Activities of cerebellar Purkinje cells during classical fear conditioning in goldfish

Masayuki Yoshida, and Hiroki Kondo
Graduate School of Biosphere Science, Hiroshima University, Japan

Cerebellar activity has been shown to be involved in classical heart-rate fear conditioning in goldfish. Ablation of the corpus cerebelli and reversible inactivation of activities of cerebellar neurons have been demonstrated to impair the acquisition of the conditioned bradycardia (cardiac deceleration). In the present study, we recorded single cerebellar Purkinje-cell activity during the course of the classical fear conditioning in goldfish. The conditioning paradigm was delayed classical conditioning with light as a conditioned stimulus (CS) and electric shock as an unconditioned stimulus (US). The conditioned response was bradycardia. Cerebellar neuron activities were recorded using a wire electrode, and Purkinje cells were identified based on the spike shape and the recording depth from the surface of the corpus cerebelli. Twenty-one Purkinje cells in different goldfish were recorded throughout the conditioning procedure. In goldfish which showed obvious acquisition of conditioned response (n=13), all of the recorded cells changed the responses to the CS as conditioned response developed: firing rate in eleven cells was decreased and that in two cells was increased in response to the CS. Little change was observed in Purkinje cell activities in the fish which showed no obvious acquisition of the conditioned response (n=8).