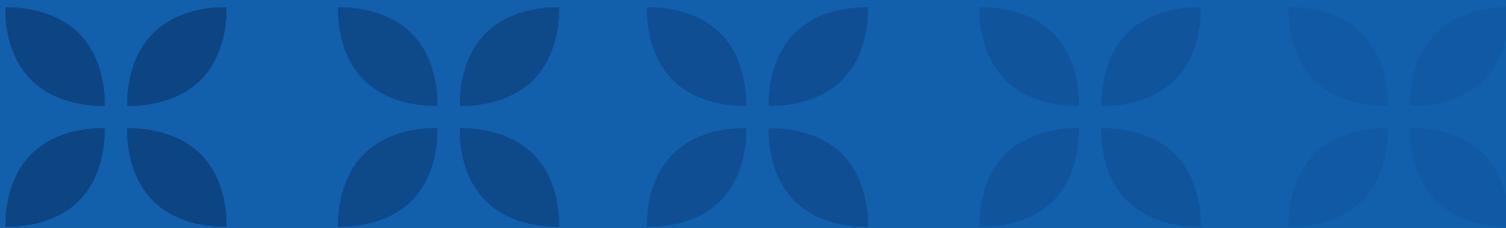


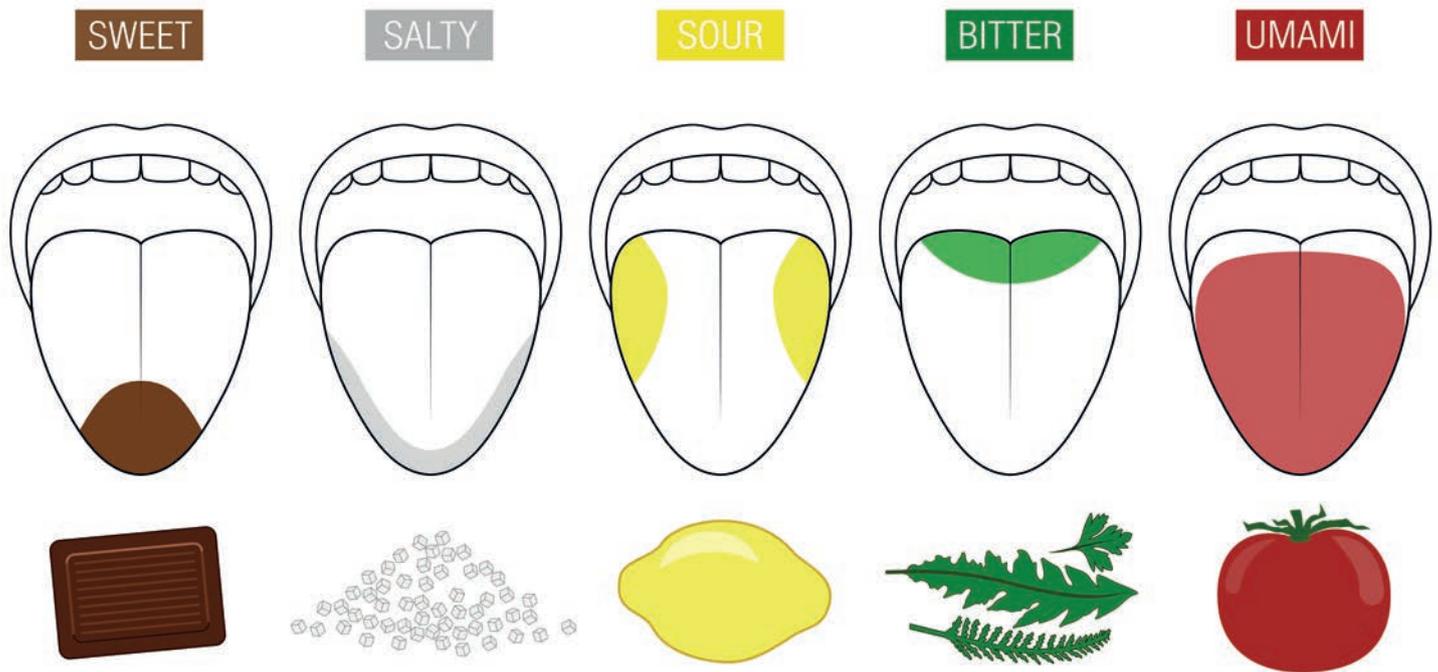
WHAT MAKES A WINNING FLAVOUR COMBINATION





This study will explore basic flavour groups and how they interact with each other. However, in order to truly understand which flavour combinations are most appealing, we also take a step back and look at how the sense of taste works for humans and how it has evolved.

We also broaden our perspective to look at how other senses come into play, both in terms of how factors such as temperature and odour can affect flavour profiles, but also how they affect the way we experience food.



Basic Flavour Profiles

Broadly speaking, the five primary flavours are salty, sweet, bitter, sour and umami. For the purpose of this paper, we will also consider spicy as a basic flavour although it is actually an experience caused by nerves transmitting a pain signal to the brain.

Humans have evolved to detect individual notes within a flavour combination. However, we are also able to appreciate the overall “gestalt”, which takes into account how well different flavours mesh together.

Below, we examine the key characteristics of each flavour category and how it combines with other flavours.

SALTY

In appropriate quantities, salt unleashes aroma and flavours. An example of how it does this is by loosening protein strands and helping meat to absorb liquid that it is cooked in, giving it a more intense flavour. This is why salt is generally added gradually throughout the cooking process and the way that it enhances the flavour of meat is consistent with how it interacts with umami flavours.

Salt, or more specifically sodium ions, also neutralises compounds with bitter flavours. This has the effect of balancing bitter dishes and by doing so also enhances sweetness (as bitter flavours counteract sweet flavours).

As with other flavours, too much salt is unpleasant and can render food unpalatable. At these high concentrations salt ends up overpowering sweet flavours rather than enhancing them.

SOUR

Ingredients with a sour taste can also easily overwhelm other flavours, so need to be added with caution. Citric fruits such as lemon and lime are good examples of the way that sourness can counteract other flavours. Adding lime to a bitter flavour such as tonic water, which contains quinine, is a great way to achieve such balance. Likewise, a squeeze of lemon can rescue a slightly over-salted dish or make a dessert less sickly.

A less commonly thought of way of adding sourness is through fermentation. This can be done to enhance and embolden the taste of products that have a strong umami taste, including meat such as sausages and salamis, fish such as herring (known as Surströmming in Sweden) or in Asian staples such as kimchi (Korean fermented cabbage) and miso.

Other sour flavours include most types of tomatoes and vinegar. Both these can be used to reduce the intensity of chillis.

UMAMI

Umami was only been officially recognised as a flavour in 2002 and its flavour can be hard to pin down. It is often described as a deep, earthy flavour and can be most easily recognised in red meat and mushrooms but is also present in other ingredients such as parmesan cheese and onions. It tends to complement most flavours, binding them together and helping to turn individual ingredients into a composite dish.

SWEET

Sweet flavours counteract sour, bitter and spicy flavours whilst enhancing salty and umami. A common sweet / bitter combination is chocolate. The sweetness from sugar (and milk) plays against the bitterness of the cocoa, producing a smooth and enjoyable combination.

In Asia, combining sweet with spicy or sour is a common theme. Thai sweet chilli sauce is one such example, and similar sauces are used for many chicken dishes, whilst sweet and sour dishes usually use rice vinegar as a sour base sweetened with honey or sugar.

BITTER

Bitter flavours are often an acquired taste and need to be added with care. Using slightly too much bitterness can ruin otherwise enjoyable food, with bitter notes used to counteract sweet or umami flavours. Good examples include adding a little coffee flavouring to desserts and smoking meat. If you over-expose meat to smoke then you can coat it in creosote, rendering the meat far too bitter and consequently unpalatable, whereas if done delicately and proportionately then the bitterness of the smoke perfectly balances the umami flavour of the meat.



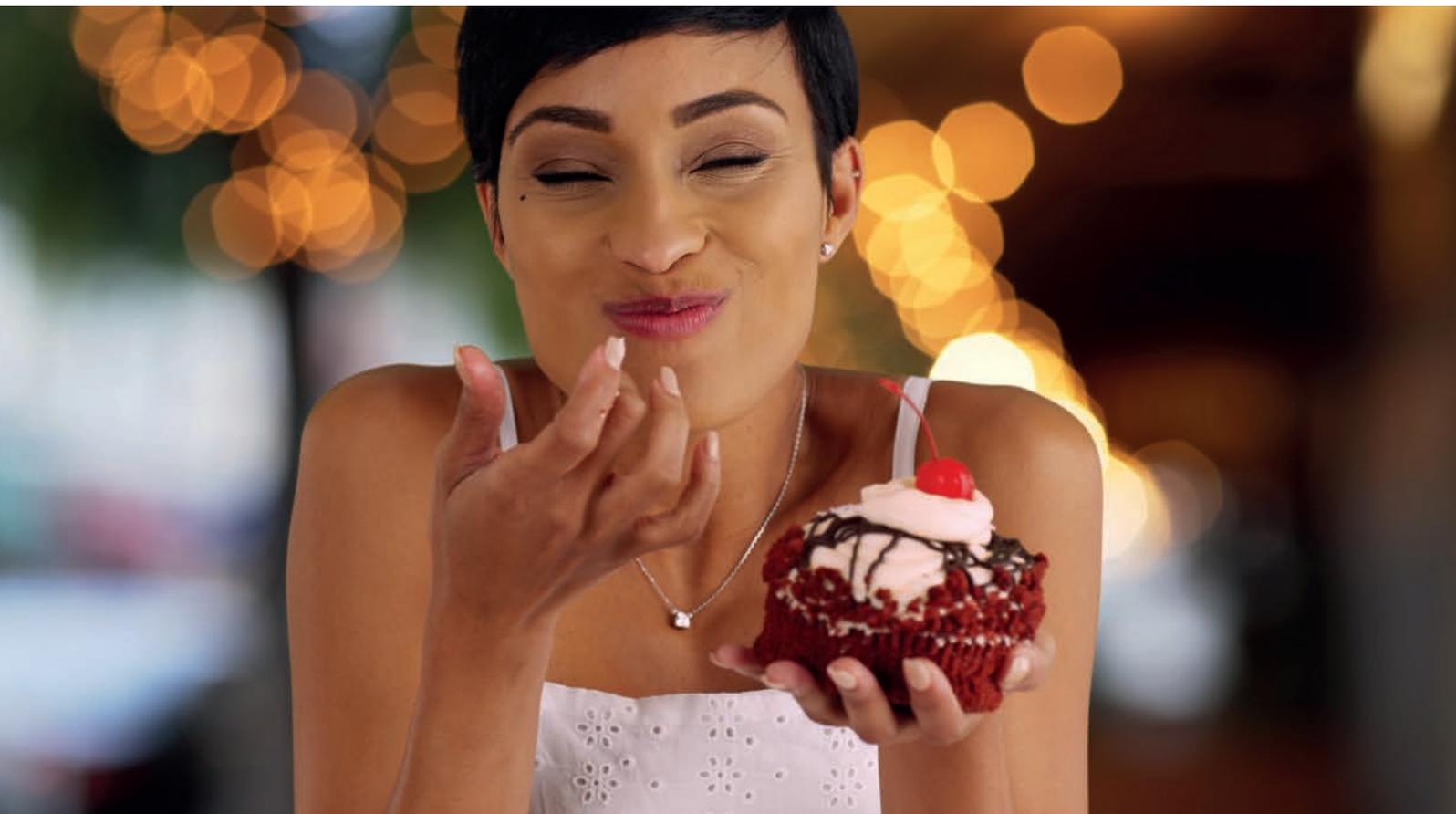


SPICY

The active ingredient in chillies, capsaicin (or another capsaicinoid), reacts with sensory neurons in the tongue and mouth causing a painful, burning sensation. This pain can trigger the release of endorphins and stimulates the metabolism. In small doses, the buzz from the endorphins can outweigh the pain signals and is even mildly addictive. Moreover, it can be argued that our systems have evolved to associate the burning sensation from eating spicy food with the positive metabolic effects and thus creating a desire to repeat this consumption.

One intuitive but interesting implication for food manufacturers is that the more chilli that you eat, the more that are able to tolerate. This is because capsaicin depletes a neurotransmitter called substance P. This depletion weakens the pain signals to the brain, thus allowing you to eat more intensely spicy food.

As mentioned above, spicy is not technically a flavour. Therefore it doesn't affect the other basic flavours in the same way. However, it can be particularly useful for livening up bland dishes, adding an extra element.



Other Factors

It should be remembered that taste is a multi-attribute sensation. This means that it is not just about flavour, but also other considerations that impact the other senses. This includes temperature, previous experience and association with the food on offer, aesthetics, texture and smell.

Of course, factors such as temperature can also directly affect flavour given that heat acts as a catalyst when cooking, which is in large part a series of interlinked chemical reactions.

Associations that we have with food is a particularly interesting subject. There is clear evidence that we can learn to like or dislike particular flavours and flavour combinations and this is the background behind the concept of an acquired taste. The implications of this for food producers is that just because a particular flavour or combination isn't popular immediately, that does not mean that it won't be as long as there is a reason for prolonged exposure to that flavour. This is especially the case for certain bitter flavours such as dark chocolate, coffee, liquorice and extends to foods that may smell or sound "icky" such as fermented fish or ingredients with uncomfortable textures such as oysters.

The Science and Evolution of Taste

Given the complexity of combining flavours and the importance of considering context, it is also interesting to look at how taste is experienced, how different combinations have evolved to become popular and what might change perceptions in the future.

The primary functions of taste are to protect us from overexposure to toxins in food, to incentivise us to provide our bodies with the nutrition that it needs and to signal to the digestive system how to optimally metabolise the incoming food.

The first two of these objectives are achieved by triggering pleasure centres in the brain for food that is deemed physiologically desirable or conversely, triggering negative reactions to food that is high in toxins or undesirable.

Of course, what is physiologically desirable now is different from what might have been beneficial in the past. This is due to many rapid changes in human behaviour, environment and needs, including different living conditions, energy expenditure and an abundance of food.

History also helps us to understand what particular flavours indicate. For example, many acids that naturally occur in food, particularly citric acid, taste sour to us and this is usually an indication of the presence of Vitamin C. On the other hand, bitter flavours often indicate the presence of toxins which is why it is often an unappealing flavour. However, given the ubiquitous nature of mild toxins in many foods, we have learned to tolerate mild amounts of bitterness and even enjoy it when combined with other flavours. To totally reject any food that contained traces of toxins would have been impractical for our foraging forebearers.

Another situation where flavour combinations mattered to our ancestors is when eating fruit. The combination of sour and sweet indicates ripeness and consequently let them know that the fruit was probably safe to eat.

Considering learned, or acquired taste, is important when looking at regional food preferences. Based on what was available to them, different communities have learned to appreciate and create positive associations with different ingredients and combinations of food. The example of Surströmming (Swedish fermented herring) that we used earlier is a good example of this. It is distasteful to many, but popular in Scandinavia where locals more likely to be accustomed to the taste (and smell!)



Indeed, given the fact that taste buds are regenerative and the ability for humans to adapt to different foods, it is not uncommon for people to go from disliking something in their younger years to enjoying it when older. In some cases, these are specific individual changes, however in others there are discernible patterns. For example, as people get older, they become less sensitive to bitterness and much more likely to enjoy the taste of wine or beer. This is one reason why alcopops are much more popular amongst those in their teens and twenties than people in their thirties and beyond.

Analysing Classic Flavour Combinations

It is clear that there are many different reasons why a flavour combination might or might not work, including concentration of each flavour, type of flavour, texture, smell, stimulation of the auditory (e.g. crunch), region and learned associations. However, by applying principles such as using a counteracting or enhancing flavour food manufacturers are able to give themselves a better chance of creating the next popular combination. Therefore, to conclude, we look at a few classic combinations and analyse the basic flavours involved to see how these principles are applied in practice:

LAMB AND ROSEMARY

Rosemary has a slightly bitter, woody flavour which perfectly balances the rich, umami flavour of lamb, adding complexity.

VEGETABLES COOKED IN SOY SAUCE

Green vegetables such as broccoli and green beans can often have a slightly bitter flavour, especially when undercooked. Stir-frying them in soy sauce suppresses this bitterness due to the high salt content in the sauce. Moreover the umami in the soy sauce adds depth and flavour to what might otherwise be a bland dish.

SALTED FISH WITH LEMON

The classic sour flavour of lemon perfectly stops us from tasting the salt too much, allowing it to bring out the umami flavour of the fish without overpowering it. As with many dishes, there are multiple flavours interacting with each other and finding a delicate balance is imperative.

RED WINE AND CHOCOLATE

This is a favourite combination for many a diner. The bitterness of the red wine perfectly balances the sweetness of the chocolate, avoiding a sickly sweet taste.

APPLE PIE AND VANILLA ICE CREAM

This is an excellent example of how factors other than flavour can also play a part. The contrast in temperature from the warm apple pie and cool vanilla ice cream is very pleasing to most palates. This contrast can be exaggerated by using cinnamon for the apple pie, which adds an artificial heat through a modest amount of capsaicin (chilli).

At its best, the apple should carry a slightly sour taste to counteract the sweetness of the ice cream, providing a dish full of contrast and layers.



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