



MARCH 8, 2018

PHOSVITIN INHIBITS MELANOGENESIS
THE AMAZING WAYS THAT PHOSVITIN FIGHTS AGE SPOTS AND CANCER
CELLS AND PROMOTES SKIN WHITENING

ALEX HOLDCROFT BSC., MM.
ECOVATEC SOLUTIONS INC.
31231 Wheel Ave., Abbotsford, B.C., CANADA, V2T6H1

Executive Summary

Ecovatec's revolutionary technology has unlocked the amazing potential of Phosvitin. Ecovatec is the only known commercial producer of phosvitin in the world.

Phosvitin has been characterized by many scientific papers, and the literature consensus is that it has huge potential as a bio-active molecule. Bioactivity is based on the ability of a compound to be "able to exert a biological effect at a physiological level, and it must be measurable and able to provide health benefits."¹ One of the many health benefits of phosvitin, is that it can inhibit the production of skin pigment in skin cells, specifically cancerous melanoma cells. Ecovatec's pure phosvitin and phosphopeptides products will enable health science and cosmetic researchers to perform further analysis of the uses of phosvitin in skin-health at a much lower cost than is currently available.

Background

Phosvitin is a highly phosphorylated protein derived from the egg yolks of vertebrates. Proteins are made up of peptides, which are short chains of amino acids linked by peptide bonds. Bioactive peptides have shown the most promising potentials as therapeutic or health promoting agents².

Serine is the major amino acid present in phosvitin (55%), and almost all the serine residues are phosphorylated. This phosphorylation gives phosvitin its strong metal binding ability.¹⁻⁵ Scientists have noted that many compounds that have metal-binding abilities are also useful as melanogenesis inhibitors⁵.

Samaraweera, et al (2011)² and *Ren, et al* (2015)⁴ both note that the potential use of phosvitin as a functional ingredient is only hampered by lack of a scalable method of extraction. **Ecovatec Solutions Inc has eliminated this barrier.**

Melanogenesis (the production of "skin pigment")

Melanin is synthesized in melanocytes in the deepest level of the skin to protect the skin from ultraviolet radiation (UV) damage⁵. Humans vary in terms of their "base level" of melanin production and their "activated level". This is what accounts for the wide variety in human skin colours. An enzyme called **tyrosinase** is responsible for the production of melanin and there are two types of skin, hair, and eye pigments that can be developed, black-brown or yellow-red^{5,6}. A third type of melanin can be produced, called neuromelanin, which has strong metal-binding properties and may be related to Alzheimer's and Parkinson's disease.⁶

Melanogenesis Disorders in Humans

When large amounts of melanin are produced and accumulate in cells, aesthetic problems such as hyperpigmentation (melasma) and age spots can be developed. **These cosmetic issues can also be associated with an increased risk for skin cancer.** Therefore, it is important for both medical and cosmetic uses to regulate or inhibit melanogenesis.

Egg Yolk Phosvitin as a Melanogenesis Inhibitor⁵

Jung et al. (2012)⁵ investigated the effects of phosvitin on melanogenesis in melanoma (skin cancer) cells. Their results showed that phosvitin was able to inhibit the activity of tyrosinase and therefore reduce the production of melanin. They concluded that the results showed that phosvitin can be used to inhibit the production of skin pigment in the cosmetics industry.

The researchers found that melanoma cell viability decreased by 20% when exposed to 1000 µg/mL phosvitin and were able to determine which aspects of the cell chemical reactions were inhibited by phosvitin. Ultimately, a molecule called cAMP which is necessary in this biological pathway is reduced by 39% in only a 50µg/mL dose, showing the power of phosvitin in this reaction.

The ways in which phosvitin acts on melanin production isn't completely understood. However, it is likely that it is due to its metal-binding abilities or because of the hydrophobic (water-repelling) ends of the protein. If the mechanism is due to its metal-binding abilities, **phosvitin phosphopeptides (PVP)**, which are the bioactive peptides and natural antioxidants derived from native (whole phosvitin), **might even have a better effect on inhibiting melanogenesis while also reducing skin oxidative stress which leads to the appearance of ageing in skin.** Therefore, it would be worth investigating whether PVP has the same melanogenesis inhibiting effects as native phosvitin.

Practical Applications

The practical applications of phosvitin in skin care are based on its ability to inhibit melanogenesis and thereby reduce the appearance of age spots, freckles, and moles. Since these aesthetic problems are also correlated to a medical condition of skin care, it is important for companies to do further research on the skin benefits of native phosvitin and its phosphopeptides and carry out live clinical trials. **Ecovatec has made this research possible by lowering the financial barriers to accessing phosvitin**, usually only available at high cost to labs for small experiments, by discovering a way to isolate pure phosvitin and phosphopeptides at a commercial scale.

Sources

¹Mudiyanselage and Himali. "Production and Characterization of Phosphopeptides from Egg Yolk Phosvitin." *Graduate Thesis and Dissertations*. 2012. Paper 12451.

²Samaraweera, Himali, et al. "Egg Yolk Phosvitin and Functional Phosphopeptides-Review." *Journal of Food Science*, vol. 76, no. 7, Jan. 2011, doi:10.1111/j.1750-3841.2011.02291.x.

³Samaraweera, Himali, et al. "Characterisation of phosvitin phosphopeptides using MALDI-TOF mass spectrometry." *Food Chemistry*, vol. 165, 2014, pp. 98–103., doi:10.1016/j.foodchem.2014.05.098.

⁴Ren, Jiandong, et al. "Preparation and characterization of phosphopeptides from egg yolk phosvitin." *Journal of Functional Foods*, vol. 18, 2015, pp. 190–197., doi:10.1016/j.jff.2015.07.007.

⁵Jung, Samooel, et al. "The functional property of egg yolk phosvitin as a melanogenesis inhibitor." *Food Chemistry*, vol. 135, no. 3, 2012, pp. 993–998., doi:10.1016/j.foodchem.2012.05.113.

⁶Chang, Te-Sheng. "Natural Melanogenesis Inhibitors Acting Through the Down-Regulation of Tyrosinase Activity." *Materials*, vol. 5, no. 12, 2012, pp. 1661–1685., doi:10.3390/ma5091661.