Interaction of Tea Catechins with Model Lipid Bilayers or Model Proteins Investigated by Quartz-Crystal Microbalance Analysis.

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A quartz-crystal microbalance (QCM) technique was applied to investigate the interaction of tea catechins with lipid bilayers. Association constants (Ka) obtained from the frequency changes of QCM revealed that (−)-epicatechin gallate (ECg) and (−)-epigallocatechin gallate (EGCg) interact with 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) *ca.* 1000 times stronger than (−)-epicatechin (EC) and (−)-epigallocatechin (ECg) (Table 1). The results exhibit good correlation with the strength of their biological activities.

It is also important to investigate the interaction of tea catechins with proteins or peptides such as inlet amyloid polypeptide (IAPP), which involves in the fibril formation in the type II diabetes. Ka of tea catechins to IAPP revealed that ECg and EGCg bind with IAPP more strongly than EC and EGC (Table 1).

We have already reported that the order of the incorporated amount of tea catechins investigated by a liposome system was same as the order of the partition coefficients of tea catechins evaluated with an *n*-octanol/PBS system: ECg>EGCg>EC>EGC.   The present results suggest that hydrophobicity of catechins also determines the strength of interaction with proteins or peptides.

Table 1. The association constants (Ka) of tea catechins to DMPC multilayer and IAPP

	Ka [M^{-1}]	
catechins	DMPC	IAPP
ECg	$3.8 \pm 1.0 \times 10^6$	3.1×10^5
EGCg	$2.2 \pm 0.8 \times 10^6$	1.5×10^5
EC	$1.9 \pm 0.1 \times 10^3$	4.9×10^4
EGC	$1.3 \pm 0.1 \times 10^3$	2.0×10^4