

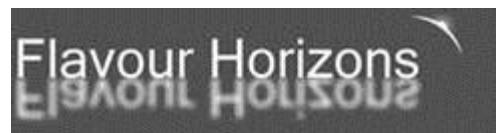
EUROPEAN SPICE ASSOCIATION
GENERAL ASSEMBLY 2013

Technical Developments in the Use of Spices

Dr David Baines
Baines Food Consultancy Ltd



Co-editor: Flavour Horizons



TECHNICAL DEVELOPMENTS IN THE USE OF SPICES

TOPICS:

Recent health claims submitted to the EU for the use of spices

Compounds in selected spices that have beneficial effects on health

The use of spices to inhibit of carcinogen formation in cooked meats

The growing use of spices in animal feeds

Salt reduction using spices

Interesting culinary herbs from Vietnam

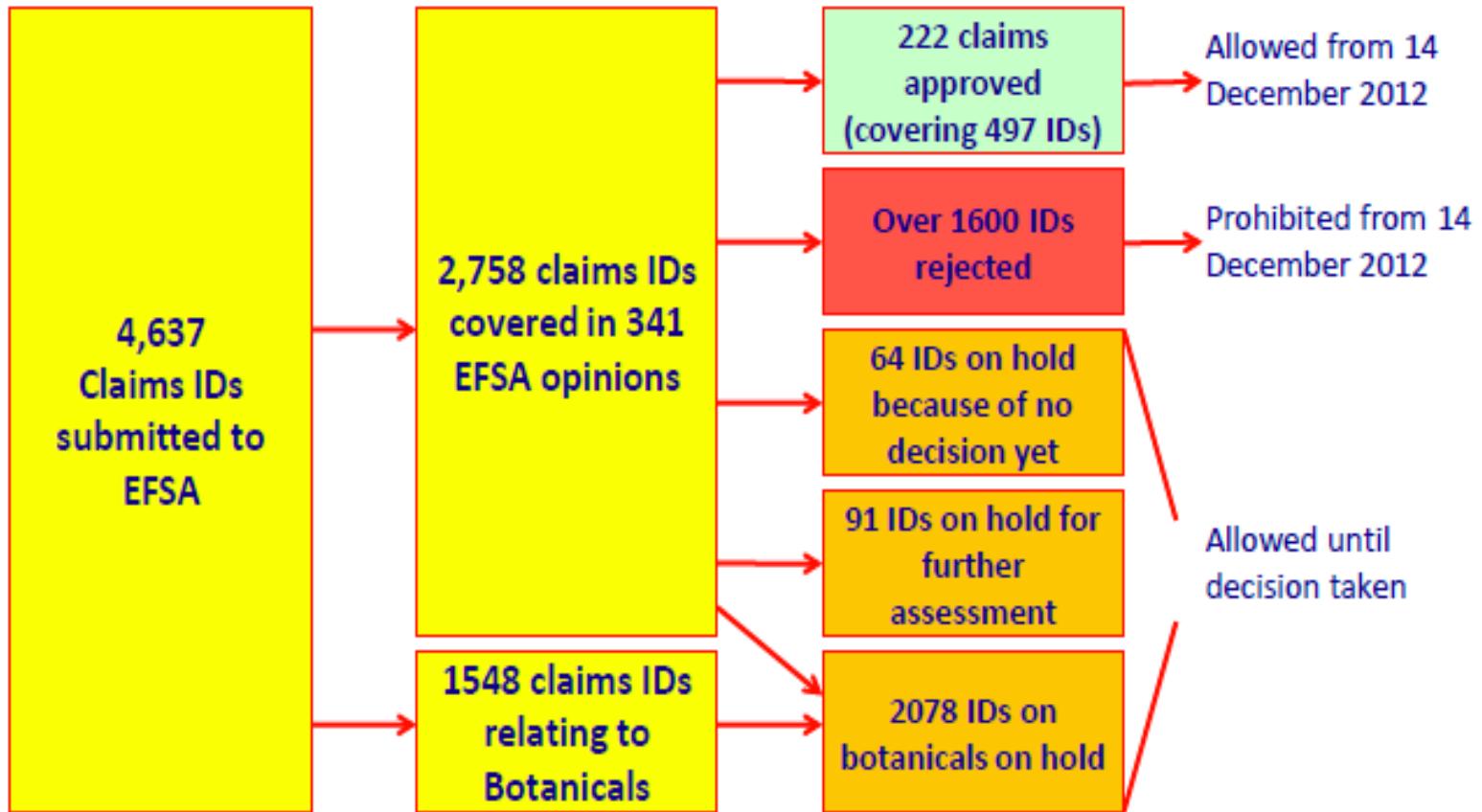
Recent Health Claims Submitted to the EU



EU REGULATION OF HEALTH CLAIMS

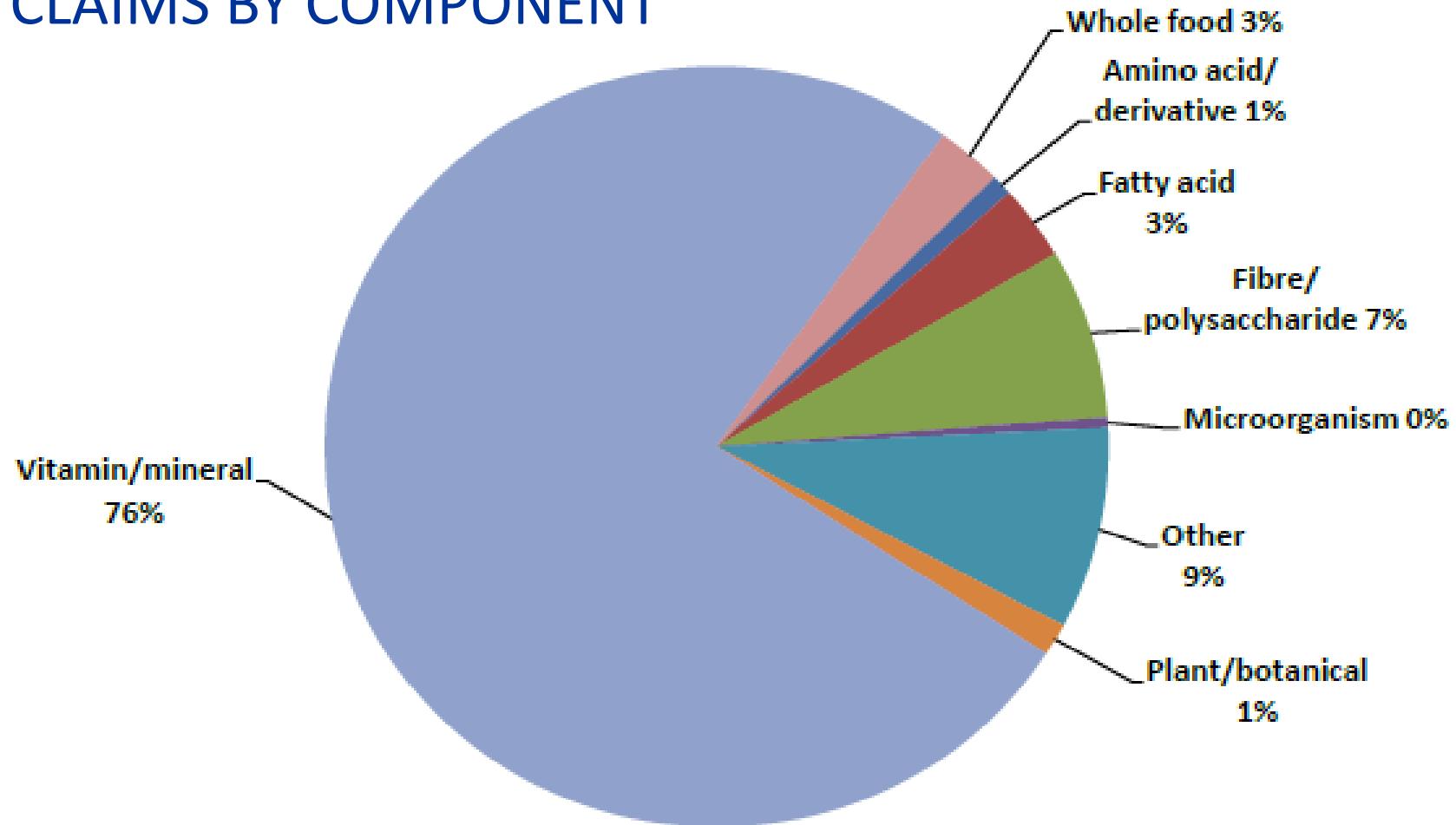
- The Nutrition and Health Claims Regulation, 1924/2006/EC is designed to ensure a high level of protection for consumers and legal clarity and fair competition for food business operators.
- Claims must not mislead consumers; they must be, accurate, truthful, understandable and substantiated by science.
- Implementation of this Regulation requires the adoption of a list of permitted health claims, based on an assessment by the European Food Safety Authority (EFSA) of the science substantiating the claimed effect and compliance with the other general and specific requirements of the Regulation.
- This list of permitted health claims was adopted in May 2012 by the Commission and became binding on 14th December 2012. Food companies must comply from this date or face prosecution for misleading marketing.

APPROVAL OF CLAIMS

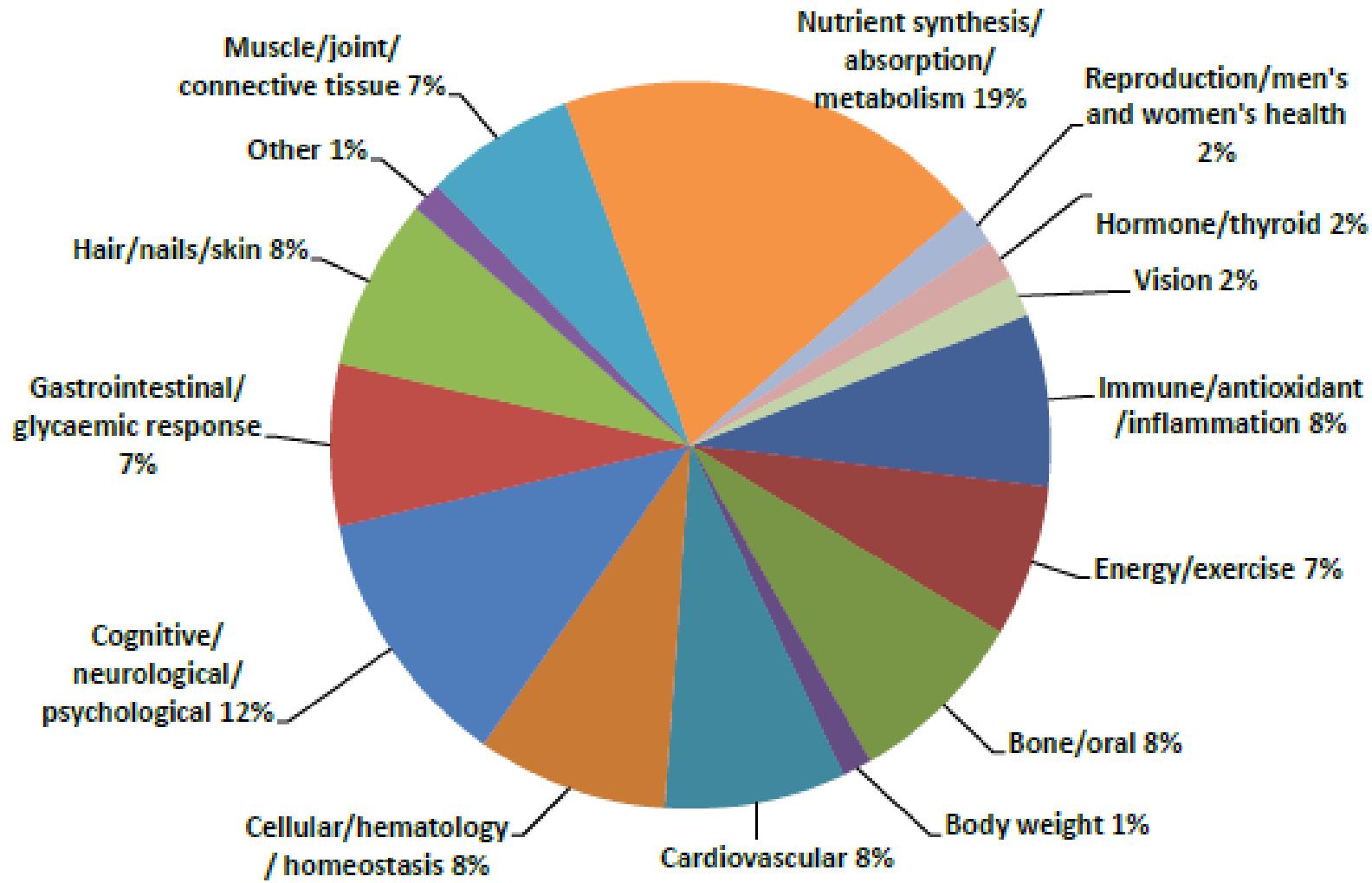


EU REGULATION OF HEALTH CLAIMS

CLAIMS BY COMPONENT



CLAIMS BY FUNCTION



CLAIMS FOR SPICES – NOT APPROVED/ON HOLD

SPICE	CLAIM(S)
Anise / Star Anise	Respiratory Health, Digestive Health, Immune Health, Lactation
Caraway	Digestive Health, Immune Health, Lactation
Cardamon	Respiratory Health, Digestive Health, Immune Health, Kidney Health, Nervous System Health, Cardiovascular Health,
Capsicum	Thermogenesis, Increasing Energy Expenditure, Enhancing Loss of Calories, Body Weight Loss, Stomach Health, Reduction of Oxidative Stress, promotion of Hair Growth.
Cassia	Intestinal Health
Chamomile	Respiratory Health, Digestive Health, Immune Health, Antioxidant Properties, Relaxation.
Cinnamon	Digestive Health, Immune Health, Appetite
Coriander	Digestive Health, Immune Health, Appetite, Nervous System Health, Urinary Tract Health, Heart Health, Vascular System Health, Skin.
Fennel	Respiratory Health, Lactation, Gastro-intestinal Health,
Fenugreek	Appetite, Glucose Metabolism

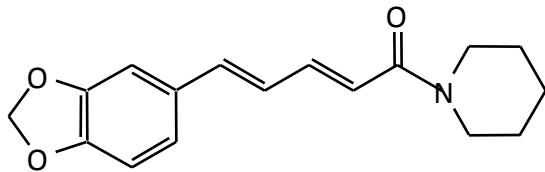
CLAIMS FOR SPICES – NOT APPROVED/ON HOLD

SPICE	CLAIM(S)
Ginger	Respiratory Health, Digestive Health, Immune Health, Heart Health, Management of Inflammatory Properties, Well-being During Travelling,
Garlic	Stress Reduction, Immune Health, Heart Health, Blood Lipids, Liver Health, Antioxidant Properties
Onion	Antioxidant Properties, Glucose Metabolism, Lipid Metabolism
Piper nigrum (Black Pepper)	Respiratory Health, Digestive Health, Immune Health, Reproductive System, Nervous System Health, Antioxidant Properties
Piper longum (Long Pepper)	Digestive and Bioavailability, Immune Health, Adoptogenic and Mental Health, Stimulant
Rosemary	Antioxidant Properties, Digestive Health, Immune Health, Invigoration of the Body, Hepatic and Biliary Health
Sage	Respiratory Health, Digestive Health, Immune Health, Stomach Health, Antioxidant Properties, Menopause, Cognitive Performance.
Thyme	Antioxidant Properties, Respiratory Health, Immune Health, Health of Upper Respiratory Tract
Turmeric	Intestinal and Digestive Health, Management of Inflammatory Responses, Antioxidant Properties,

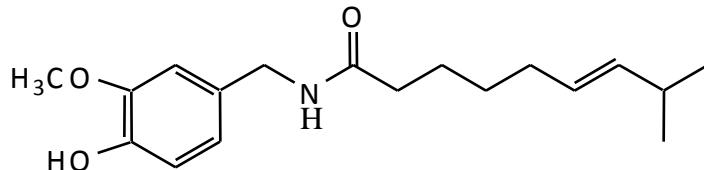
Compounds in Spices with a Beneficial Effect on Health



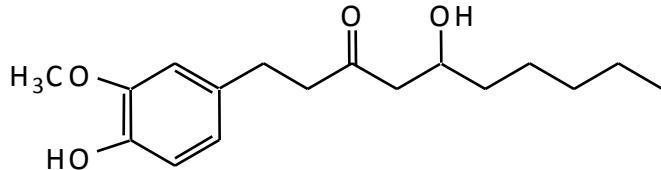
PUNGENT COMPONENTS OF SPICES



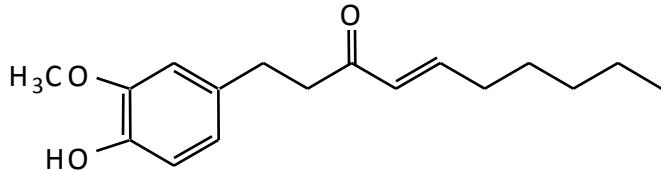
Piperine



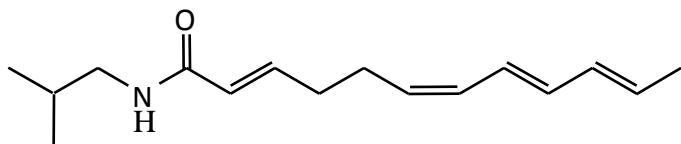
Capsaicin



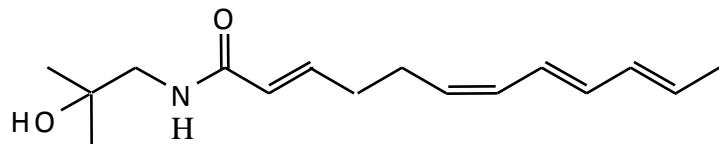
Gingerol



Shogoal



Sanshool



Hydroxy Sanshool



Sichuan peppers

Northern China.

Unique acidic peppery flavour
with tongue tingling
characteristics.

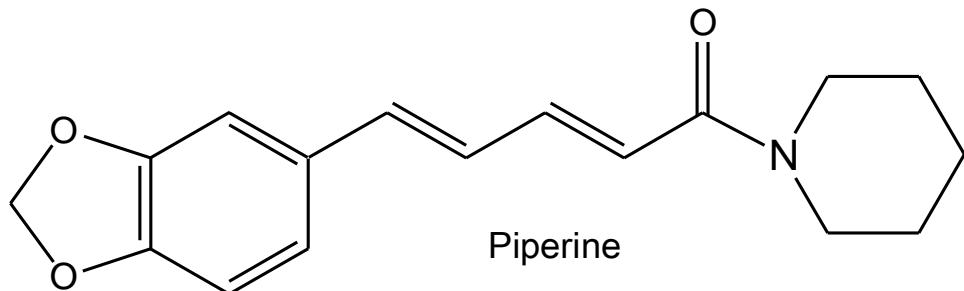
Component of 5-spice and a main
component of Szechwan dishes



Andaliman peppers

S E Asia, lemon-like flavour with tongue
tingling characteristics. Wild spice of
the Batak ethnic group of Indonesia.
Used with meat and fish dishes (Pepper
Sambal). Antimicrobial properties and
an immuno-stimulant

PIPERINE – DEPRESSION AND DIGESTION



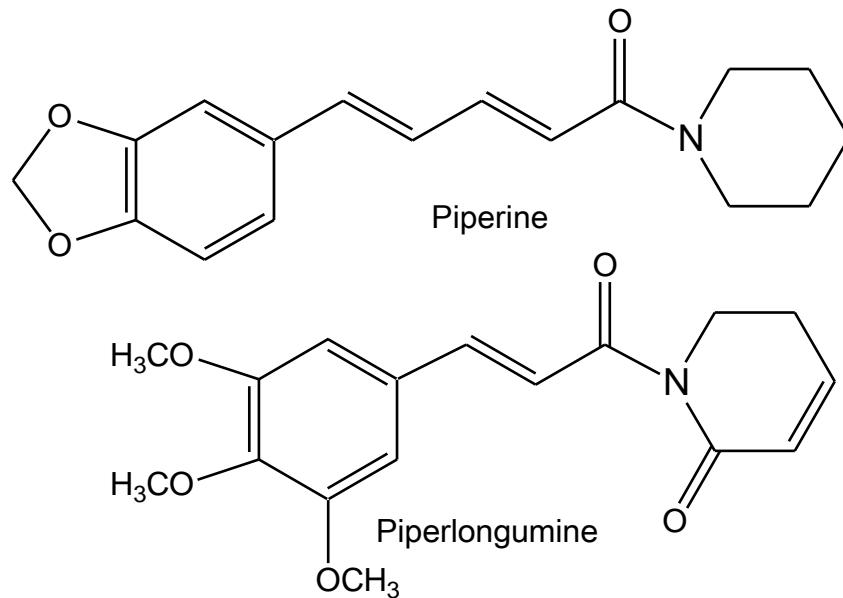
'Piperine Protects Epilepsy Associated Depression'

'Authors: A. Pal, et al; Eur Med. Pharmacol. (2011) 15(11) 1288-95

The antidepressant activity of piperine results from its ability to stimulate the synthesis of serotonin. In patients with epilepsy a common co-morbidity is depression and a elevation in serotonin levels counters this mood disorder.

Piperine has also been shown to improve the digestion of important food chemicals, for example, the absorption of beta-carotene. Significant increases (60%) in serum beta-carotene occurs during supplementation of orally administered beta-carotene with piperine.

LONG PEPPER – PIPERLONGUMINE

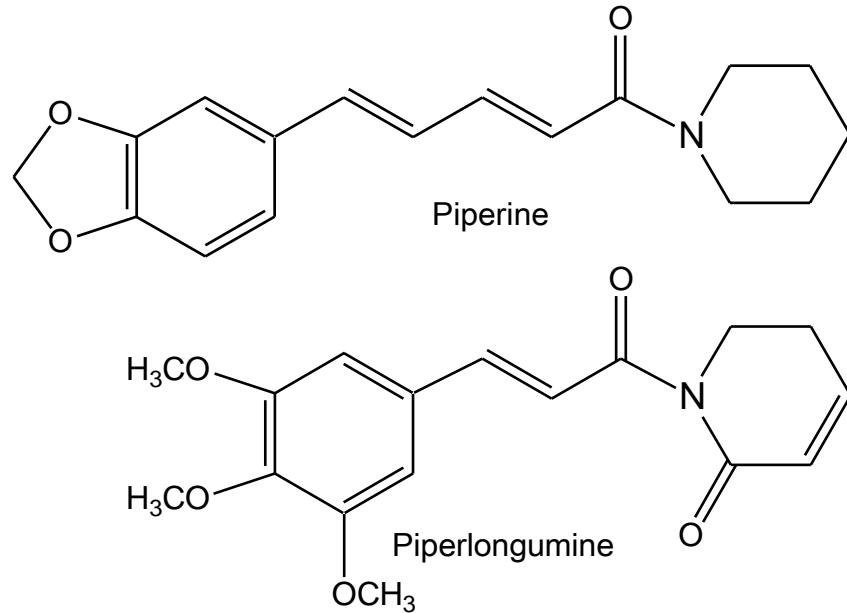


Long pepper was known to the ancient Greeks and Romans but is a very rare ingredient in European cuisine today. It can still be found in Indian and Malaysian dishes.

The major component, piperlongumine, was reported to selectively kill cancer cells following research at the Massachusetts General Hospital. ‘The novelty of this compound is that it is able to discriminate cancer cells from normal cells.’

Published in *Nature* (2011) 475, 231-234. Now being investigated as a drug to counter leukaemia and patented as a general cancer treatment EP 2276487 A1 (2011).

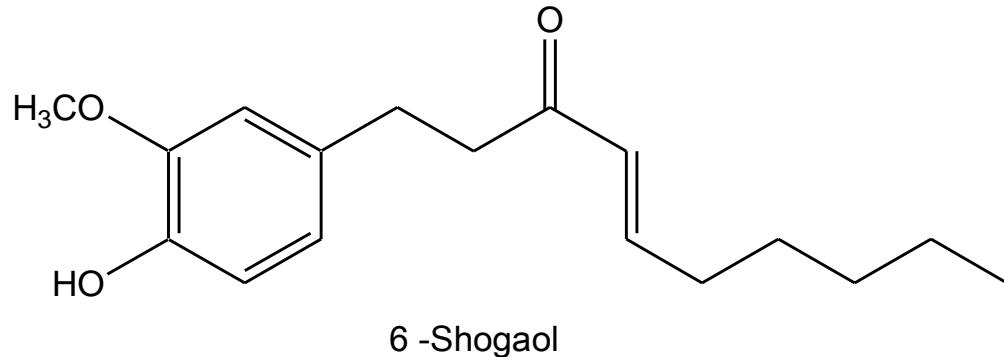
LONG PEPPER – COGNITIVE FUNCTION



The combination of piperine and piperlongumine is the subject of a patent claiming that the mixture improves cognitive functions such as learning, memory, alertness as well as relieving psychosocial pressure.

‘Novel Nutraceutical Compositions Containing Black Pepper or its Constituents Improving Mental Performance’. W. Mezger, DSM Nutritional Products Ltd, EP2289528 Publication 02.03.2011.

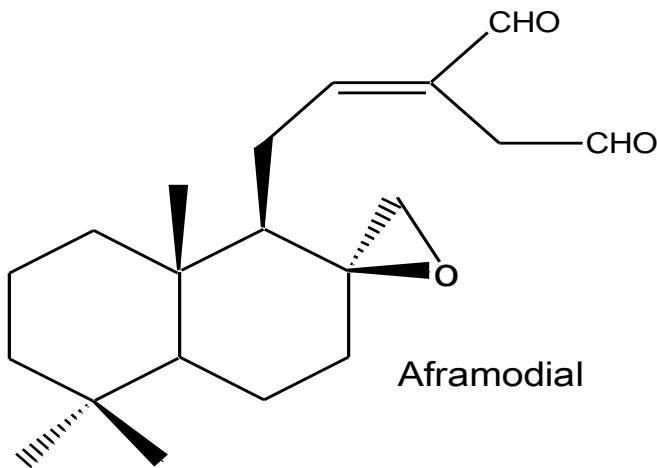
GINGER – ASTHMA RELIEF



American Thoracic Society meeting May 2013 Philadelphia.
‘Active Constituents Of Ginger Potentiate β -Agonist-Induced Relaxation Of Airway Smooth Muscle’
Authors: E.A. Townsend, et al; Columbia University

Purified components of ginger work synergistically with asthma medicines to relax airway muscle tissues. 6-Shogaol was found to be the most effective. It was established that it inhibits the enzyme phosphodiesterase which plays a central role in muscle relaxation processes and helps asthma sufferers breath more easily.

GINGER – HEART HEALTH

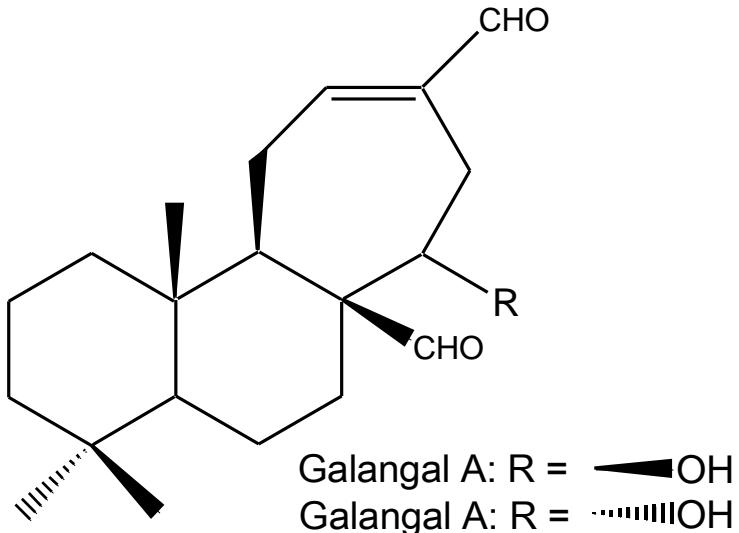


Potent inhibitor of human platelet aggregation and is protective against thrombosis. It is claimed that this compound is four-fold more potent than aspirin at inhibiting human platelet aggregation.

‘Chemistry of ginger constituents and inhibitory factors of the arachidonic acid cascade’.

S. Kawakishi, et al; Food Phytochemical for Cancer Protection Vol II,
ACS Washington DC, pp244-250 (1994)

GINGER – CANCER PROTECTION

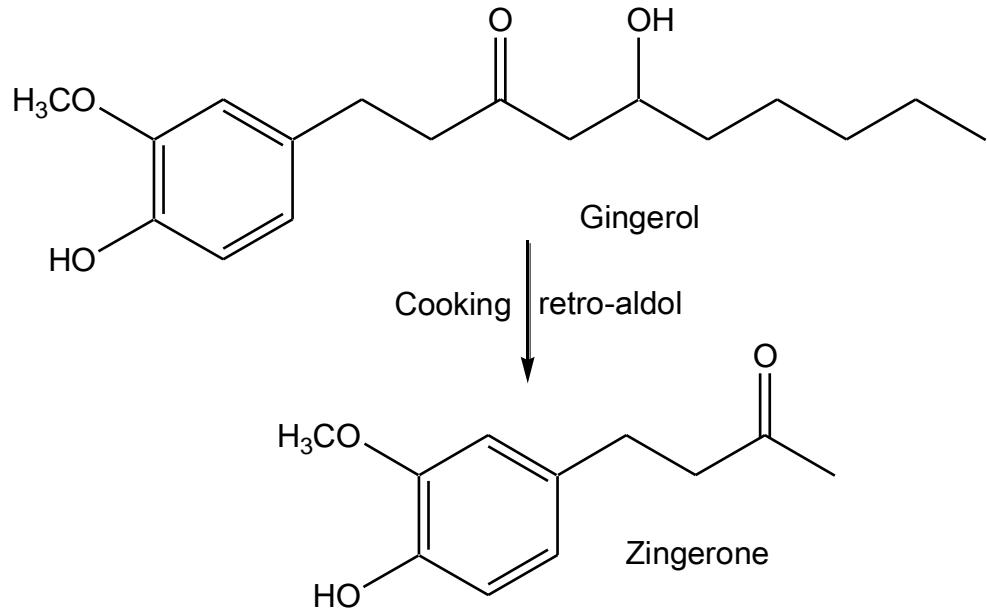


Dietary Ginger Constituents, Galangals A and B are potent apoptosis inducers in Human T Lymphoma Jurkat Cells.

N. Miyoshi, et al; Cancer Letters, (2003) 199, 113-119

Galangals A and B isolated from the flower buds of a Japanese ginger produced apoptotic cell death of human lymphoma cells showing them to be potent anti-cancer agents.

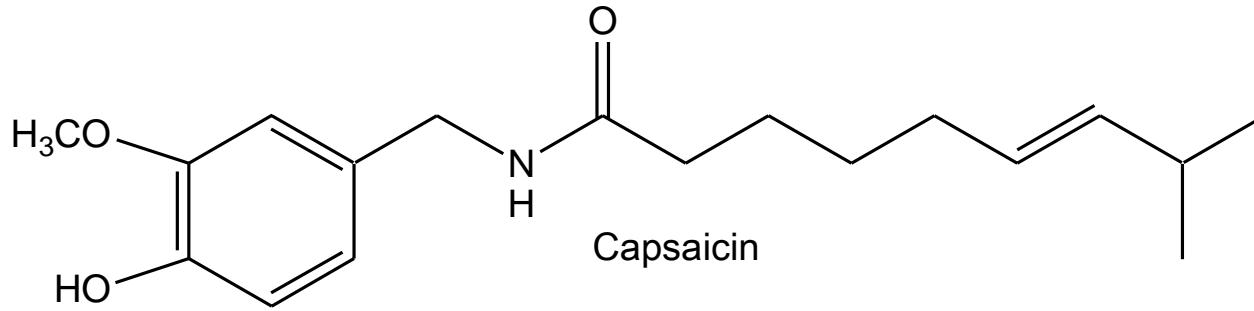
GINGER – ENTEROTOXIC PROTECTION



Zingerone has been shown to be active against enterotoxigenic *E.coli* heat-labile enterotoxin-induced diarrhea. This type of diarrhea is the leading cause of infant death in developing countries. It inhibits spontaneous contractile movements in the bowels by direct action on the smooth muscles.
Chen et al. J. Agric. Food Chem., (2007) 55(21), 8390-8397

Old English Word: Feague (verb). To increase the liveliness of a horse by inserting peeled raw ginger into its fundament.

CAPSAICIN – PROSTATE CANCER



'Capsaicin, a Component of Red Peppers Inhibits the Growth of Androgen-Independent, p53 Mutant Prostate Cancer Cells'

'Authors: A. Mori, et al; J. Cancer Research, (2006) 66, 3222

'Capsaicin has a profound anti-proliferative effect on human prostate cancer cells and dramatically slows the development of prostate tumours'. It appears to selectively attack tumour cells leaving the healthy cells alone by inhibiting the protein involved with prostate cancer cell proliferation.

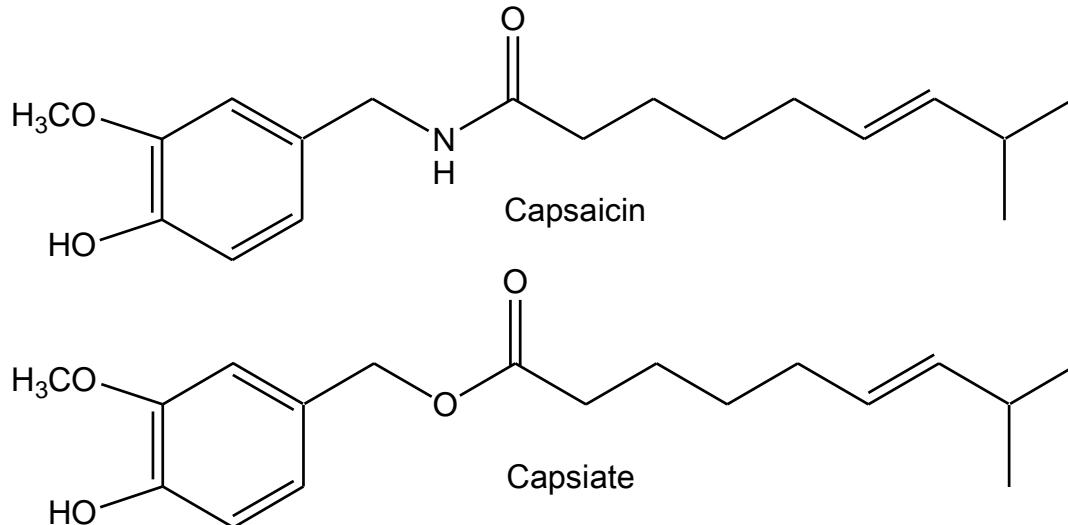
The inhibitory effects of capsaicin on cancer development in multiple organs, such as, stomach, lung, and liver have been extensively documented.

REVIEW PAPER (2010) : Oyagbemi et al. Indian J. of Cancer, (2010) 47, 53-58.

'Capsaicin: A novel chemopreventive molecule and its underlying mechanism of action.'

CAPSAICIN / CAPSIATE AND WEIGHT LOSS

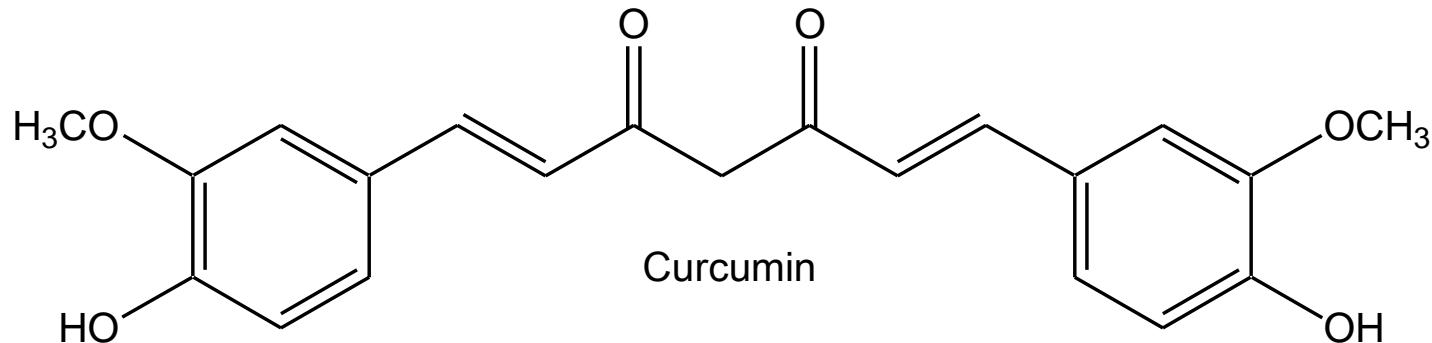
Capsaicin has also been used in diet strategies claiming that it speeds up metabolism and burn fat leading to weight loss. The amount needed to achieve this has side effects.



Marketed by Ajinomoto (FI Japan 2012). Weight loss product Capsiate Natura is claimed to deliver the thermogenic punch of capsaicin without the pungency and adverse side effects. The peppers producing them are grown in Thailand in farms operated by Ajinomoto and the capsinoids are extracted, purified and encapsulated. The product has been available in Japan since 2006 and was granted US FDA approval in 2007.

TURMERIC AND ALZHEIMER'S DISEASE

During the past decade attention has focussed on turmeric and its colour compound curcumin for the prevention of cognitive loss and as a way of combatting the onset of Alzheimer's disease.

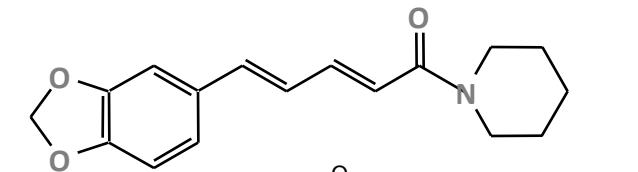


0.3% of the population of India suffer from Alzheimer's disease – in the USA it is 1.6%.

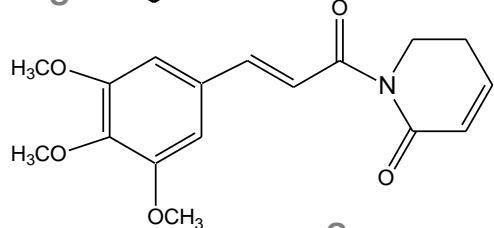
Curcumin in turmeric is consumed on a daily basis in India and recent work with mice has shown that it inhibits and reverses the formation of amyloid plaques responsible for the disease.

Garcia-Alloza et al. Journal of Neurochemistry (2007), 102(4), 1095-1104

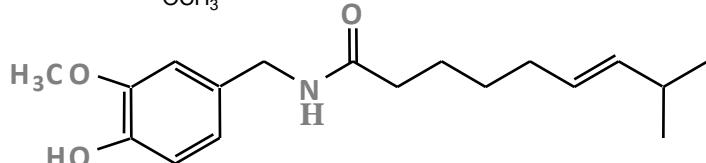
PUNGENT SPICES - CLUES IN THE STRUCTURE?



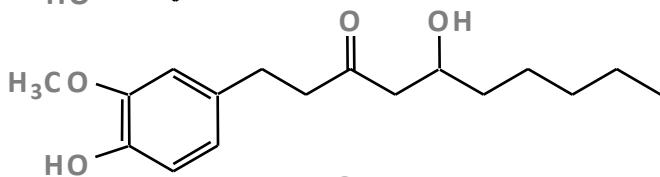
Piperine



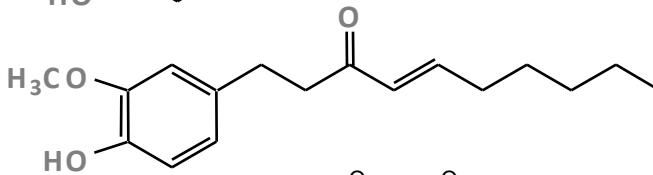
Piperlongumine



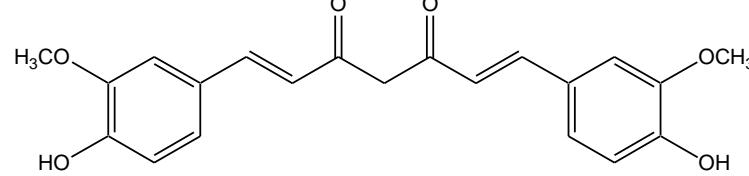
Capsaicin



Gingerol



Shogoal



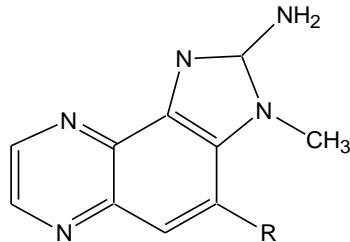
Curcumin

The Use of Spices to Inhibit Carcinogen Formation

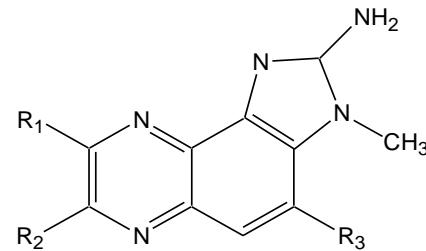


CARCINOGENS AND MUTAGENS IN MEAT

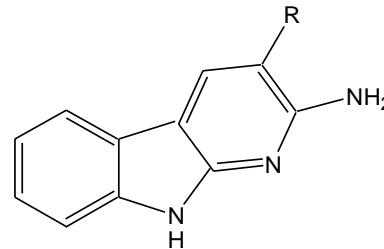
Carcinogens and mutagens (heterocyclic aromatic amines) are formed in meat when it is cooked. Well done and BBQ meats contain the highest levels.



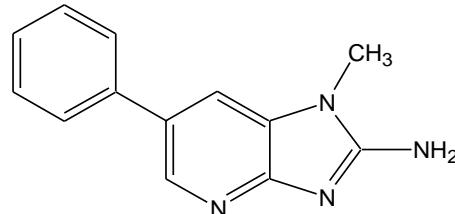
R = H (IQ)
R = CH₃(MeIQ)



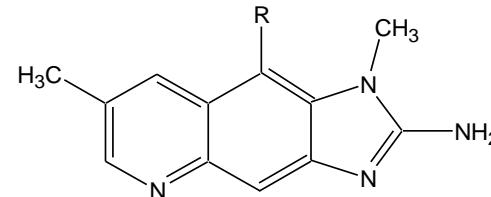
R₁, R₂, R₃ = H (IQx)
R₁ = CH₃, R₂, R₃ = H (8-MeiQx)
R₁, R₃ = CH₃, R₂ = H (4,8-DiMeIQx)
R₁, R₂ = CH₃, R₃ = H (7,8-DiMeIQx)



R = H (AaC)
R = CH₃(MeaC)



PhIP



R = H (7-MeiQx)
R = CH₃(7,9-DiMeIQx)

In comparison to other known food mutagens it is now known that these compounds are over 100 fold more mutagenic than Aflatoxin B1 and 2000 fold more mutagenic than the polycyclic hydrocarbon benzo[a]pyrene responsible for lung cancer in smokers.

CARCINOGENS AND MUTAGENS IN MEAT

Two EU assessment studies have determined human exposure at 103 and 160 ng/day. Over the past 15 years an increasing number of epidemiological studies have evaluated the association of well-done meat intake and meat carcinogen exposure with cancer risk. These studies were reviewed by Zheng and Lee.

Zheng, W. and Lee, S-A. (2009)

Well-done meat intake, heterocyclic amine exposure and cancer risk.

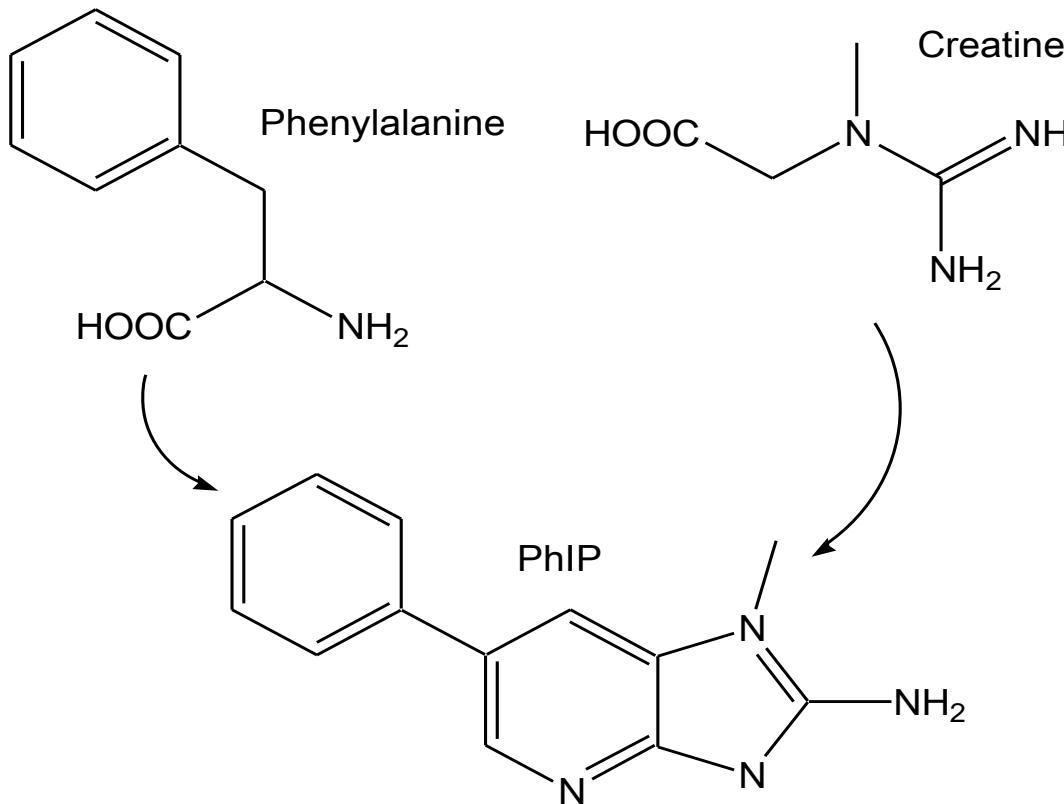
Nutrition and Cancer, 61(4), pp 437-446

Exposure	No. of Studies Evaluated	No. of Studies Reporting Positive Associations %	Cancers Implicated
HAAs General	10	7 (70%)	Colorectal, breast, pancreatic, stomach, esophagus, squamous cell carcinoma, lung.
PhIP	13	8 (61.5%)	Colorectal, breast, pancreatic.
MeIQx	12	6 (50%)	Colorectal, lung.
DiMeIQx	11	6 (54.5%)	Colorectal, pancreatic.

PhIP, MeIQ, MeIQx and IQ are now listed in the IARC Report on Carcinogens

CARCINOGENS AND MUTAGENS IN MEAT

PhIP is formed in the highest amounts and is usually responsible for around 80% of the aromatic amines present in cooked meat products. It is listed on the IARC list of carcinogens. Its route of formation is understood;



THE GOOD NEWS INVOLVES SPICES

A recent study evaluated the use of black pepper in meat balls fried at three different temperatures (175°C, 200°C and 225°C). The black pepper was shown to completely eliminate the PhIP at all temperatures against a control containing no black pepper. The control sample cooked at 225°C contained 31.8ng/g of HAAs.

(PhIP. F. Oz and M. Kaya, (2011) Food Control, Vol 22, pp 596-600)



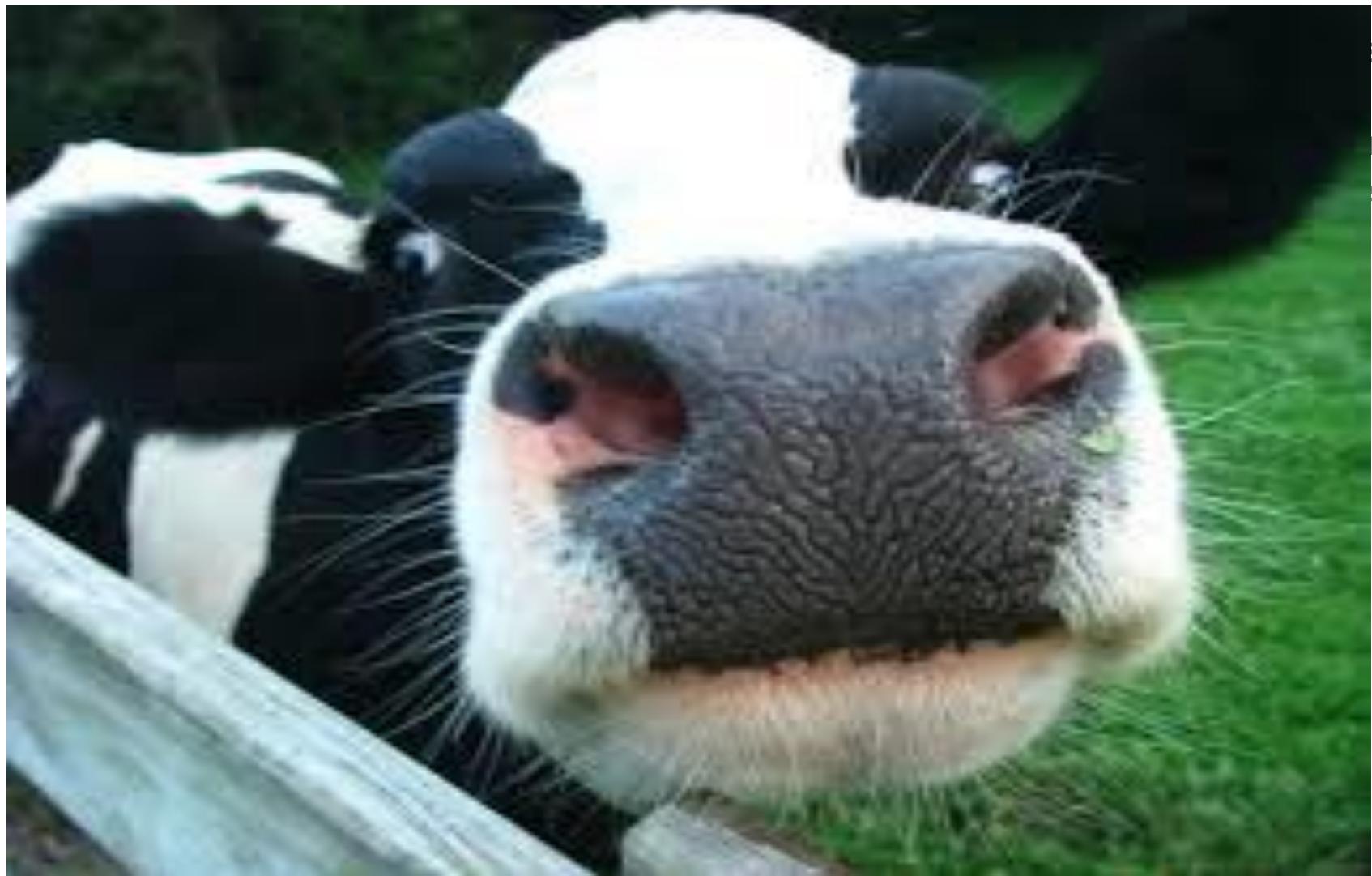
Marinade application to the surface of meat prior to cooking can have a significant effect on HAAs. A mixture of rosemary, thyme, sage, and garlic in brine reduced the overall content by 60% compared to a non-marinated control. Marinades based on sugar can increase the content of heterocyclic aromatic amines in fried beef. Turmeric, garlic and onions have also been shown to reduce heterocyclic amines.



The Growing Use of Spices in Animal Feeds



SPICES IN ANIMAL FEEDS



SPICES IN RUMINANT FEEDS

Over the past decade there have been numerous studies showing the beneficial effects of herbs and spices on feed, intake, immune function, rumen fermentation, methanogenesis, the productivity of calves, dairy cows, heifers and beef cattle.

Cinnamon, anise, oregano, garlic, capsicum and yucca show beneficial effects on rumen fermentation.

Caraway, camomile, nettles, dandelion, and common agrimony improve the quality of milk.

Garlic and eucalyptus are effective against endometritis (inflammation of the uterus)

A mix of cloves, cinnamon and garlic has been recently patented to reduce the production of methane from dairy cows.

US 20120171323A1 July 5th 2012. D. Bravo, S Calsamiglia



SPICES IN PIG FEEDS

Pigs are omnivores with similar taste senses to humans. Their feeding behaviour and feed intake can be affected by flavours such as apple and strawberry and they have a liking for the heat of capsaicin. More recently attention has moved from pig flavour preferences to ingredients that improve health and thereby improve performance. The pig still has to enjoy the taste though.

In pig production most problems can be expected at farrowing and weaning. The use of herbs and spices in piglet nutrition has been shown to reduce the incidences of infections and reduce mortality over this critical period.

A mixture of cinnamon and garlic increases feed intake and live weight gain in weaned piglets and reduces mortality.

Oregano, cinnamon, thyme and capsicum reduce gastrointestinal problems in weaned pigs.

Imprint flavours have been used to facilitate weaning.



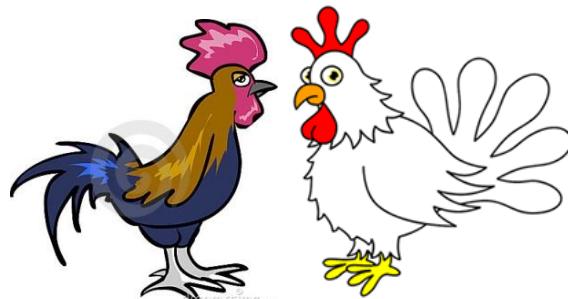
dreamstime.com

SPICES IN POULTRY FEEDS

The use of herbs, spices, flavours in chicken feeds was previously unheard of but it is now a growing area of research.

Three main areas are emerging:

- 1) Growth performance – various mixtures of oregano, clove, anise, cinnamon, thyme, rosemary and capsicum have been shown to produce significant improvements in feed conversion and body weight gain in chickens. Anise alone at 1% in a feed significantly improved daily live weight gain over a 6 week period and it is suggested that it is a natural growth promoter for poultry.
- 2) Egg Production – dietary supplementation with ginger produced a higher egg mass, and improved egg yolk antioxidant status
- 3) Meat – the use of oregano in turkey and chicken feeds significantly decreases lipid peroxidation of cooked and fresh meat during refrigerated storage.



Spices and Salt Reduction

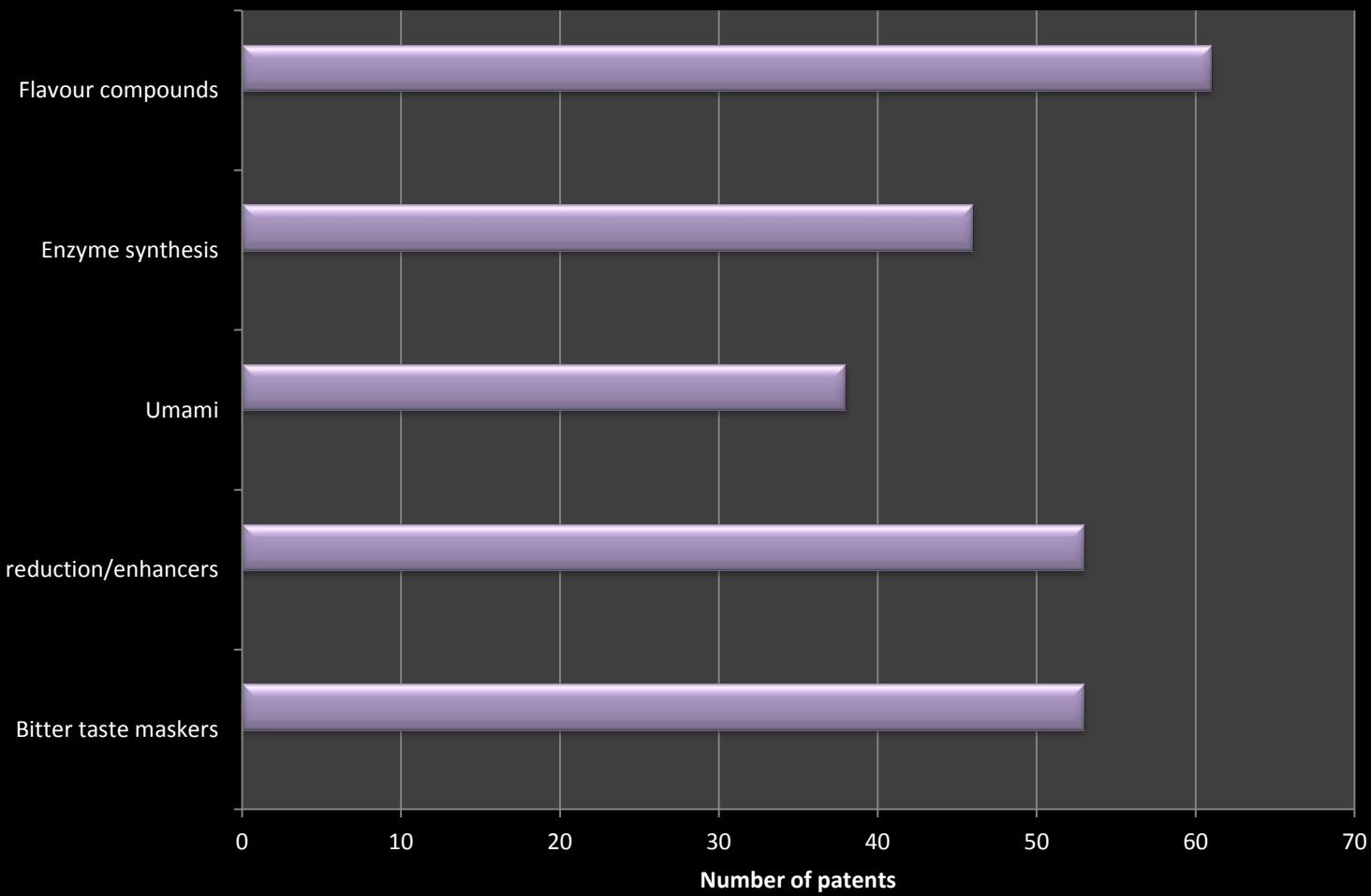


SPICES AND SALT REDUCTION

- The WHO has stated that salt reduction is of equal importance to smoking cessation.
- The UK Government is actively pursuing a salt reduction strategy with a target of 6g/person/day above the age of 11 years.
- The NICE report of 2010 recommends that salt reduction is accelerated and the target achieved by 2015.
- Currently (March 2013) 90 companies have signed up to make salt reduction a priority.
- The UK now has the lowest salt intake of any developed country in the world (June 2012) at 8.1g/day down from 9.5g/day in 2005.



Food and Beverage Flavour Patents 2010-12



Source: <http://worldwide.espacenet.com>

SPICES AND SALT REDUCTION

A patent filed in 2012 by House Foods Corporation, Osaka Japan, claims the use of a number of spices in salt reduction formulations enhances the salty taste of sodium chloride and serves to mask the bitter notes of potassium chloride.

Spices: White pepper, black pepper, green pepper, ginger, zanthoxylum, capsicum, cumin, thyme, oregano, coriander, laurel, cardamon, mustard, cinnamon, garlic, rosemary, sage, basil, citrus unshiu peel, perilla and lemon and extracts of the above.

The examples cite only white pepper. In salt blends containing sodium chloride, potassium chloride, acetic and lactic acids the white pepper (< 0.05%)enhances the salty taste producing good salty character compared to a sample without white pepper.

Clearly if spices do have a role in enhancing salty character they could be used quite easily in the relevant dishes.

It may also be worthy of industry sponsored research.



Interesting Herbs and Spices



PHO SOUP – PASTEUR RESTAURANT HO CHI MINH CITY



PHO SOUP



Herbs of Pho Soup

HOLY BASIL



Ocimum tenuiflorum

BASIL



Ocimum basilicum

Aromatically, holy basil has basil, clove and liquorice character

Herbs of Pho Soup

Limnophila aromatica is used in Vietnamese dishes including Pho Soup along with other herbs to produce a unique and delicious dish.

It has a rosemary, citrus and cumin character.

It grows across S. E Asia in watery environments hence its other name – Rice Paddy Herb.



EUROPEAN SPICE ASSOCIATION
GENERAL ASSEMBLY 2013

Thank You and
I will leave you with
the spicy herbal
smells of Vietnam

