6 Umami flavour of meat

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6.1 Introduction

Many compounds have been shown to be present in the flavour fraction of food. However, the flavour chemist has to decide which compound or series of compounds are the major contributors to specific food flavours. This has been a long and difficult task, and as a result, the flavours of foods such as meats are still not completely understood.

Even more complex is the situation where certain compounds have been shown to intensify, modify or mask the flavours of certain foods. The fact that a specific compound or combination of compounds, when intentionally added or formed in foods by biological or thermal pathways, has the ability to change the perceived flavour properties of certain foods is a research area that is fascinating.

Over the years, various nomenclatures have been proposed for compounds that have the ability to modify flavour perception. These include terms such as flavour potentiators, flavour enhancers and umami. Currently, the scientific community appears to be adopting the name umami, defined as the taste of monosodium glutamate (MSG) and 5'-nucleotides such as 5'-inosinate (IMP) and 5'-guanylate (GMP).

The major objectives of this chapter are to define and discuss the properties of umami in model system studies, and to review the formation, identification, quantitation and stability, together with the sensory significance in beef, pork, chicken, turkey and lamb. The influence of meat aging/processing and compound synergism is also discussed, in this attempt to update the role of umami in meat flavour chemistry.

6.2 Definitions

Umami can be defined as the taste properties resulting from the natural occurrence or intentional addition of compounds such as monosodium glutamate (MSG) and certain 5'-nucleotides such as 5'-inosine monophosphate (IMP) and 5'-guanosine monophosphate (GMP). Other researchers have used terms such as 'savoury', 'beefy' and 'brothy' to describe the same taste sensations. These nucleotides have also been referred to respectively as inosinic and guanylic acids, 5'-inosine and 5'-guanylic acids,

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inosine 5'- and guanosine 5'-phosphates and disodium 5'-inosinate or disodium 5'-guanylate. IMP and GMP blends have also been marketed under the trade name Ribotide®.

Compounds of these types are especially interesting in that they have the ability to modify taste, even though they do not possess characteristic flavours of their own, especially at the low concentrations at which they affect food flavour. In using the above definition of flavour alteration without taste contribution, one could also consider that sodium chloride, if used at subthreshold levels, also possesses umami properties. This is an area that deserves research attention.

6.3 Historical background

Many cultures throughout the world have long used ingredients or food preparation techniques that result in the presence of umami compounds that intensify certain food flavours. Experience has taught cooks what it took scientists many years to discover.

It was not until the early 1900s that a specific compound that was proven to be responsible for an umami sensation was isolated. Ikeda (1909) was able to identify the compound monosodium glutamate (MSG) in the naturally occurring form in an extract from dried kombu or sea tangle, a type of seaweed. The importance of his discovery was soon evident because the commercial production of MSG for the intentional addition to foods began shortly thereafter. Apparently, Ikeda was the first to propose the name ‘umami’, which means ‘deliciousness’ in Japanese, for the taste sensation associated with MSG. Today MSG is produced in many countries and is consumed internationally.

A few years later, another food common to Oriental cuisine, dried bonito tuna, was the source for the identification of another umami compound, namely inosine monophosphate (IMP). It was reported in the initial study (Kodama, 1913) that the compound in question was the histidine salt of 5'-inosinic acid. However, it was later concluded that histidine was not a significant contributor to umami. In contrast to MSG, the commercialization of IMP was not begun until the early 1960s.

In the early 1960s another compound, guanosine monophosphate (GMP) was identified from another natural source, the Shiitake black mushroom (Nakajima et al., 1961; Shimazono, 1964). It is quite interesting to note that the three commercially available umami compounds were first identified from natural sources. In fact, it has been postulated (Hashimoto, 1965) that all types of marine products possess umami compounds due to the high amounts of glutamic acid and nucleotides that they contain.

More recently, other umami compounds, including ibotenic and tricho-