The human bitter taste receptors (hTAS2Rs) respond to green tea catechins

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Recently, the demand for green tea has grown with Japanese food becoming popular worldwide. However, bitterness and astringent taste of the green tea might disturb the spread of it. Therefore, it is important to decrease or mask the bitterness and astringent taste to promote consumption of green tea. The bitterness and astringent taste mainly arises from catechins, functional components included in the green tea. We revealed that (-)-epicatechin gallate (ECg) is recognized by taste cells. This suggests the possibility that there are taste receptors for catechins in taste cells. However, the taste receptor that responds to catechins has not been clarified yet. Since catechins have strong bitterness, we focused on hTAS2Rs. We tried to identify bitter taste receptor for catechins using hTAS2R expressed HEK293T cell. hTAS2Rs and chimeric G protein Gα16gust44 were transiently cotransfectioned into HEK293T cells. The hTAS2R expressing cells were loaded with 3 μM Fluo4-AM for 30 min at 25°C in a loading buffer. The change of intracellular Ca^{2+} concentration ($[Ca^{2+}]_i$) was measured by cell-base assay system, Flexstation^{TM}II(Molecular Devices, Sunnyvale, CA, USA). We investigated the activation of 25 human bitter taste receptors (hTAS2Rs). 1, 3, 10, 30, 100 and 300 μM ECg, (-)-epigallocatechin gallate (EGCg), (-)-epicatechin (EC) and (-)-epigallocatechin (EGC) were used as catechins stimulus. To investigate whether the response to catechins is via hTAS2Rs, only hTAS2Rs expressing cells and HEK293T cells were similarly used for $[Ca^{2+}]_i$ measurement.

We investigated 25 types of hTAS2Rs. As a result, on hTAS2R39 catechins clearly increased $[Ca^{2+}]_i$. However on other hTAS2Rs, significant increase of $[Ca^{2+}]_i$ by catechins haven't been observed. This result indicates that hTAS2R39 might be the main bitter taste receptor for catechins.