Bitterness Prediction or Bitterness Suppression in Human Medicines Using a Taste Sensor

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The purpose of the present study was to develop a method for the quantitative evaluation and bitterness prediction or bitterness suppression in commercial medicines using a taste sensor. The bitterness of 16 commercial medicines was evaluated in human gustatory sensation tests with 11 volunteers and using a multichannel taste sensor. For sensor measurement, three variables were used to predict estimated bitterness in multiple regression analysis or principal component analysis: sensor output (S), the change of membrane potential caused by adsorption (C), and C/S. For the 10 drugs with a positive sensor output, multiple regression analysis was applied. A particularly good correlation (r=0.822) was obtained between bitterness scores predicted using C/S values for channels 2 and 4 (which have high sensitivity for drugs with positive charge; see text for detail). Six drugs with no positive charge inside the molecule did not show any sensor output, although they had a low bitterness score in gustatory tests. Finally, an artificial taste sensor was used to evaluate or predict the bitterness suppression in quinine by sucrose, aspartame, NaCl, phosphatidic acid and tannic acid. The sensor output profile was shown to reflect the suppressant effect (human gustatory sensation result) of phosphatidic and tannic acids at the receptor site well, whereas no sensor output changes by sucrose and aspartame were observed.