



Phosvitin Phosphopeptides (PPPs) from Egg Yolk– The Myth of Calcium Absorption

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Summary

Osteoporosis is a worldwide disease affecting 21.3% of women and 5.5% of men over 50 years old. Osteoporosis increases the risk of fracture due to the reduction of bone mass and declining of bone micro architectures. In Canada, the osteoporosis burden of the year 2007-2008 was estimated around 2.3 billion dollars to 4.1 billion dollars, and it is expected to increase rapidly in the next few decades with the aging Canadian population.

Egg yolk phosvitin showed strong ability to bind minerals. After enzymatic hydrolysis the phosphorylated fragments/peptides of phosvitin (PPP) show the opposite effects to enhance Fe and Ca absorption through cell culture and animal experiments. In fact, phosphopeptides from casein (CPP) have been successfully applied as a functional ingredient in health products to maintain bone/dental health. However, the commercialization of PPP is hindered by the lack of preparation protocols.

The objectives of this study are:

- (1) To prepare PPP and study its ability to promote Ca absorption and dental health.
- (2) To study the relationship of PPP's molecular structure and its physiological activities.

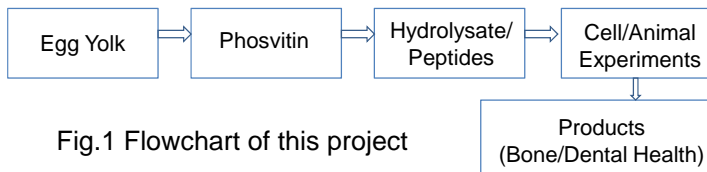


Fig.1 Flowchart of this project



Fig.2 Products of CPP/PPP

Results

Table 1 Phosphopeptides prepared by different protocols

	DH %	Peptide yield mg/g	Peptide recovery %	N/P atomic ratio
Ting et al.	5.2	N/A	N/A	11.8
CPPs	N/A	N/A	N/A	6-18
This study	12.9	10.4	6.1	3.9

*Lower N/P values relate to higher activities

Table 2 Sequences of Phosvitin Phosphopeptides

Sequence	Molecular Weight
Domain I AEFGTEPDAKTSSSSSSASSTATSSSSSSASSPN (PV 1-34)	
1 AEFGT(P)EPDA (1P)	935.4
Domain III SGHLEDDSSSSSSSVLSKIWG (PV 190-211); 6-10 phosphorylation	
2 SGHLEDDSSSSSSSVLSK (10P)	1894.9
3 SGHLEDDSSSSSSSVLS (8P)	1766.8
4 SGHLEDDSSSSSSSVLSKI (6-7P)	2007.9
5 LEDDSSSSSSSVLSKI (7P)	1726.8
6 LEDDSSSSSSSVLSK (7, 8, 9P)	1613.7

*the numbers in the parenthesis are the numbers of phosphorylated amino acids in the peptide sequences; High degree of phosphorylation relates to high physiological activities

Our Observations

- We prepared phosvitin phosphopeptides (PPP) with lower(better) N/P than commercial CPP
- We identified multi-phosphorylated peptides with great potential to promote Calcium absorption

Significance

Our observations suggest

- the possibility to prepare highly phosphorylated peptides from egg yolk at low cost
- The possibility to develop novel functional foods to promote Ca absorption with phosvitin phosphopeptides.

- To optimize the protocol to prepare PPP
- To study the activities of PPP through cell culture and animal experiments

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