The Effect of asparticacid on the Formation of Calcium Bilirubinate in Inverse Microemulsion*

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Pigment gallstone is a product of abnormal biomineralization. The main component of it is calcium bilirubinate. There are also minor organic matrixes in it, such as polysaccharide, protein, amino acids. It is significant to study the influence of amino acids on the nucleation and growth of calcium bilirubinate in inverse microemulsions for understanding formation mechanism of biomineralization, prophylaxis and cure of pigment gallstone.

In this paper, the CaBR (I) and (II) nanoparticles were prepared in inverse microemulsion (I) composed of Triton X-100/n-hexyl alcohol/cyclohexane/water and above microemulsion containing asparticacid (microemulsion II), respectively. The CaBR nanoparticles were characterized by Fourier transform infrared spectroscopy (FT-IR), UV-vis spectra, transmission electron microscopy (TEM), and Zeta potential. The results showed that the nucleation and growth of CaBR (I) particle could be controlled by the surfactant at water/oil interface in microemulsion (I). After adding certain concentration of asparticacid to microemulsion (I), the formation of CaBR (II) was mainly induced by asparticacid because the strong coordination between the two –COOH groups of asparticacid and Ca^{2+}could provide nucleation site for CaBR. It resulted in differences of the microstructure, composition and properties of two CaBR paticles. The average diameter of CaBR (II) is larger than that of CaBR(I) although their morphologies are all spherical grain. Asparticacid improved the crystallization of CaBR and made CaBR(II) was difficult to be dissolved in EDTA aqueous solution. When the pH value of the microemulsion (II) approached to that of human gall (pH = 6.5-7.5), the CaBR (II) particles was agglomerated and deposited easily. It suggests that Asparticacid could promote the nucleation and growth of CaBR and play an important role in the formation pigment gallstone.

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