

*A Cytochrome and a Green Pigment of
Sulfate-reducing Bacteria*

By Makoto ISHIMOTO, Jiro KOYAMA and
Yutaka NAGAI

(Received July 31, 1954)

Some strains of sulfate-reducing bacteria, isolated from paddy fields, were found to contain a cytochrome-like red pigment and a green one in spite of their strictly anaerobic character. In cell suspension, the cytochrome was reduced by molecular hydrogen or by formate, which are the proper metabolites of the bacteria¹⁾, and oxidized by sulfate, sulfite or thiosulfate. So they seem to behave as an intermediary carrier of hydrogen in sulfate reduction in a manner similar to usual cytochromes in aerobic organisms²⁾. The presence of the cytochrome and the green pigment was reported recently by Postgate³⁾ in other strains of sulfate-reducing bacteria, but he did not notice the oxidation of the cytochrome by sulfate.

Both pigments could be easily extracted after being made soluble by grinding the cells of the sulfate-reducing bacteria with quartz sand or alumina. A preparation of the green pigment, almost free from the cytochrome, was obtained as precipitate from the saline extract, previously treated with 0.1 M manganese chloride, by addition of its half volume of acetone. The cytochrome, free from the green pigment, was extracted with M/15 disodium phosphate from the residue of the ground cells, which had been treated three times with saline. Their absorption spectra determined by Beckman spectrophotometer, Model DU, are indicated in Fig. 1 and 2.

The cytochrome has absorption maxima at 553 m μ , 524 m μ and 420 m μ in reduced form and at 528 m μ and 410 m μ in oxidized. The absorption bands did not change by the addition of cyanide or carbon monoxide. The

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Department of Chemistry Faculty of
 Science, Tokyo University

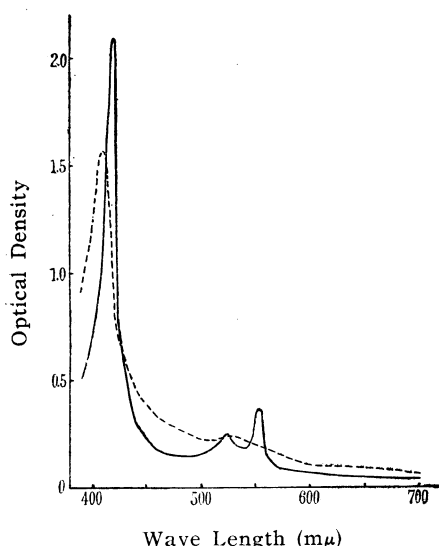


Fig. 1. Absorption spectra of the cytochrome of sulfate-reducing bacteria.
 Continuous line: reduced form.
 Broken line: oxidized form.

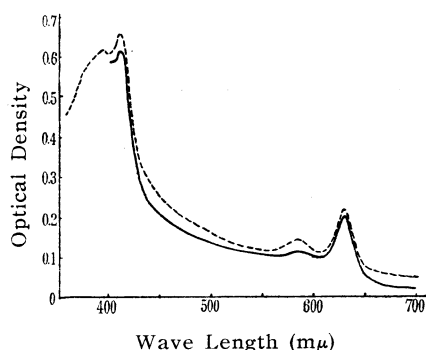


Fig. 2. Absorption spectra of the green pigment of sulfate-reducing bacteria.
 Broken line: before reduction.
 Continuous line: after reduction.

reduced form was autoxidizable. This cytochrome resembles fairly well cytochrome- b_4 in respect of the absorption spectra⁴⁾, but differs from it in autoxidizability and redox potential. rH_0 of the cytochrome of the sulfate-reducing bacteria falls in between 9.3 and 5.7, when measured by Ball's method⁵⁾.

The green pigment had absorption maxima at 630 $m\mu$, 590 $m\mu$ and 410 $m\mu$, which were not affected by reduction, but shifted by the addition of pyridine to 590 $m\mu$ and 555–545 $m\mu$. This pigment seems to be also a hemo-protein.

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 2) M. Ishimoto, J. Koyama and Y. Nagai, *J. Japan Biochem. Soc.*, **26**, 304 (1954).
 3) J. Postgate, *Biochem. J.*, **56**, xi (1954).