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Hiddenari Inoue^a; Rieko Koshimizu^a; Naoki Yoshioka^a; Ekkehard Fluck^b

^a Keio University, Japan ^b Max-Planck-Haus, Germany

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INTERACTION OF WATER-SOLUBLE METALLOCHLOROPHYLLS WITH DNA

Hidehiko Inoue,^a Rieko Koshimizu,^a Naoki Yoshioka,^a
and Ekkehard Fluck^b

Keio University, Japan^a and Max-Planck-Haus, Germany^b

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Some of metallochlorophylls have received much attention not only as photosensitizers for photodynamic therapy of cancer but also as strong DNA binders.^{1,2} In the present study, a few water-soluble metallochlorophylls have been synthesized to investigate their interaction with calf thymus DNA and synthetic DNA such as poly(dA-dT)₂ and poly(dG-dC)₂. Upon interaction of metallochlorophyll with DNA in a phosphate buffer (pH = 6.8), copper(II) chlorophyllins such as sodium copper(II) pheophorbide a, disodium copper(II) chlorin e₄ and trisodium copper(II) chlorin e₆ exhibited no shifts but 8.9~16.9% hypochromicity in the Soret and Q bands. The molar circular dichroism $\Delta\epsilon$ at the Soret band is enhanced by the addition of DNA to copper(II) chlorophyllins, indicating that the copper(II) chlorophyllins interact strongly with DNA in the phosphate buffer. The thermal denaturation temperature T_m of DNA is elevated upon the addition of the copper(II) chlorophyllins to the DNA solution. The rising tendency in T_m at an R ($=[\text{Chlorophyllin}]/[\text{DNA in base pair}]$) of 0.05 is as follows: trisodium copper(II) chlorin e₆ > disodium copper(II) chlorin e₄ > sodium copper(II) pheophorbide a. The binding constant of the copper(II) chlorophyllins with DNA has been spectrophotometrically determined to be $1.1\sim 2.0 \times 10^4$ [M⁻¹]. In conclusion, the water-soluble copper(II) chlorophyllins have been demonstrated to outside bind to the double-helix DNA.

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Address correspondence to Hidehiko Inoue, Department of Applied Chemistry, Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama 223-8522, Japan.
E-mail: inoue@aplc.keio.ac.jp