PURINE 5’-RIBONUCLEOTIDE-GLUTAMATE HYBRIDS AS POTENTIAL TOOLS TO INVESTIGATE THE MECHANISM OF *UMAMI* TASTE RECEPTION

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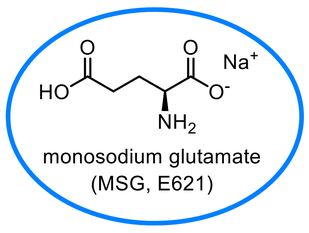
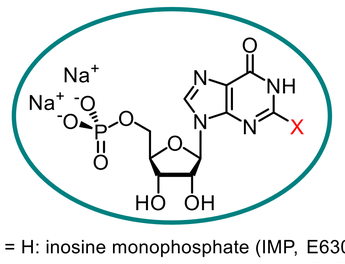
THE *UMAMI* FIFTH TASTE

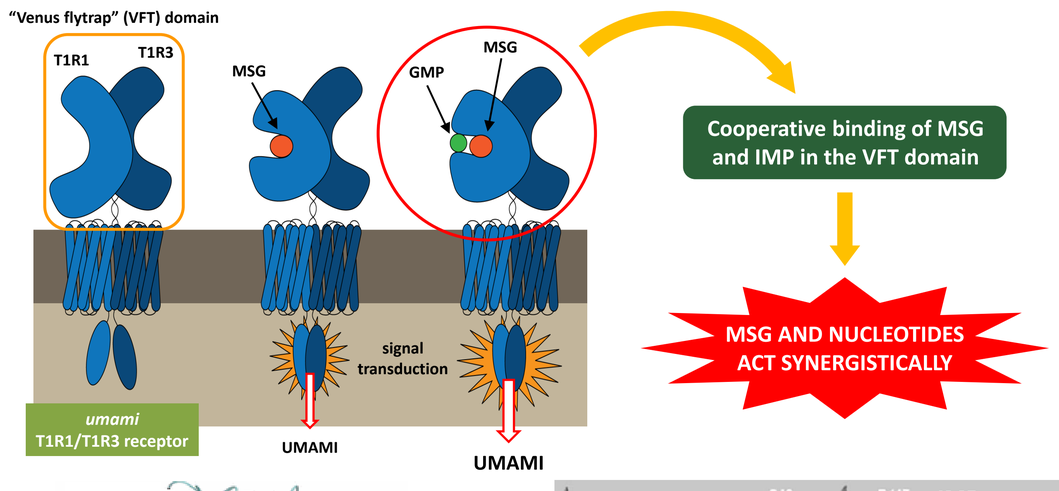
Umami (a Japanese term for “delicious” or “savory”) is now accepted as the fifth basic taste quality along with sweet, sour, salty and bitter. The prototypical *umami* substance is monosodium glutamate (MSG), first identified in 1908 by prof. Kikunae Ikeda[1] in the typical Japanese soup *dashi*, made from *kombu seaweed* and *katsuobushi* (dried *bonito* flakes). The *umami* taste is also elicited by the presence of purine 5’-ribonucleotides, in particular guanosine and inosine 5’-monophosphate (GMP and IMP, respectively). *Umami* substances are naturally found in a wide variety of foods such as meat, cheese, seafood and vegetables.

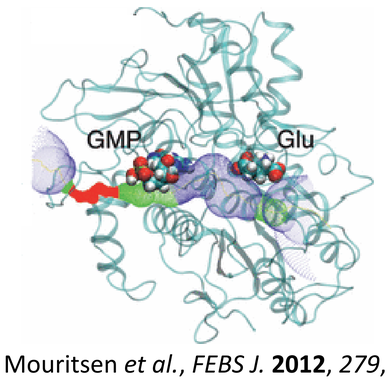




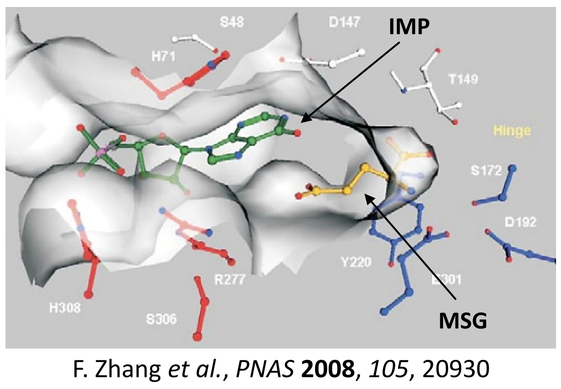
X = H: inosine monophosphate (IMP, E630)
X = NH_2: guanosine monophosphate (GMP, E626)

SYNERGISM IN THE *UMAMI* RECEPTOR[2,3]



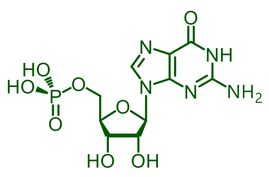


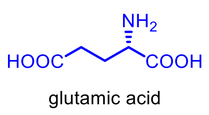
O. G. Mouritsen *et al.*, *FEBS J.* **2012**, *279*, 3112

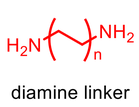


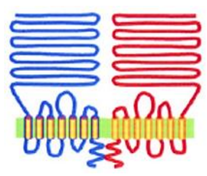
F. Zhang *et al.*, *PNAS* **2008**, *105*, 20930

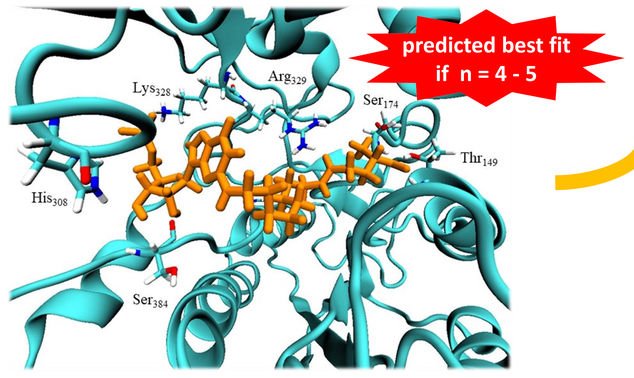
MOLECULAR DYNAMICS ON THE HOMOLOGY MODEL OF THE *UMAMI* RECEPTOR VFT DOMAIN

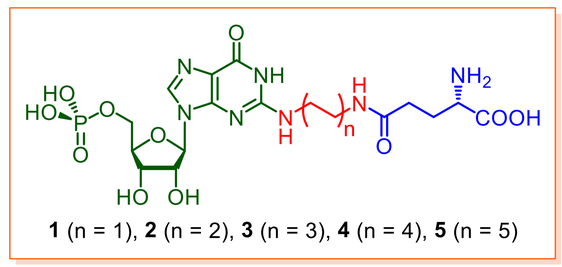






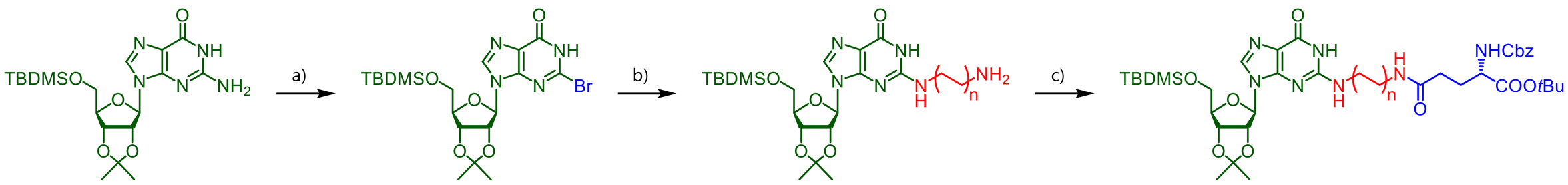






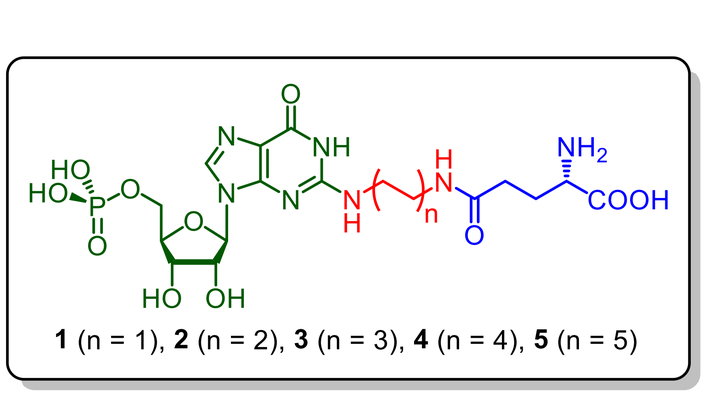
cell-based T1R1/T1R3 receptor assays

SYNTHESIS OF PURINE 5’-RIBONUCLEOTIDE-GLUTAMATE HYBRIDS



6 **7** **8** (n = 1), **9** (n = 2), **10** (n = 3), **11** (n = 4), **12** (n = 5) **13** (n = 1), **14** (n = 2), **15** (n = 3), **16** (n = 4), **17** (n = 5)

d)



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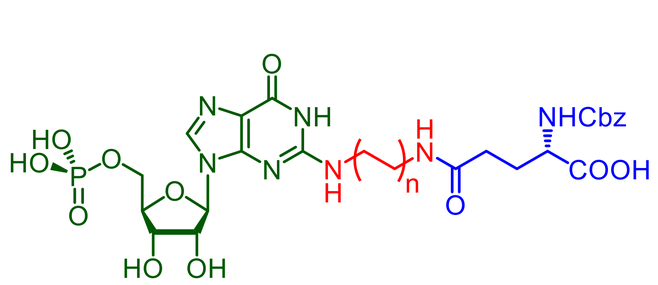

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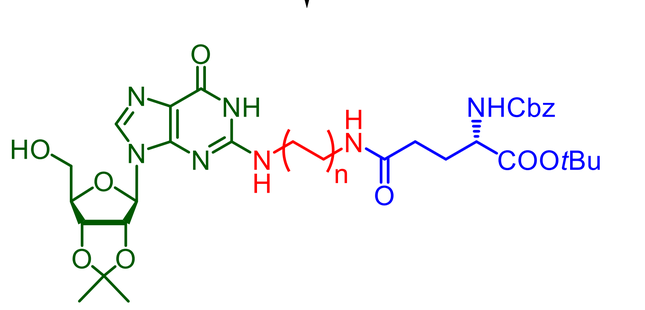

Reagents and conditions (yield): a) TMSBr, *t*-BuONO, CH_2Br_2, -10 °C to 5-10 °C (70%); b) $H_2N(CH_2CH_2)_nNH_2$, 2-methoxyethanol, 85 °C (not isolated); c) Z-Glu(*α*-O*t*Bu)-OH, DCC, EtOAc or 2-methoxyethanol (42-64%); d) TBAF·$3H_2O$, THF (55-85%); e) i) triethylphosphate; ii) $POCl_3$, 0 °C (3-4 h); iii) H_2O, 6 M NaOH to pH 2; iv) 70 °C (2-4 h); v) TFA, 0 °C (38-74%); f) $HCOONH_4$, Pd/C, H_2O-MeOH (1:1), 95 °C (62-95%)).

References

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[2] https://scienceandfooducla.wordpress.com/2013/07/09/understanding-umami/
[3] a) W. Wang, X. Zhou, Y. Liu, *Trends Anal. Chem.* **2020**, *127*, 115876; b) F. Zhang, B. Klebansky, R. M. Fine, H. Xu, A. Pronin, H. Liu, C. Tachdjian, X. Li, *PNAS* **2008**, *105*, 20930-20934; b) O. G. Mouritsen, H. Khandelia, *FEBS J.* **2012**, *279*, 3112-3120; c) J. Zhang, D. Sun-Waterhouse, G. Su, M. Zhao, *Trends Food Sci. Technol.* **2019**, *88*, 429-438

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