SL307

Detoxification Mechanism for Cadmium in a Cadmium-Resistant *Azomonas agilis* PY101

Yong Keun Park

Graduate School of Biotechnology, Korea University, Seoul 136-701, Korea

As a result of industrial release into the environment, cadmium ranks as a major anthropogenic pollutant. Microorganisms are known to employ a large variety of mechanisms for adaptation to the presence of cadmium. A cadmium-resistant strain isolated from Anyang stream, *Azomonas agilis* PY101 exhibited strong resistance to 1.0 mg/mℓ of Cd^{2+}. Transmission electron microscopic analysis revealed that *A. agilis* PY101 actively accumulated Cd^{2+} in the cytoplasm. *A. agilis* PY101 produced a yellow-green pigment induced by cadmium. This pigment was water-soluble and fluorescent under ultraviolet light. The absorbance of the yellow-green pigment was measured from 350nm to 450nm by UV-VIS spectrophotometer. This extracellular yellow-green pigment was induced by cadmium. The growth medium of *A. agilis* PY101 under cadmium stress was entirely converted to a bright green color. The amount of pigment induced by $CdCl_2$ in the culture medium during the growth of *A. agilis* PY101 gradually increased to 6 times of intial value after addition to 1.0mg/mℓ of $CdCl_2$. The pigment peak(peak II) was observed when the supernatant acquired from *A. agilis* PY101 cells culture was fractionated on a column of Superdex 75. Cadmium levels were estimated by AAS with Varian AA-1495 instrument. Peak II contained more than 80% in the supernatant component. The dramatic decrease(97%) of concentration of sulfate ion(SO_4^{-2}) in the cytoplasm during the growth phase of *A. agilis* PY101 under the stress of cadmium was confirmed by ion chromatography. The sulfate concentration in *A. agilis* PY101 under the stress of cadmium was only 0.25μg/mℓ. It is likely that decrease of SO_4^{-2} is responsible for the formation of S-rich pigment by *A. agilis* PY101. The addition of cadmium apparently enhanced pigment production by *A. agilis* PY101. This response may have been due to increased the pigment-producing gene(s) activity to bind toxic cadmium for optimal growth. It measured crudely that this pigment contained an amount of sulfur atom by element analysis. The Cd^{2+}-binding pigment in peak II was analyzed by FT-IR. In the analytical result of FT-IR, we demonstrated that this extracellular pigment contained several sulfur-containing groups. We suggest that this region of the pigment supply Cd^{2+}-binding motif to the Cd^{2+}-binding pigment. It is likely that extracellular binding plays a major role in alleviating the toxicity of the metal to *A. agilis* PY101. The cadmium tolerance due to sulfate is not an uncommon feature in the microbial world. We suggest that the decrease of SO_4^{-2} in the cytoplasm of *A. agilis* PY101 is involved with the formation S-rich pigment. We therefore assume that the cadmium resistance of *A. agilis* PY101 can be achieved by microbially binding of S-rich pigment for cadmium.