East-West Perspectives on Functional Foods

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Overview of presentation

- Western traditions of functional foods (Hippocrates, Galen)
- Blueberries
- Apples
- Asian traditions of functional foods
- Chinese tea
- Curcumin (turmeric)
- Evidence and standards
- Issues and recommendations

Statement

- This presentation is solely the responsibility of the author, and does not necessarily represent the views of the International Life Sciences Institute or any of its branches.
- No compensation or awards have been received from any producer or provider of any foods or beverages mentioned.
- I do regularly consume blueberries, apples, turmeric and tea.

Hippocrates – 'On Diet'

Let your food be your medicine, your medicine be your food .

- *Diet in Acute Diseases - Medical Foods, 5th century BC*

Galen – On the Powers of Foods

- Galen was born in AD 129 at Pergamum, a large city on the Aegean seaboard of what is now Turkey. He learned from and expanded on Hippocrates (5th century BC). He spent most of his adulthood in Rome. Emperor Marcus Aurelius called Galen the finest doctor and a unique philosopher .
- *'On the Powers of Foods'* published in 180 AD
- He recognized (as common) that some foods could also be used as drugs. The difference was in preparation and dosage.

Galen – On Food and Diet

- That a good diet ensured health was a fundamental concept of ancient medicine, since food could cause disease or restore health.
- Prevention was in every way better than a cure. By contrast drugs and surgery were drastic, to be used only when diet could no longer help.
- Philosophical aspect -everyone had it in their power to control their way of life and this gave to food a moral dimension. Moderation and balance were essential in the pursuit of truth and the ultimate good.

Galen as Food Technologist – On Barley Soup

- Galen believed that a good doctor should also be a good cook.
- ”Soak the barley beforehand in water while it is still raw, then rub it between your hands to remove the skin. Using the same method, again rub the barley between your hands until all the chaff is removed, unless you want it to be more laxative, in which case it is better to boil it with its skin. You should boil it like this: first over a high flame, then afterwards on a gentle flame until it has liquefied”
- Philosophical aspect -everyone had it in their power to control their way of life and this gave to food a moral dimension. Moderation and balance were essential in the pursuit of truth and the ultimate good.

Galen as Food Technologist – On Barley Soup

”Barley soup is smooth, uniform, consistent, and homogenous to such a degree as not to allow one part to appear thin and another thick or uneven. This is not only to the touch, but also indeed to its power and activity. It is also soothing to the taste, because it has no unpleasantness, and it is moist and hydrating, because of the stickiness in it. Whatever is smooth, moist and soothing has been rid of astringency and any other strong quality. In addition, it possesses no flatulence because it has been cooked properly. Hence it is suitable for acute fevers, not only because it is the opposite to them in every way, but also because it is extremely easy to digest… “.

Galen on Refined Bread

- ”Those who have devoted thought to the preparation of refined bread have discovered a food with little nourishment, but it does avoid, as far as is possible, the harm that comes from blockages. This bread is the least thick and viscous, since it is more airy than earthy. Its lightness is observed from its weight and from it not sinking in water, but rather bobbing on the surface like a cork”.
- However, “Anyone with any intelligence should not need convincing that flour which is genuinely fine, white and free from all branny material is converted more efficiently and quickly in the stomach and because of this is digested better, as well as being distributed more easily, furnishing nourishment more readily, so that it is completely assimilated and absorbed by the bodies that are being fed”.

Galen, On the Powers of Foods, Book 1

Galen – on Apples

- ”There is not a single type of apple, …for some have a harsh juice, whilst others have a sharp or sweet juice”.
- ”So apples should be used according to the powers of the prevalent juices.
  - Harsh apples can be employed when the stomach is weak because of hot bad temperament or excessive moistness
  - astringent apples can be administered when these two problems are exacerbated
  - sharp apples can be eaten when a thick fluid which is not completely cold can be assumed to have collected in the stomach”

Galen, On the Powers of Foods, Book 2

Galen - Wine

- ”Everyone agrees that wine is among that which nourishes; and if everything nourishing is a food, it must be said that wine too should be classed as a food”.

Galen, On the Powers of Foods, Book 3

Galen - **Wheats boiled in water**

- ”If I had not at one time eaten wheat boiled in water, I would never have considered there to be any purpose in eating it. For no one, even during a food shortage, would arrive at such a practice, since bread can be made if there is a good supply of wheat”.

Galen, On the Powers of Foods, Book 1

Blueberries – potential against metabolic syndrome

- Daily dietary supplementation with bioactives from whole blueberries improved insulin sensitivity in obese, nondiabetic, and insulin-resistant participants.

- Stull et.al, 2010, Bioactives in Blueberries Improve Insulin Sensitivity in Obese, Insulin-Resistant Men and Women, J. Nutr., 140: 1764–1768, 2010.

Apples -

- **8,000 B.C.**—Nomadic hunter/gatherer societies invent agriculture and begin to "settle" in places throughout the "fertile crescent" from the Nile through the Tigris and Euphrates, the Indus, and Yellow River Valleys. As both trade and military expeditions begin among these earliest civilizations, ***dessert* apples quickly spread from the forests of their origin in the Tien Shan mountains of eastern Kazakstan throughout the "*civilized*" world.**
- **5,000 B.C.**—Feng Li, a Chinese diplomat, grafts pears and apples as a commercial venture according to "The Precious Book of Enrichment", part I, chap. 4

Apples -

- **200 B.C.**—Latin emerges from a localized dialect in Central Italy to a full and precise language still used in biology, law, medicine, and religion. The Latin **"Fruor"** meaning **"I delight in"** is the source of our word **"fruit"**.

- **650 A.D.**—*The Koran*, codified by Caliph Utman hails fruit as a sublime gift of God.

Apples -

- 1866 - A Pembrokeshire proverb. “Eat an apple on going to bed, And you’ll keep the doctor from earning his bread”.
- 1898 - ‘An apple a day, no doctor to pay.’
- 1899 - An apple a day sends the doctor away.
- 1904 – ‘An apple a day keeps the doctor away’, proclaimed fruit specialist J.T. Stinson in an address in St. Louis, USA

Apples -

- Most commonly consumed fruit in USA (est. 22 kg/year)
- Apples contain vitamin C and polyphenols, which may reduce free radical damage in humans.

Apples -

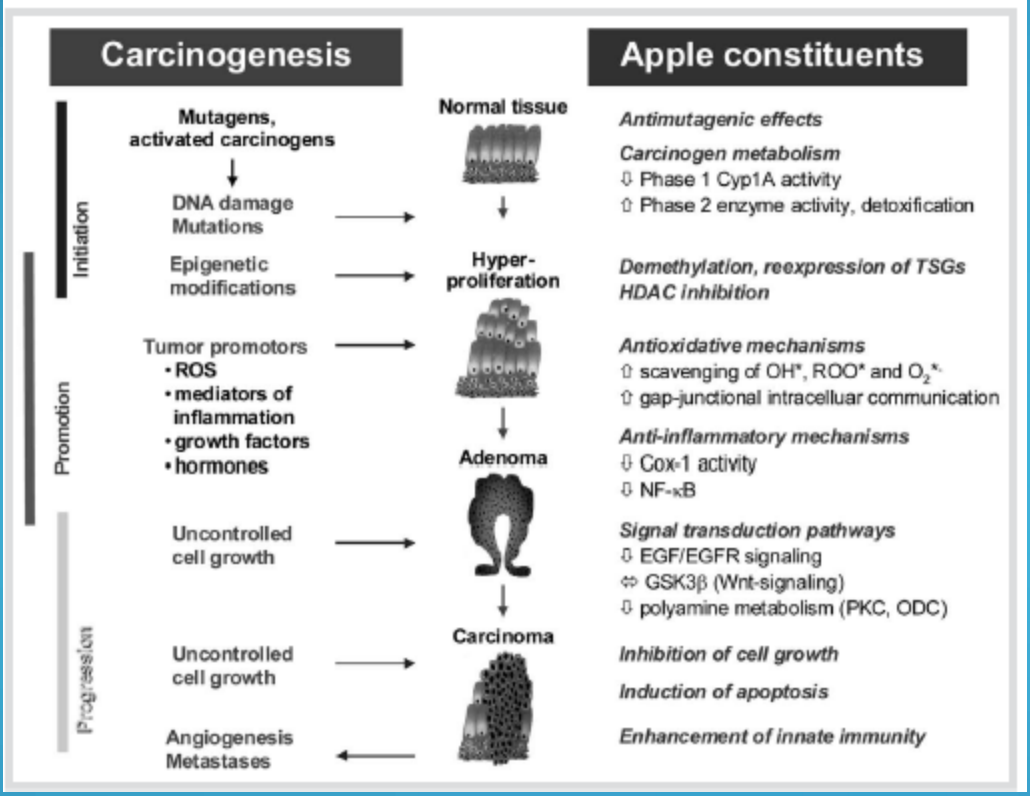
Table 2. Contributions of Major Antioxidants to the Total Antioxidant Activity of Apples

phytochemical	concn (mg/100 g of fresh wt)	EC_{50}	relative VCEAC value[a]	total antioxidant activity (mg of VCEAC/100 g)	relative contribution (%)
quercetin glycosides	13.20	0.56	3.06	40.39	34.7
epicatechin	8.65	0.64	2.67	23.10	19.9
procyanidin B_2	9.35	0.72	2.36	22.07	19.0
vitamin C	12.80	1.71	1.00	12.80	11.0
phloretin glycosides	5.59	1.05	1.63	9.11	7.8
chlorogenic acid	9.02	1.76	0.97	8.75	7.6
total	58.61			116.22	100.0

[a] Relative VCEAC value = VCEAC of each compound/antioxidant capacity of vitamin C.

- Lee et.al, 2003, Major Phenolics in Apple and Their Contribution to the Total Antioxidant Capacity, J. Agric. Food Chem. 51, 6516-6520

Apples – Cancer Prevention



- Gerhauser, 2008, Cancer Chemopreventive Potential of Apples, Apple Juice, and Apple Components, Plant Med, DOI 10.1055/s-0028-1088300

Tea

- Believed that tea polyphenols are the main active component contributing to human health
- May protect chromosonal DNA , structural proteins, and membrane lipids from ROS.
- Main polyphenols in tea are four catechins (gallocatechin(EC), epicatechin gallate (ECG), epigallocatechin (EGC) and epigallocatechin gallate (EGCG).

Tea

- Prostate cancer risk was reduced with increased consumption of green tea. The protective effect of green tea was significant (odds ratio 0.14, 95% CI: 0.06-0.35) for the highest quartile relative to the lowest after adjusting for total vegetables and fruits intakes and other potential confounding factors.
- Epidemiological study
- Lee et.al., Tea and lycopene protect against prostate cancer, Asia Pac J Clin Nutr 2007;16 (Suppl 1):453-457

Tea

- However – “Although tea and/or tea polyphenols have been found in animal studies to inhibit tumorigenesis at different organ sites, including the skin, lung, oral cavity, esophagus, stomach, small intestine, colon, liver, pancreas, and mammary gland, the results of human studies—both epidemiologic and clinical studies—have been inconclusive”
- US National Cancer Institute

Curcumin (turmeric) – Potential in cancer and obesity

- **Turmeric** (***Curcuma longa***) is a rhizomatous herbaceous perennial plant of the ginger family , Zingiberaceae. It is native to tropical South Asia. Its main active ingredient is curcumin.
- Turmeric is approved as a food additive, referenced as E100, as a colorant (no health properties).
- Turmeric, known as 'Haridra' in Sanskrit and 'Haldi' in Hindi, has been used since ancient times in Ayurvedic food and medicine.

Curcumin (turmeric) – Potential in cancer and obesity

- Activities of Turmeric include: Alterative, analgesic, antibacterial, anti-inflammatory, anti-tumor, anti-allergic, antioxidant, antiseptic, antispasmodic, appetizer, astringent, cardiovascular, carminative, cholagogue, digestive, diuretic, stimulant, and vulnerary.
- Therapeutic uses of Turmeric: Anemia, cancer, diabetes, digestion, food poisoning, gallstones, indigestion, IBS, parasites, poor circulation, staph infections, and wounds.
- Turmeric reduces fevers, diarrhea, urinary disorders, insanity, poisoning, cough, and lactation problems in general.
- Turmeric is used to treat external ulcers that respond to nothing else.
- In Ayurvedic cooking, turmeric is **everywhere**

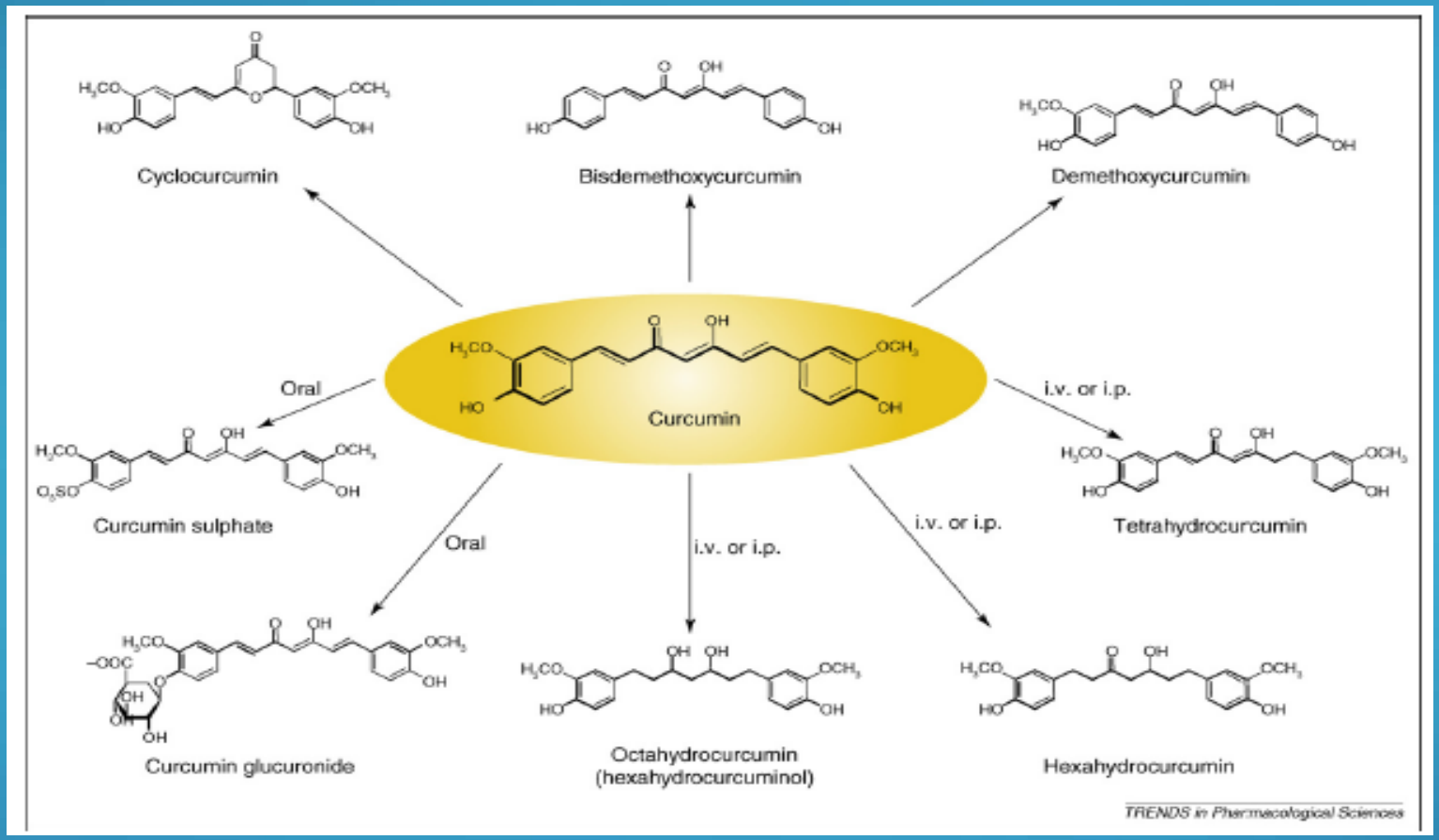
Curcumin (turmeric) – From East to West

- “I have found a plant that has all the qualities of Saffron, but it is a root.”
- (Marco Polo on Turmeric, 1280 AD)
- In China, turmeric has been used for over 1000 year to decrease blood pressure, to clear abdominal pain and stagnation in men, women and children, and to remove the pain due to stagnant Chi.
- Unani - ancient Persian system of medicine that connected Ayurveda with Greek Medicine

Curcumin – From traditional use to modern science

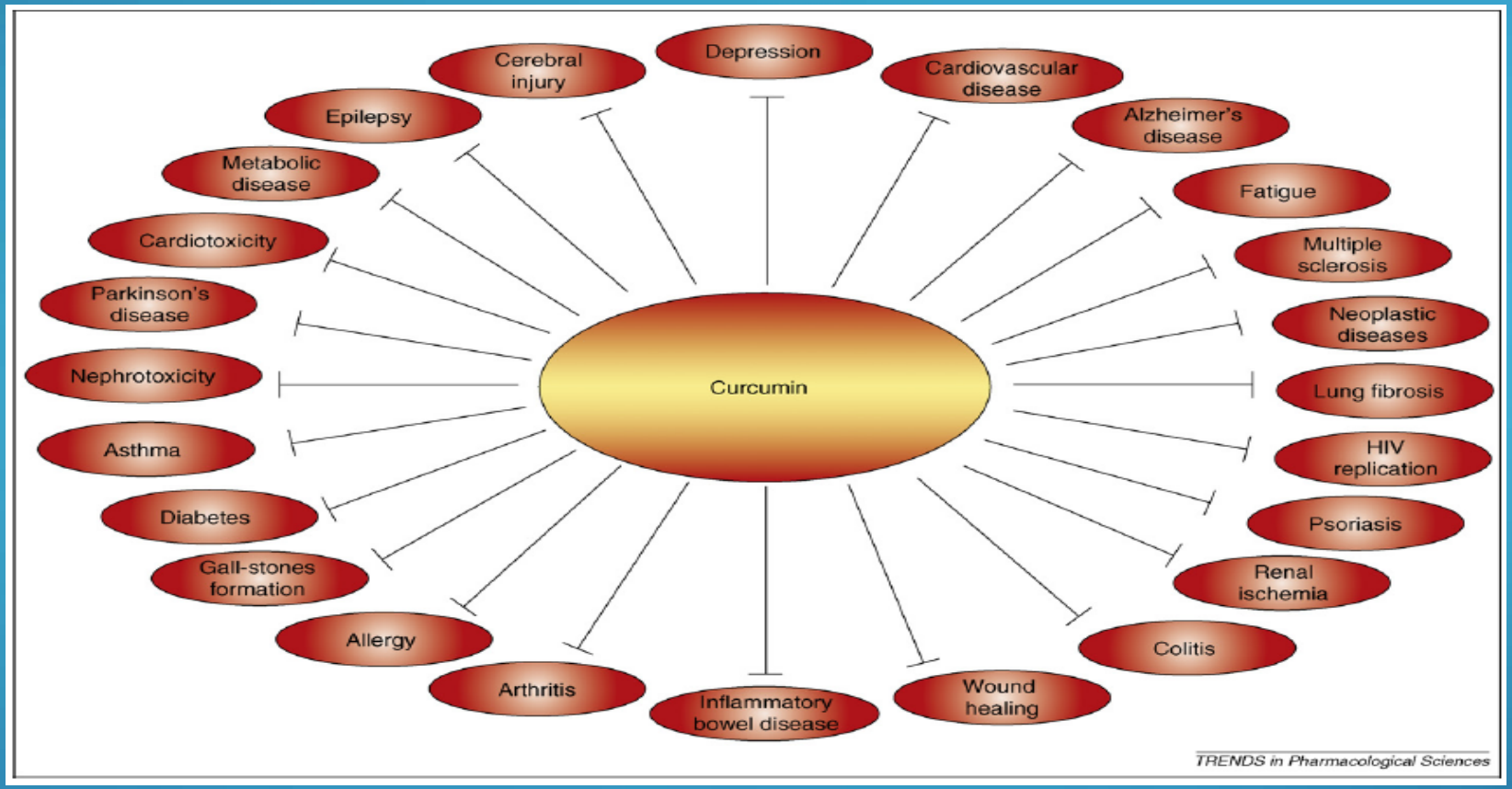
- Curcumin (diferuloylmethane), an orange-yellow component of turmeric is a natural polyphenol.
- Studies suggest curcumin has anticancer, antiviral, antiarthritic, anti-amyloid, antioxidant, and anti-inflammatory properties.
- The underlying mechanisms of these effects are diverse and appear to involve the regulation of various molecular targets
  - transcription factors (such as nuclear factor-κB)
  - growth factors (such as vascular endothelial cell growth factor)
  - inflammatory cytokines (such as tumor necrosis factor, interleukin 1 and interleukin 6)
  - protein kinases
  - other enzymes (such as cyclooxygenase 2 and 5 lipoxygenase.

Curcumin (turmeric) – Potential in cancer and obesity



- The structure of curcumin, its natural analogs and its most important metabolites in rodents and humans, from Aggarwal and Sung, 2008, Trends in Pharmacological Sciences Vol.30 No.2, pps 85-94

Curcumin (turmeric) – Potential in cancer and obesity (and other inflammatory diseases)

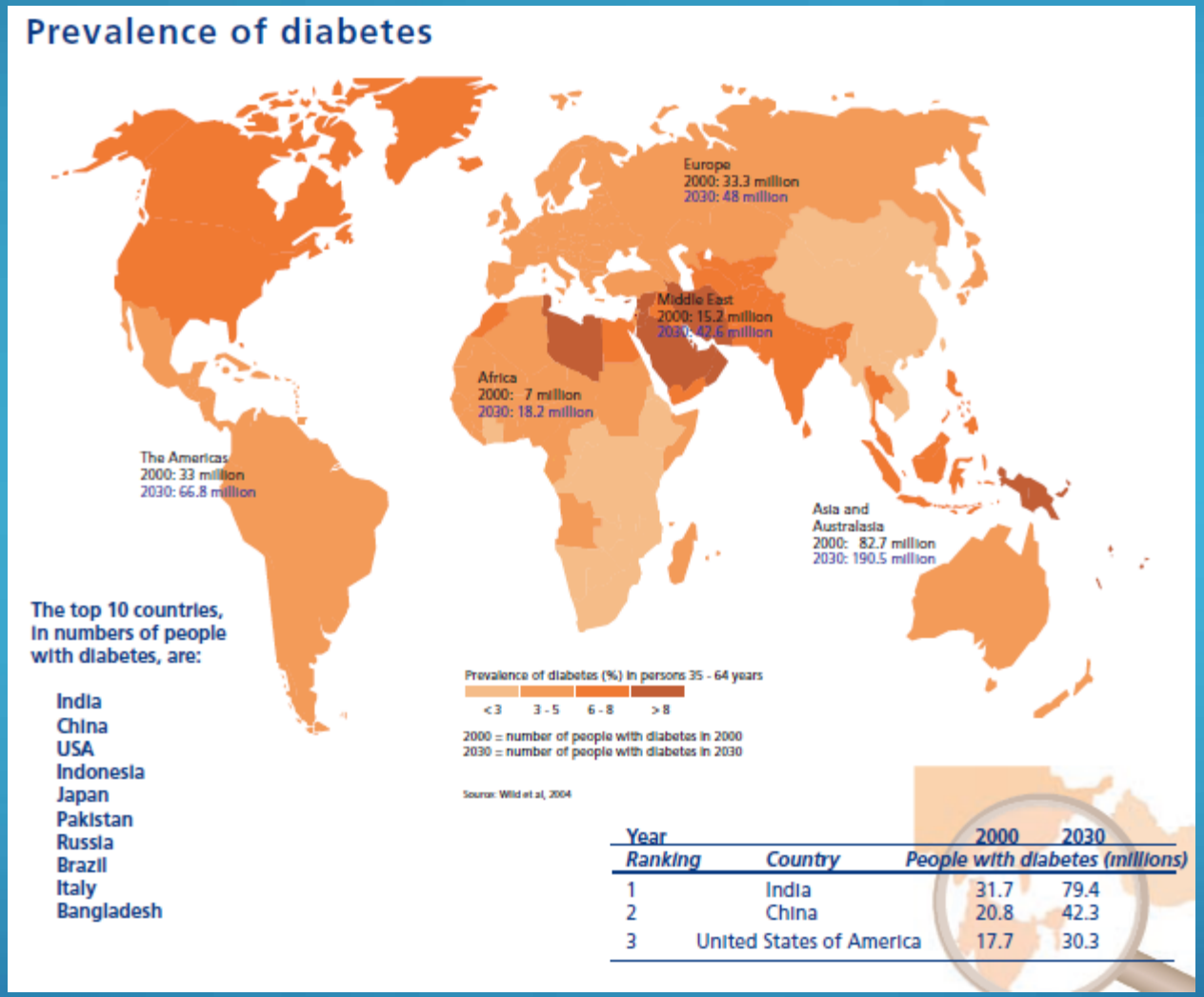


- Effect of curcumin on neurodegenerative, cardiovascular, pulmonary, metabolic, autoimmune and neoplastic diseases, from Aggarwal and Sung, 2008, Trends in Pharmacological Sciences Vol.30 No.2, pps 85-94

Curcumin (turmeric) – Potential in cancer and obesity

- ClinicalTrials.gov (NIH) list 27 trials underway or just completed on the use of turmeric/curcumin for health. ain active ingredient is curcumin.
- Turmeric is approved as a food additive, referenced as E100, as a colorant (no health properties).
- Over 350 studies on potential health impacts of curcumin in last 8 years

Why active nutrition/diet research is critical



- **International Diabetes Foundation, 2008**

Why active nutrition/diet research is critical

	COUNTRY/TERRITORY	2010 MILLIONS		COUNTRY/TERRITORY	2030 MILLIONS
1	India	50.8	1	India	87.0
2	China	43.2	2	China	62.6
3	United States of America	26.8	3	United States of America	36.0
4	Russian Federation	9.6	4	Pakistan	13.8
5	Brazil	7.6	5	Brazil	12.7
6	Germany	7.5	6	Indonesia	12.0
7	Pakistan	7.1	7	Mexico	11.9
8	Japan	7.1	8	Bangladesh	10.4
9	Indonesia	7.0	9	Russian Federation	10.3
10	Mexico	6.8	10	Egypt	8.6

- Number of people with diabetes (20-79 years), 2010 and 2030 **International Diabetes Foundation, 2010**

Evidence and standards - talking past each other?

- **Two professors - Dr Moritz Hagenmeyer and Dr Andreas Hahn – proposed the claim: *"Regular consumption of significant amounts of water can reduce the risk of development of dehydration and of concomitant decrease of performance".***

- **EFSA concluded: *"…the proposed claim does not comply with the requirements for a disease risk reduction claim pursuant to nutrition and health claims regulation [NHCR]."***

- Nevertheless – we still drink water to address thirst.

Evidence and standards - PASSCLAIM (Process for the Assessment of Scientific Support for Claims on Foods

- **Scientific review of methods to adopt standardized evidence-based approaches to establishing food-health relationships. ILSI Europe (Aggett etal., 2005, Eur J Nutr., 44 Suppl. 1, 1-30)**
- **Standard differ in most parts of the world**
- **RCT's may not always be the best evidence**
- **How to weight different types of studies?**

Evidence and standards - New proposal: PROCLAIM (PROving the efficacy of foods and food constituents for health CLAIMS

- **Diet is well known to have beneficial health properties that extend beyond traditionally accepted nutritional effects**
- **Consumer safety top priority**
- **Consumers should have confidence in health claims**
- **How can research on the physiological effects of foods and food components be encouraged?**
- **Relatively few validated biomarkers and risk factors for food and food components**

Gallagher et.al, accepted, 2011, Br. J. Nutr.

PROCLAIM (PROving the efficacy of foods and food constituents for health CLAIMS Research Priorities

- **Basis for accepting whether a demonstrated effect can be considered beneficial to human health**
- **Establishment of scientific framework addressing the relationship of intervention versus observational studies, confounders, and design issues**
- **Establishment of scientific framework for weighing of evidence**
- **Use of "continuum of health" approach**

Gallagher et.al, accepted, 2011, Br. J. Nutr.

Issues and conclusions

- “Information” spreads
- Beware of Type-2 errors
- Independent organization could be established
- Consider “weak” informational claims

Acknowledgments

- Mark Grant, 2000, Galen on food and diet, Routledge, London

- Gallagher et.al., 2011, accepted, Br. J. Nutr

Thank you

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