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### Total potentially available casein phosphopeptides (TPA-CPP)

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Casein phosphopeptides (CPP) are a group of peptides derived from casein that contain a high content of phosphate groups. The primary benefit of CPP is that it binds minerals such as calcium, iron or zinc, increasing the solubility and absorption of these minerals (Bennett et al, 2000; Scholz-Ahrens & Schrezenmeir, 2000; Tsuchita, Suzuki & Kuwata, 2001; Narva et al 2003). The mineral binding sites in CPP consists of a series of amino acids, with attached phosphates.

CPP can be produced commercially by enzymatic hydrolysis of caseinates and is sometimes added to foods or supplements to enhance mineral uptake. Different forms of CPP, which can have different functions, are produced from the different casein proteins, but all contain high amounts of phosphate (Reynolds, Riley & Adamson, 1994). However, addition of this artificially produced CPP to foods is only useful in situations of calcium or vitamin D deficiency or when calcium absorption is inhibited by foods containing phytate, eg soy (Scholz-Ahrens & Schrezenmeir, 2000). Several studies show that casein or milk is as effective as commercially produced CPP (Bennett et al, 2000; Tsuchita, Suzuki & Kuwata, 2001; Narva et al 2003). This is because CPP are released from casein by the digestion of the milk in the gastrointestinal tract.

We can estimate the quantity of CPP that is bound in casein that can potentially be released by digestion by simulating the digestion process (Lin & Chiang, 1996, Miquel et al, 2005). The term Total Potentially Available CPP (TPA-CPP) is useful to describe the CPP that is measured in this way. Generally, the more casein protein present the higher the amount of TPA-CPP. The typical TPA-CPP level in goat milk products manufactured by Dairy Goat Co-operative 9.1g per 100g protein, compared with 6.1 g per 100g protein in cow milk powders.

#### **References**

- Bennett T, Desmond A, Harrington M, McDonagh D, FitzGerald R, Flynn A, Cashman KD 2000 The effect of high intakes of casein and casein phosphopeptide on calcium absorption in the rat. *Brit J Nutr* 83: 673-680.
- Lin J-H, Chiang B-H 1996 A modified procedure for caseinophosphopeptide analysis. *J Chromatog Sci* 34:358-361.
- Miquel E, Gomez, JA, Alegria A, Barbera R, Farre R, Recio I 2005 Identification of casein phosphopeptides release after simulated digestion of milk-based infant formula. *J Agric Food Chem* 53:3426-3433.
- Narva M, Karkkainen M, Poussa T, Lamberg-Allardt C, Korpela R 2003 Casein phosphopeptides in milk and fermented milk do not affect calcium metabolism acutely in postmenopausal women. *J Am Coll Nutr* 22: 88-93.

Reynolds EC, Riley PF, Adamson NJ. 1994 A selective precipitation purification procedure for multiple phosphoserine-containing peptides and methods for their identification Anal Biochem. 1994 217:277-284.

Scholz-Ahrens KE, Schrezenmeir J 2000 Effects of bioactive substances in milk on mineral and trace element metabolism with special reference to casein phosphopeptides. *Brit J Nutr* 84 (Suppl 1): S147-S153.

Tsuchita H, Suzuki T, Kuwata T 2001 The effect of casein phosphopeptides on calcium absorption from calcium-fortified milk in growing rats. *Brit J Nutr* 85:5-10

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