

Effects of astaxanthin on brain damages due to ischemia

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Brain requires high energy-supply to keep its normal function. Well-developed blood vessels in the brain supply enough glucose and oxygen to generate required energy. When some part of blood vessels were closed or occluded by some reason, the area supported by those blood vessels will fall into ischemia and the neuronal cells distributed in the area will be damaged or die. Since neuronal cells have no neogenetic properties, the functions supported by the area will be lost forever. We know and take care of large scale of neuronal cell death which will cause severe loss of brain function, but we ignore small scale of ischemia which may have no apparent dysfunction. However senile dementia will be formed due to the accumulation of such small scale ischemic neuronal cell death. Although big efforts have been made to develop some drugs to rescue the cells exposed to ischemia from death, we have no effective drugs so far. Since astaxanthin has been known to have antioxidant effects, we expected this drug to rescue the cell damage during ischemia and re-perfusion.

In the present study we used slice preparations (300 μm) of hippocampus obtained from young adult rats. To measure intracellular Ca^{2+} concentration before, during and after ischemia we stained the slice preparation by fura-2, a Ca^{2+} indicator. The fluorescence of loaded fura-2 was analyzed by an image processor (Argus 50; Hamamatsu photonics). To examine brain edema during ischemia we used self-made devise, which is consisted of an infra-red differential interference microscope with an infra-red camera and an image processor and measured "contrast value" as indices of edema.

Astaxanthin (0.003%) pretreated for ten minutes before ischemia reduced the increase in intracellular Ca^{2+} concentration during ischemia and accelerate the recovery from the abnormal increase in Ca^{2+} concentration. Pretreated astaxanthin (0.01%) also reduced the edema developed during ischemia.

Although present results were still preliminary, astaxanthin can be expected to have effective rescuing effects on neuronal damages induced by ischemia.