Ig and BSA hydrolysates by MALDI-TOF/MS and ESI-MS/MS

	Amino acid sequence	Protein sequence		
BSA tryptic hydrolysate	LGEYGFQNALIVR	BSA f (421-433)	LVTDLTK	BSA f (257-263)
	HLVDEPQNLIK	BSA f (402-412)	SEIAHR	BSA f (29-34)
	HPEYAVSVLLR	BSA f (361-371)	GACLLPK	BSA f (198-204)
	LVNELTEFAK	BSA f (66-75)	AWSVAR	BSA f (236-241)
	EACFAVEGPK	BSA f (588-597)	TPVSEK	BSA f (490-495)
	QTALVELLK	BSA f (549-557)	QEPER	BSA f (118-122)
	LVVSTQTALA	BSA f (598-607)	AFDEK	BSA f (524-528)
	DLGEEHFK	BSA f (37-44)	VASLR	BSA f (101-105)
	YLYEIAR	BSA f (161-167)	FWGK	BSA f (157-160)
	AEFVEVTK	BSA f (249-256)	FGER	BSA f (229-232)
	DDSPDLPK	BSA f (131-138)	DTHK	BSA f (25-28)
	ATEEQLK	BSA f (562-568)	SLGK	BSA f (452-455)
			VHK	BSA f (264-266)

	Amino acid sequence	Protein sequence
β -Ig tryptic hydrolysate	VYVEELKPTPEGDLEILLQK	β -Ig f (41-60)
	SLAMASSDISSLLDAQSAPLR	β -Ig f (21-40)
	TPEVDDEALEKFDK	β -Ig f (125-138)
	TPEVDDEALEK	β -Ig f (125-135)
	VLVLDTDYK	β -Ig f (92-100)
	LIVTQTMK	β -Ig f (1-8)
	TKIPAVFK	β -Ig f (76-83)
	IDALNENK	β -Ig f (84-91)
	ALPMHIR	β -Ig f (142-148)
	VAGTWY	β -Ig f (15-20)
	IPAVFK	β -Ig f (79-83)
	GLDIQK	β -Ig f (9-14)
	IIAEK	β -Ig f (71-75)
FDK	β -Ig f (136-138)	
ALK	β -Ig f (139-141)	

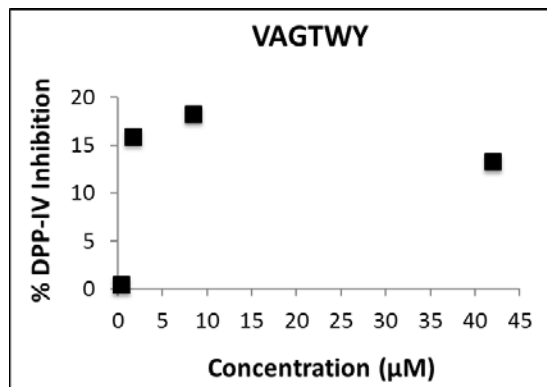
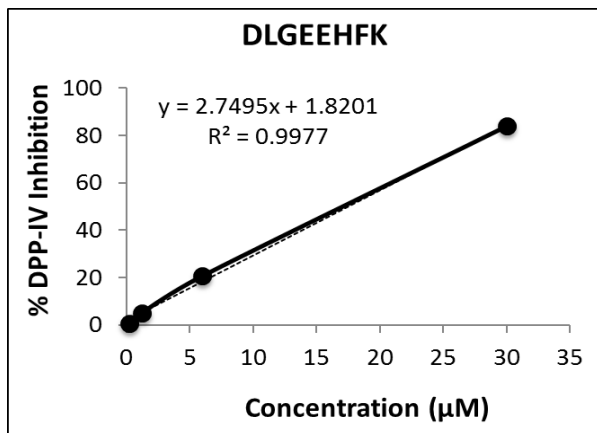
Analytic RP-HPLC chromatograms of fractions VAGTWY and DLGEEHFK



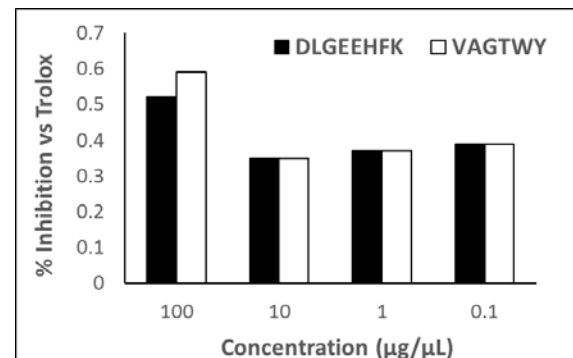
Results: bioactivity *in vitro* assays

Dipeptidyl peptidase-IV (DPP-IV) inhibition percentage versus peptides VAGTWY and DLGEEHFK concentration.

The best-fit equations are presented on the plots when appropriate



Antioxidant activity of VAGTWY and DLGEEHFK





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Conclusions

Purified multifunctional peptide fractions were obtained by hydrolysis, filtration and chromatography, from proteins isolated from by-product streams

Fraction DLGEEHFK (BSA f (37-44)) showed promising antioxidant activity and outstanding antidiabetic activity. 2 activities described until now

Fraction VAGTWY (β -lg f (15-20)) showed promising antioxidant activity, apart from the formerly described antidiabetic activity. 5 activities described until now





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THANK YOU

