Further studies are required to understand how spices can be combined to achieve a pleasant taste and to provide maximum antimicrobial effect. The challenges of using spices for preservation on a commercial scale are:

- Batch variation of essential oils and spices dependent on the place of origin and supplier.
- Limited knowledge of the active substances in the spices and the essential oils.
- Limited knowledge of the distribution of the anti-microbial compounds in the foodstuffs.
- Limited knowledge of the extent to which the antimicrobial effect of the spices can be increased/inhibited by traditional preservation methods such as salt, heat, acid and packaging gas.

DMRI
Danish Meat Research Institute

DANISH TECHNOLOGICAL INSTITUTE

University of Copenhagen
Faculty of Life Sciences

Financing

Pig Levy Fund

Danish Food Industry Agency

For further information contact

Mari Ann Tørngren
Email: MATN@dti.dk
Tlf: +45 7220 2682

Anette Granly Koch
Email: AGLK@dti.dk
Tlf: +45 7220 2539

Danish Meat Research Institute
Maglegaardsvej 2
DK-4000 Roskilde
Tlf: +45 7220 2000
dmri@dti.dk
www.dti.dk

Helene Christine Reinbach, PhD
Email: hcre@life.ku.dk
Tlf: +45 3533 3173

Department of Food Science/Sensory Science
Faculty of Life Sciences
University of Copenhagen
Rolighedsvej 30, 5th floor
DK-1958 Frederiksberg C

Safe and healty

5 'hot'

reasons for using spices

- Minimises rancidity in fatty pork products
- Reduces warmed-over flavour in pork products that are reheated and kept warm
- Inhibits undesirable bacteria in meat products
- Increases satiety when consumed in high daily doses
- Spices often have a distinctive flavour, which must be suited to the products, unless tasteless extracts are available

DANISH TECHNOLOGICAL INSTITUTE

DMRI
Danish Meat Research Institute

Safe and healthy

Spices contain a number of positive attributes when added to meat and meat products. They prevent rancidity and warmed-over flavour, inhibit hazardous bacteria and reduce hunger, making it easier to keep a slender waistline. However, because spices also have natural strong flavours, it is important that the spices complement the meat product.

Minimises rancidity

Spices, herbs and green tea are well-known antioxidants that slow down the oxidation processes in meat products through their natural content of active flavonoids, terpenes and phenols. The spices can be used in their natural form as visible herbs that provide flavour, or they can be added as concentrated, invisible extracts.

Herbs substantially reduce rancidity in pork, if they are added:

- before freezing or after thawing
- to meat batter or to the surface of the meat
- before, during or after cooking

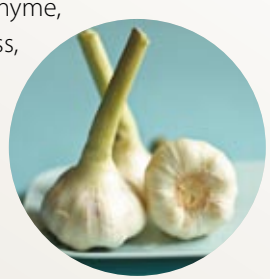
Natural antioxidants, whether they be herbs, berries or extracts, can be used to reduce the risk of rancidity in raw meat for processing or to minimise warmed-over flavour when food is reheated and kept warm.

A less well-known natural antioxidant is honey. Honey reduces oxidation processes and has been shown to reduce rancidity in reheated pork patties. Of the tested honeys, Danish rape honey and the New Zealand Manuka honey are the most effective.

Inhibits bacteria

Several spices and essential oils extracted from spices have an inhibitory effect against bacteria, yeast and mould. The effect is typically 4 -10 times smaller in foodstuffs than in laboratory media and is always linked to the flavour of the spices. The fat content in the foodstuffs is also important because increasing fat percentages require higher concentrations of spices to inhibit bacteria.

This means that effective concentrations often impart flavour to the meat product. For that reason, the product concept must include both a preservative effect and the flavour profile, for example in marinated or spicy barbecue products.



Clove, cinnamon, sage, rosemary, thyme, oregano, garlic, ginger, lemongrass, anise, cumin and horseradish are some of the spices and essential oils that have antimicrobial effects. The active substances are often phenol compounds and aldehydes/ketones.

Different studies have shown that berries have antimicrobial effects, e.g. cranberries, blackcurrants, raspberries, prunes and redcurrants. The effect is dependent on pH and is attributable to the anthocyanin content of the berries.

Increases satiety

One spice in particular, chilli, differs from the others in that it has a significant influence on satiety and the metabolic rate - especially when combined with green tea. Immediately after ingestion, bioactive substances in chilli (capsaicin) and green tea (caffeine, catechins) increase the metabolic rate by as much as 30%, corresponding to increasing the daily metabolic rate by 1 - 2% or reducing the daily energy intake by as much as 16%.

Recent Danish studies indicate that hot spices and green tea should be consumed several times daily in high doses and preferably in combination to affect energy intake and appetite. In the long term, a reduced energy intake can prevent an increase in weight, while the satiating effect may make it easier to stick to a slimming diet.