

Study on Vanadium-Binding Proteins of an ascidian *Ascidia sydneiensis samea*

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Ascidians, tunicates or sea squirts, are well known to accumulate high levels of vanadium ion in the vacuole of one or more type(s) of blood cells. We previously identified five low molecular weight vanadium-binding proteins, designated Vanabins, from the vanadocytes and the ceolomic fluid of a vanadium-rich ascidian *Ascidia sydneiensis samea*^{1,2,3}). We examined the activities of Vanabins to bind vanadium(IV) ions by Hummel-Dreyer's method. Recombinant proteins of the two Vanabins, Vanabin1 and Vanabin2, bound to 10 and 20 vanadium(IV) ions with dissociation constants of 2.1×10^{-5} M and 2.3×10^{-5} M, respectively¹). EPR analysis supported these results and indicated that amine nitrogens coordinate with vanadium (IV) ions⁴). VanabinP, which is one of most abundant proteins in ceolomic fluid, also bound to vanadium (IV) ions at a similar value (maximum 13 vanadium ions at $K_d=2.8 \times 10^{-5}$ M)³). Although Vanabin1, Vanabin2 and VanabinP are transcribed in blood cells, their distribution patterns are different; Vanabin1 and Vanabin2 are in cytoplasm of signet ring cells (vanadocytes) while VanabinP in ceolomic fluid³). These results suggested that Vanabin1 and VanabinP act as cytoplasmic vanadium carrier proteins, and VanabinP as a vanadium carrier protein in ceolomic fluid, since vanadium(IV) is easily precipitated at physiological pH range. The distribution and function of Vanabins are discussed.

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2) Yamaguchi et al., Mar. Biotechnol. 6, 165-174 (2004).

3) Yoshihara et al., submitted.

4) Fukui et al., J. Am. Chem. Soc. 125, 6352-6353 (2003).