

## 論文の内容の要旨

論文題目    Functional microzones during sensorimotor activities in relation to aldolase C/zebrin II compartments in mouse cerebellar cortex.

(Aldolase C/zebrin II コンパートメントと運動・知覚機能を司るマウス小脳皮質微小帯域との密接な関連)

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Simple and regular anatomical structure is a hallmark of the cerebellar cortex. Parasagittally-arrayed alternate expression of aldolase C/zebrin II in Purkinje cells (PCs) has been extensively studied, but surprisingly little is known about its functional significance. Here I found a precise structure-function relationship between aldolase C expression and synchrony of PC complex spike activities that reflect climbing fiber inputs to PCs. I performed two-photon calcium imaging in knock-in mice in which aldolase C compartments can be visualized *in vivo*, and identified highly synchronous complex spike activities among aldolase C-positive or -negative PCs, but not across these populations. The boundary of aldolase C compartments corresponded to that of complex spike synchrony at single cell resolution. Sensory stimulation evoked aldolase C compartment-specific complex spike responses and synchrony. This result further

revealed the structure-function segregation. In awake animals, complex spike synchrony both within and between PC populations across the aldolase C boundary were enhanced in response to sensory stimuli, in a way that two functionally distinct PC ensembles are co-activated. These results suggest that PC populations characterized by aldolase C expression precisely represent distinct functional units of the cerebellar cortex, and these functional units can cooperate to process sensory information in awake animals.