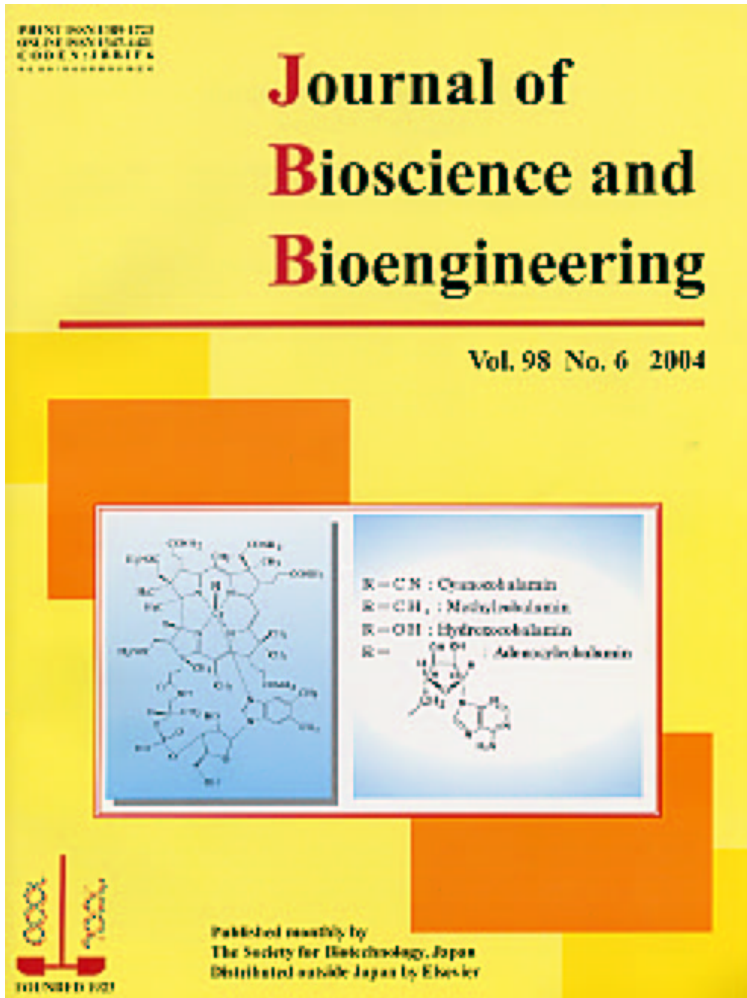


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Structure of vitamin B₁₂ (cyanocobalamin).

To increase the production of the vitamin by *Propionibacterium freudenreichii*, a known producer of this important vitamin in medical and food areas, more than 10 genes belonging to the *hem*, *cob* and *cbi* gene families involved in the vitamin B₁₂ synthetic pathway of *P. freudenreichii* and other bacteria were overexpressed in the bacterium, and approximately 2-fold higher productivity was attained, confirming the greater usefulness of the bacterium for the production of vitamin B₁₂ compared to chemical synthesis, which requires more than 70 complicated steps.

Related article: Piao, Y., Yamashita, M., Kawaraichi, N., Asegawa, R., Ono, H., and Murooka, Y., "Production of vitamin B₁₂ in genetically engineered *Propionibacterium freudenreichii*", *J. Biosci. Bioeng.*, vol. 98, 167-173 (2004).

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