Bitterness Classification System in Active Pharmaceutical Ingredients Using Taste Sensor
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Purpose
Taste plays an important role in the development of a pharmaceutical formulation. Many active pharmaceutical ingredients exhibit an unpleasant taste, so taste-masking has become increasingly important. The use of an 'electronic tongue' or taste sensor for pharmaceutical purposes is an important step forward, as it reduces dependence on human gustatory sensation testing. The taste sensor is an analytical sensor array system which is able to detect specific substances by means of different artificial membranes using electrochemical techniques. We have reported a quantitative analytical method for the evaluation of the bitterness of various pharmaceutical products using a taste sensor. The purpose of the present study was to make a new system of API (active pharmaceutical ingredient) classification as to bitterness intensity and other physico-chemical properties, named bitterness classification system.

Methods
Various kinds of basic API or acid API which have confirmed quantitative evaluation in bitterness intensity of them using a taste sensor (Intelligent sensor technology, Inc., Kanagawa, Japan) were used as objective API to make bitterness classification system. The concentration (mM) of objective API in bitterness intensity tau 1 (means bitterness threshold) were calculated using the data of taste sensor. As other physico-chemical properties, properties of solubility or hydrophobicity were used. These values were obtained by Marvinsketch (ChemAxon). Moreover, multiple regression analysis were examined the physico-chemical factors that have affected bitterness intensity of objective API.

Results
From the results of multiple regression analysis, bitterness intensity has correlation with solubility and hydrophobicity. According to 3D graph (X-axis; property of solubility, Y-axis; property of hydrophobicity, Z-axis; the concentration (mM) of objective API in bitterness intensity tau 1), high solubility and high hydrophobicity of API were suggested to cause high bitterness intensity of objective API.

Conclusion
Bitterness intensity of API has correlation with solubility and hydrophobicity of it. Bitterness intensities of API were suggested to classify according to 3D graph (X-axis; property of solubility, Y-axis; property of hydrophobicity, Z-axis; the bitterness intensity).