Inflammation, Diet, and Disease: Food as Medicine

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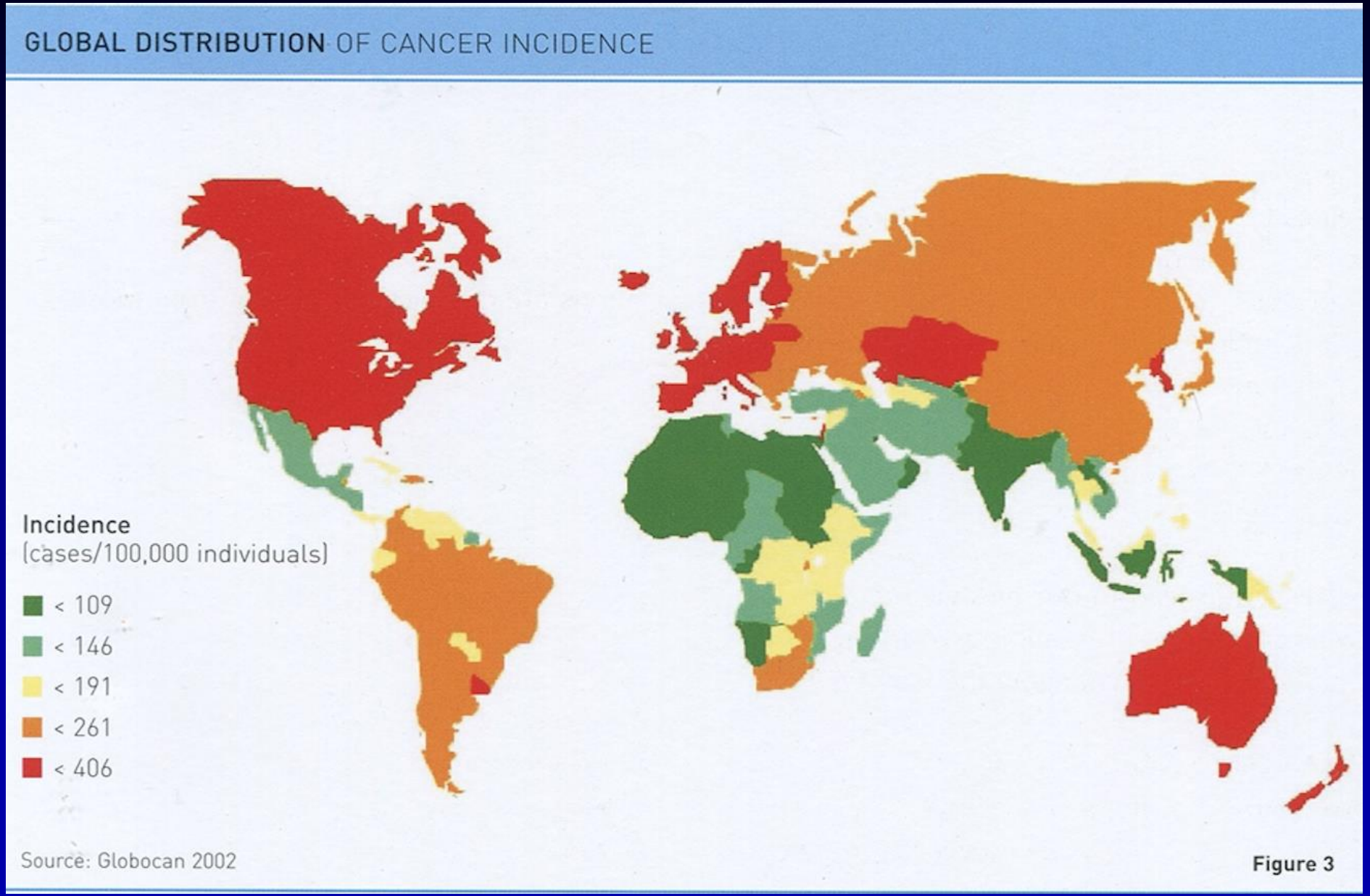
Wednesday, September 27, 2017; Time: 9:00-10:00 am

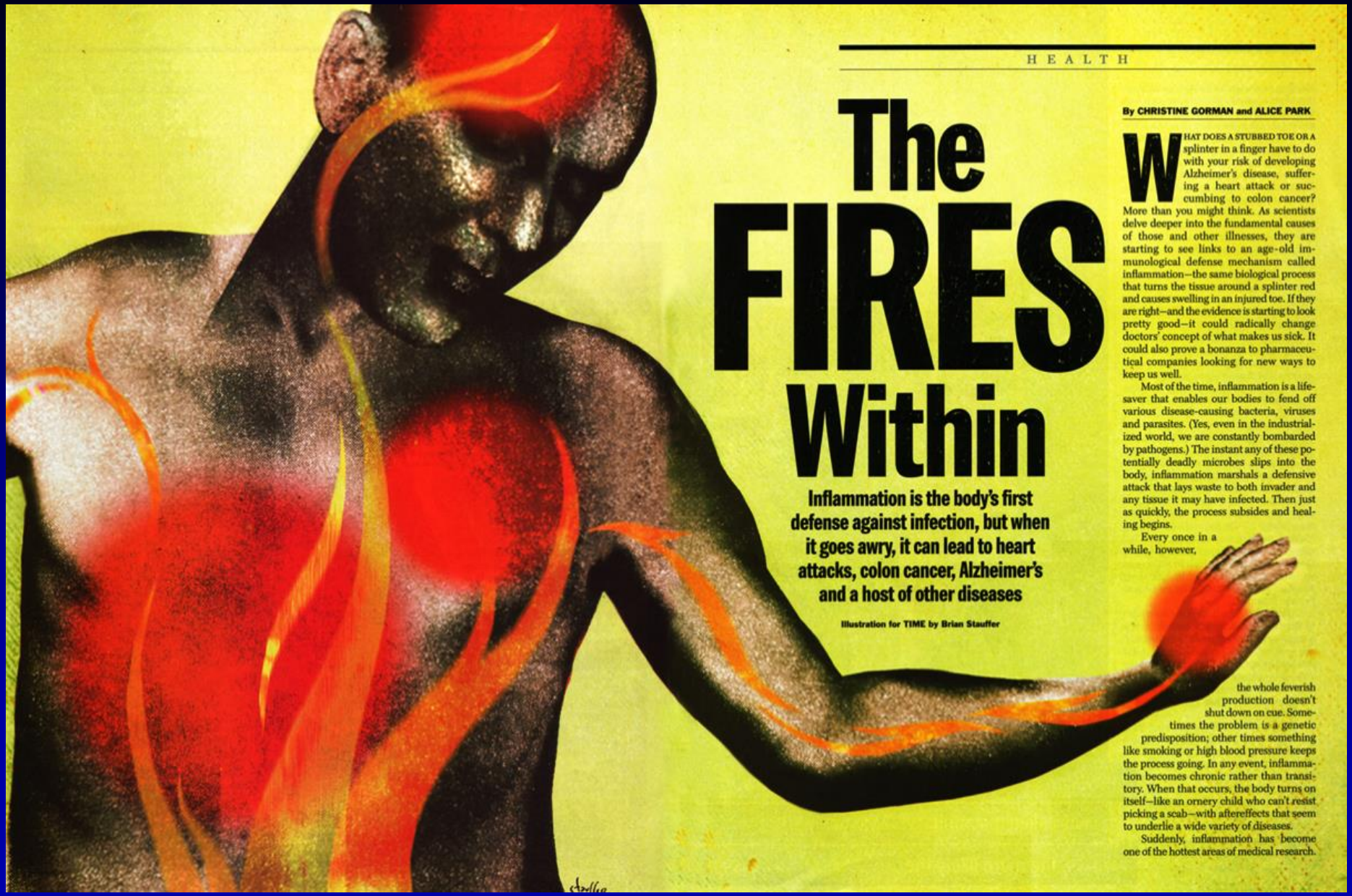
Working Hypothesis:

Dysregulated chronic inflammation caused by life style factors mediate chronic diseases including cancer!

Global Cancer Incidence



TIME Feb. 23, 2004



The FIRES Within

Inflammation is the body's first defense against infection, but when it goes awry, it can lead to heart attacks, colon cancer, Alzheimer's and a host of other diseases

Illustration for TIME by Brian Stauffer

By CHRISTINE GORMAN and ALICE PARK

WHAT DOES A STUBBED TOE OR A splinter in a finger have to do with your risk of developing Alzheimer's disease, suffering a heart attack or succumbing to colon cancer? More than you might think. As scientists delve deeper into the fundamental causes of those and other illnesses, they are starting to see links to an age-old immunological defense mechanism called inflammation—the same biological process that turns the tissue around a splinter red and causes swelling in an injured toe. If they are right—and the evidence is starting to look pretty good—it could radically change doctors' concept of what makes us sick. It could also prove a bonanza to pharmaceutical companies looking for new ways to keep us well.

Most of the time, inflammation is a lifesaver that enables our bodies to fend off various disease-causing bacteria, viruses and parasites. (Yes, even in the industrialized world, we are constantly bombarded by pathogens.) The instant any of these potentially deadly microbes slips into the body, inflammation marshals a defensive attack that lays waste to both invader and any tissue it may have infected. Then just as quickly, the process subsides and healing begins.

Every once in a while, however, the whole feverish production doesn't shut down on cue. Sometimes the problem is a genetic predisposition; other times something like smoking or high blood pressure keeps the process going. In any event, inflammation becomes chronic rather than transitory. When that occurs, the body turns on itself—like an ornery child who can't resist picking a scab—with aftereffects that seem to underlie a wide variety of diseases.

Suddenly, inflammation has become one of the hottest areas of medical research.

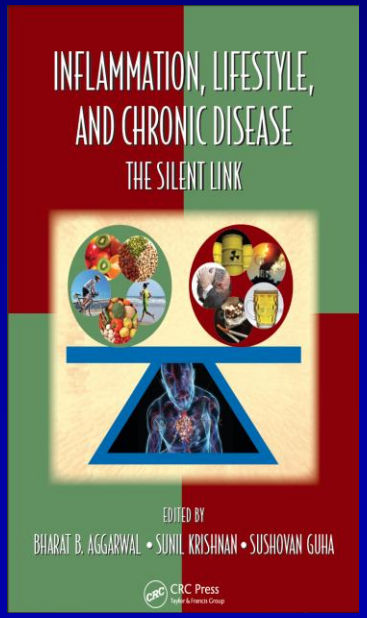
Inflammation/Flame/Fire

Controlled

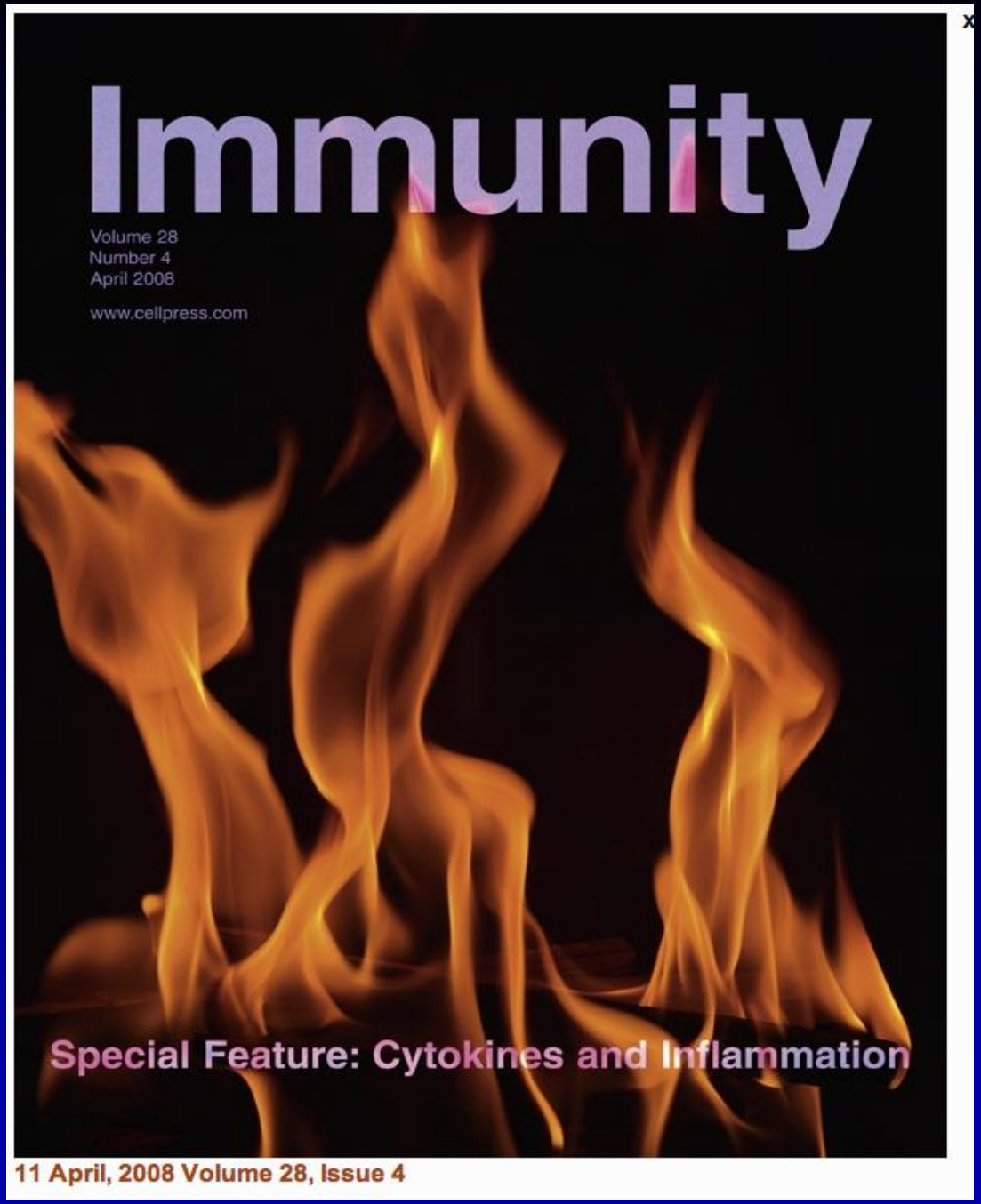
Uncontrolled

Inflammation, Lifestyle and Chronic Diseases: The Silent Link

Bharat B. Aggarwal, Ph.D. (Editor),
Sunil Krishnan, M.D. (Editor),
Sushovan Guha, M.D. (Editor)



(Francis and Taylor)


Immunity
Volume 28
Number 4
April 2008
www.cellpress.com
Special Feature: Cytokines and Inflammation
11 April, 2008 Volume 28, Issue 4

Signalling pathways of the TNF superfamily:

a double-edged sword.

Aggarwal BB.
Nature Reviews Immunology
2003 Sep;3(9):745-56.

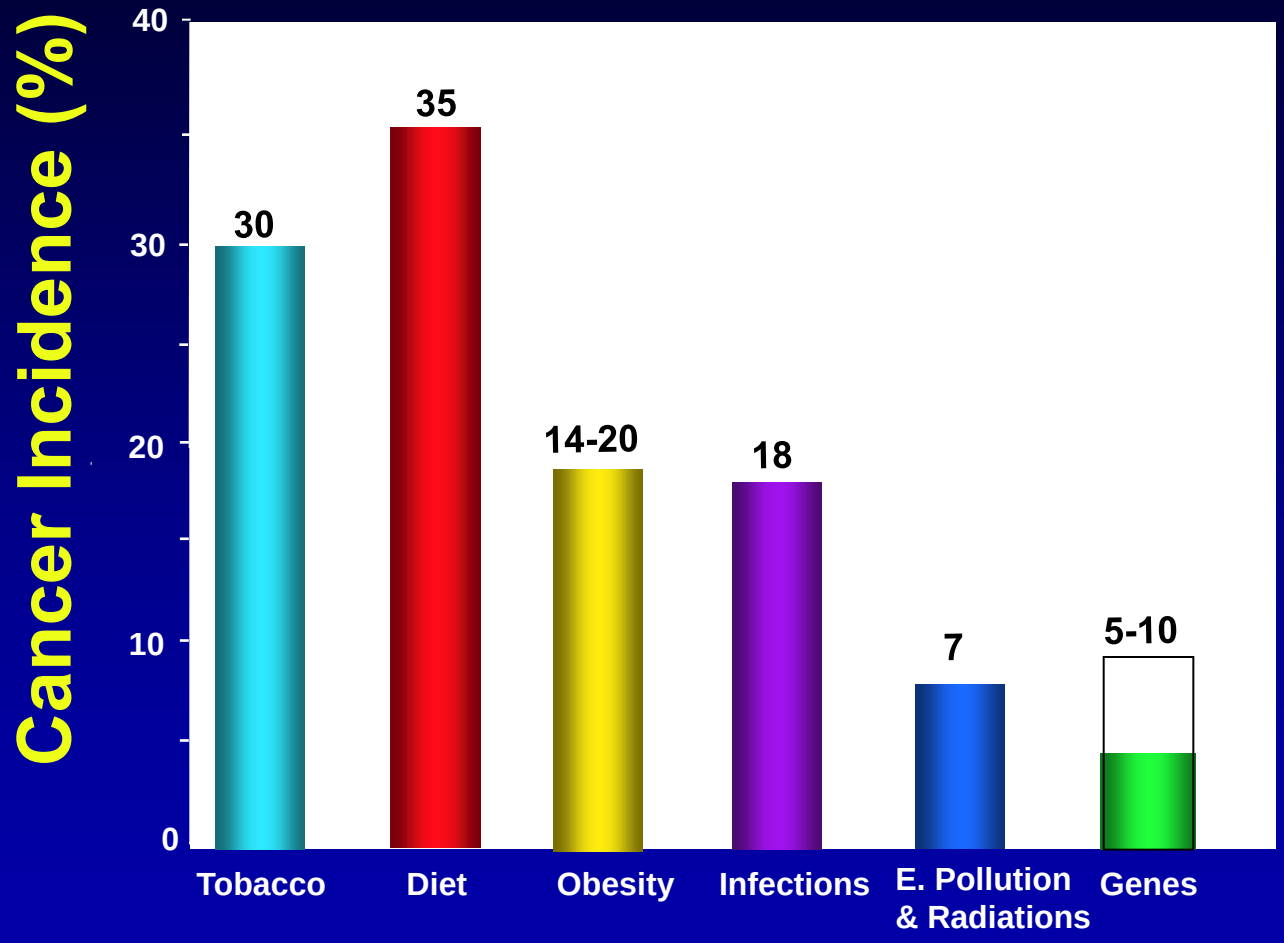
Historical perspectives on tumor necrosis factor and its superfamily:

twenty-five years later, a golden journey.

Aggarwal BB, Gupta SC, Kim JH.
Blood. 2012 Jan 19;119(3):651-65.

Life style Carcinogens/Risk factors

Cancer Is a Preventable Disease That Requires Major Changes in Life Style



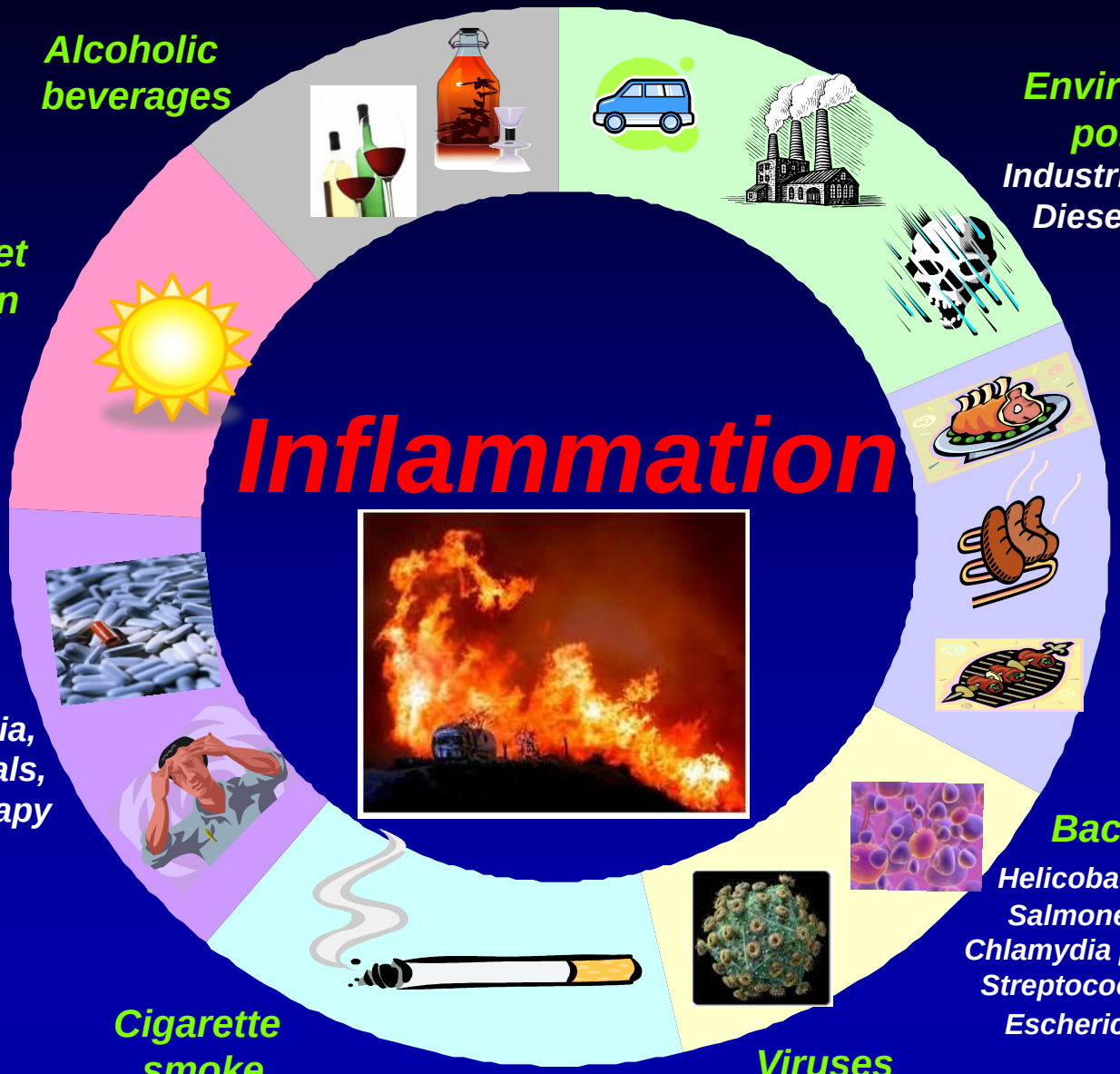
Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

About 5-10% of all cancers are inherited, meaning that mutations in specific genes are passed from one blood relative to another.

Genetic testing can determine your family history and cancer risk.

Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

Potential Sources of Inflammation



Inflammation and cancer

Redness, swelling, heat and pain

Rudolf Virchow
(1821-1902; in 1850)

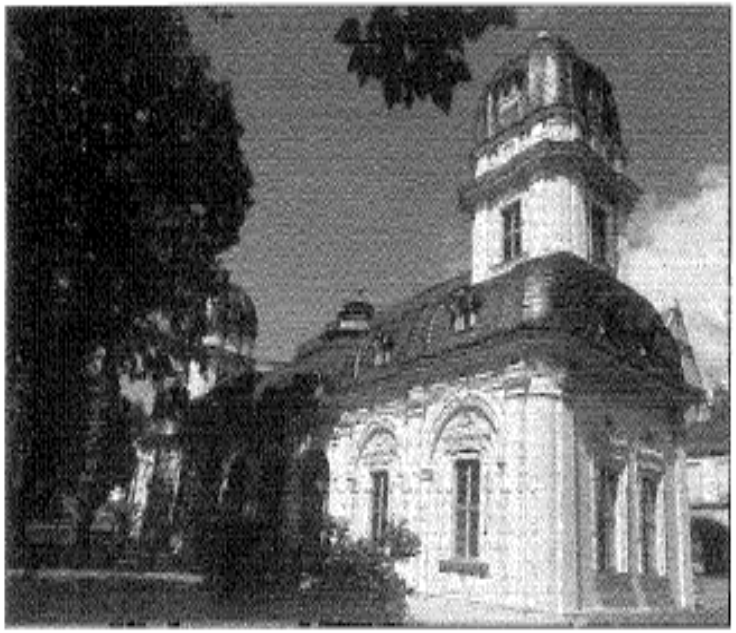


Fig. 3 - Juliusspital-Pavilion, Virchow's working place in Würzburg (1849-1854).

His Pathology laboratory in Wurzburg, Germany

Linked Inflammation with atherosclerosis, rheumatoid arthritis, multiple sclerosis, cancer, asthma, Alzheimer's

From Heidland A et al, History of Nephrology, 2006

Inflammation is "itis"

Arthritis is inflammation of the joints

Bronchitis…… Bronchus

Sinusitis…… Sinus

Gastritis…… Stomach

Esophagitis…… Esophagus

Pancreatitis…… Pancreas

Meningitis……Brain

Rhinitis…… Rhina

Gingivitis…… Gum

Inflammation-mediated diseases

Adenitis
Adrenalitis
Allergic rhinitis
Appendicitis
Arachnoiditis
Arteritis
Arthritis
Blepharitis
Bronchiolitis
Bronchitis
Bursitis
Capsulitis
Carditis
Cellulitis
Cerebellitis
Cerebritis
Cervicitis
Cheilitis
Cholecystitis
Chondritis
Chorditis
Choroiditis
Colitis
Conjunctivitis
Cystitis
Dermatitis
Dermatomyositis
Diverticulitis
Duodenitis
Encephalitis
Endocarditis
Endotracheitis
Endometritis
Enteritis
Enterocolitis
Epididymitis
Epididymo-orchitis
Fibrositis
Epiglottiditis
Epiphysitis
Episcleritis
Esophagitis
Ethmoiditis
Fascitis
Fibromyositis
Folliculitis
Funiculitis
Gastritis
Gastroenteritis
Gingivitis
Glossitis
Glottitis
Glomerulonephritis
Hepatitis
Hidradenitis
Ileitis
Iritis
Iridocyclitis
JejunitisKeratitis
Keratodermatitis
Laminitis
Laryngitis
Lymphadenitis
Lymphangitis
Mastitis
Mastoiditis
Meningitis
Meningomyelitis
Myelitis
Myeloencephalitis
Myocarditis
Myositis
Myringitis
Nephritis
Neuritis
Neuroretinitis
Omphalitis
Onychitis
Oophoritis
Oophorosalpingitis
Ophthalmitis
Orchitis
Osteochondritis
Osteitis
Otitis
Optic neuritis
Osteoarthritis
Pancreatitis
Panophthalmitis
Pansinusitis
Paracolpitis
Paraglottitis
Paradenitis
Parahepatitis
Parametritis
Paranephritis
Parasalpingitis
Parodontitis
Parotitis
Periadenitis
Periangitis
Periarteritis
Periarthritis
Pericarditis
Periodontitis
Peritonitis
Pharyngitis
Phlebitis
Pleuritis
Pneumonitis
Poikilodermatomyositis
Proctitis
Pyelonephritis
Retinitis
Rhinitis
Rheumatoid arthritis
Salpingitis
Salpingo-oophoritis
Sialoadenitis
Sinusitis
Sphenoiditis
Splenitis
Spondylitis
Stomatitis
Syndesmitis
Synovitis
Tendonitis
Temporal arteritis
Tenosynovitis
Thrombophlebitis
Thyroiditis
Typlitis
Tonsillitis
Urethritis
Uveitis
Vaginitis
Valvulitis
Vulvitis
Vulvovaginitis

Inflammation as a risk factor for most cancers

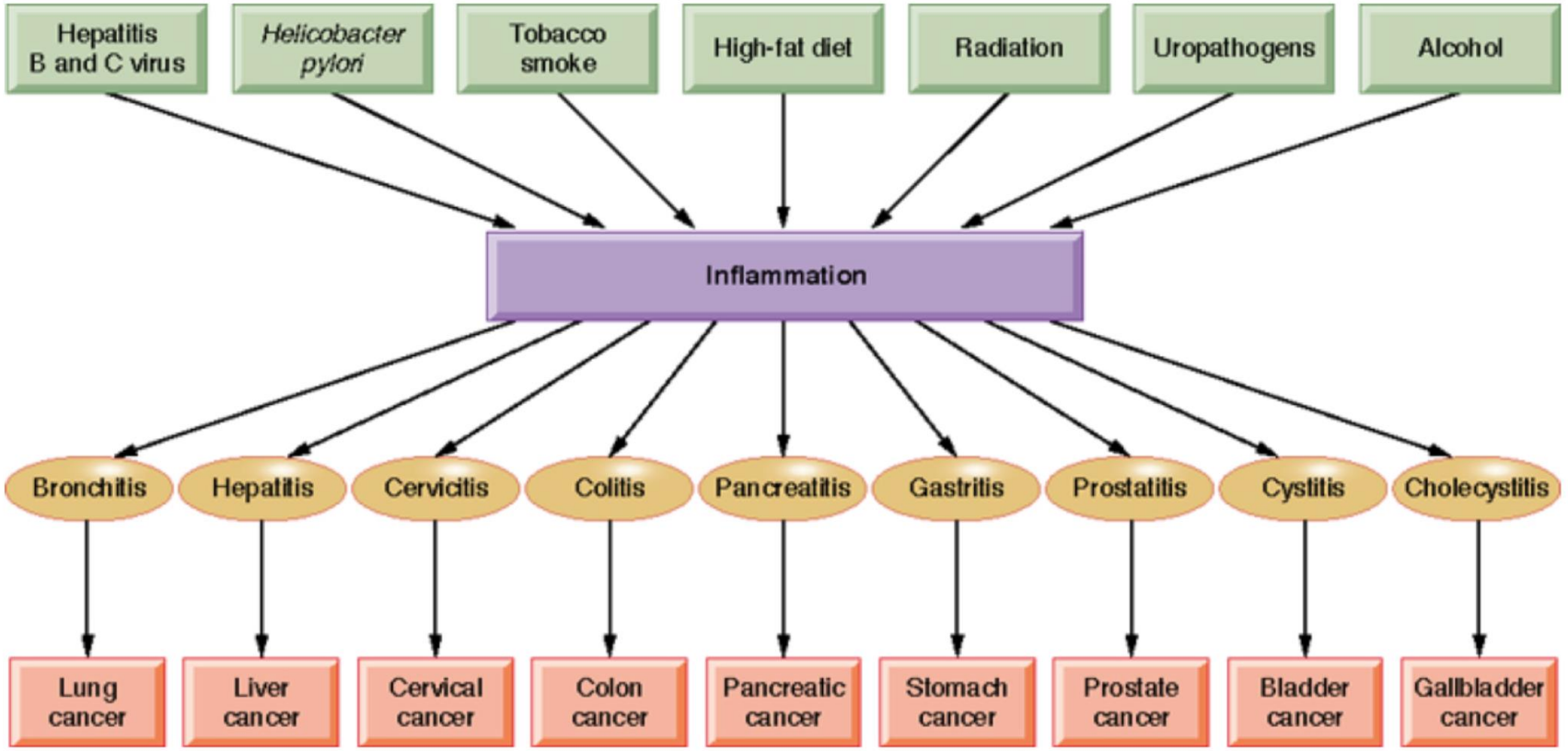


FIGURE 6.1

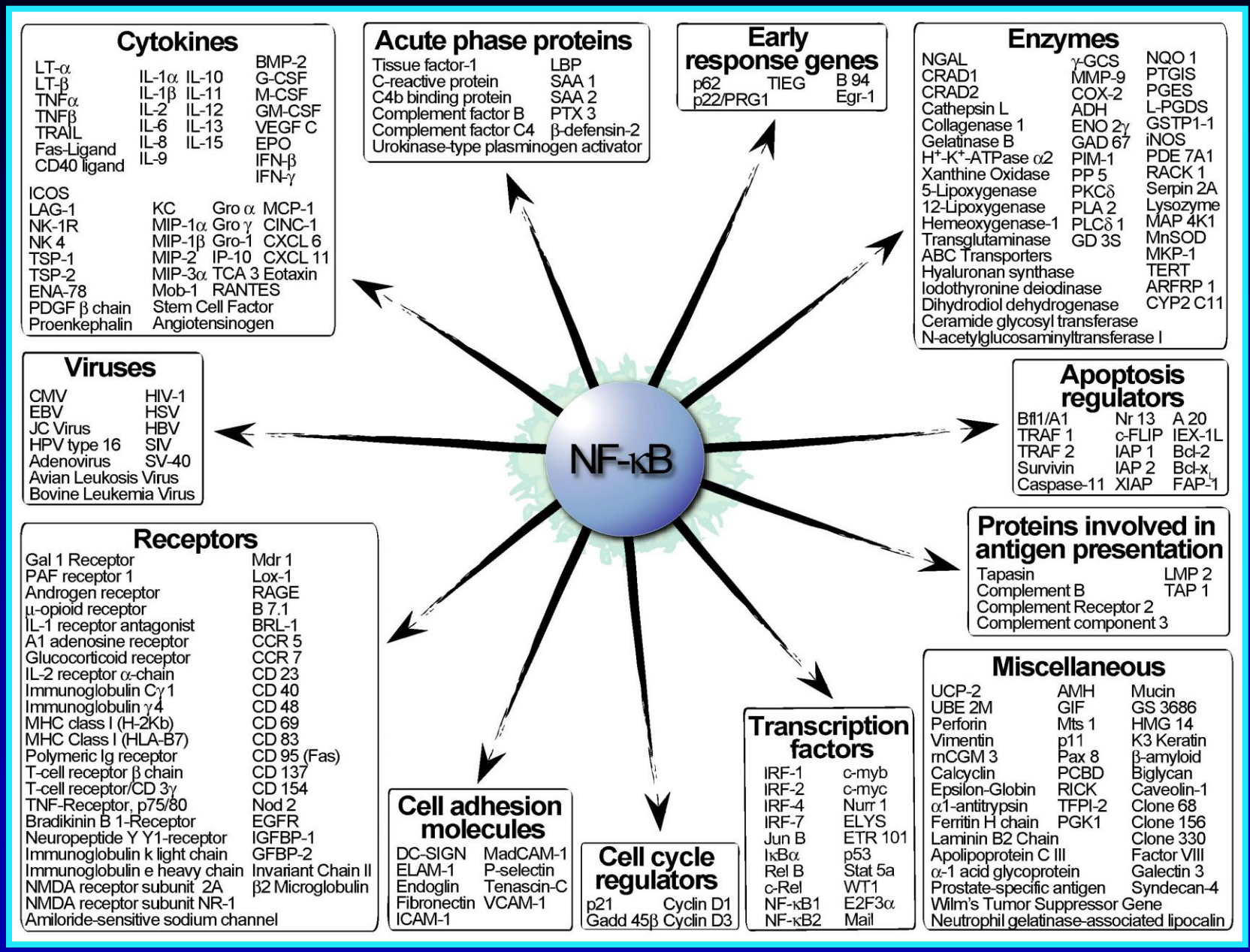
Origin of inflammation and its role in various cancers.

From: Aggarwal BB, et al. Inflammation and cancer: How hot is the link? Biochemical Pharmacology, 72, 2006, 1605-21

Hypothesis!

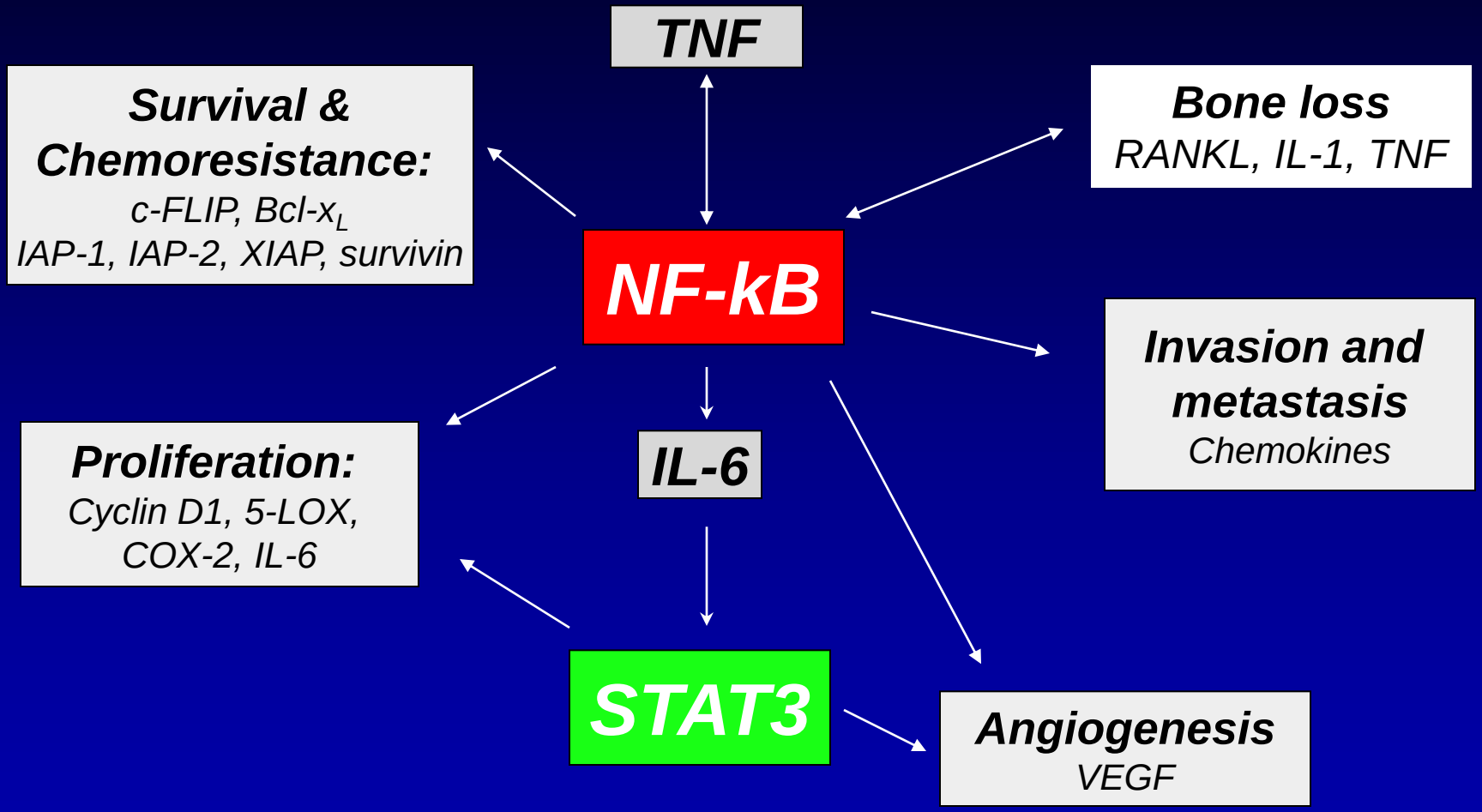
NF-κB activation is a major mediator of inflammation in most chronic diseases (including cancer) & inhibition of NF-κB can prevent/delay the onset of the chronic diseases!

NF-κB -regulated genes



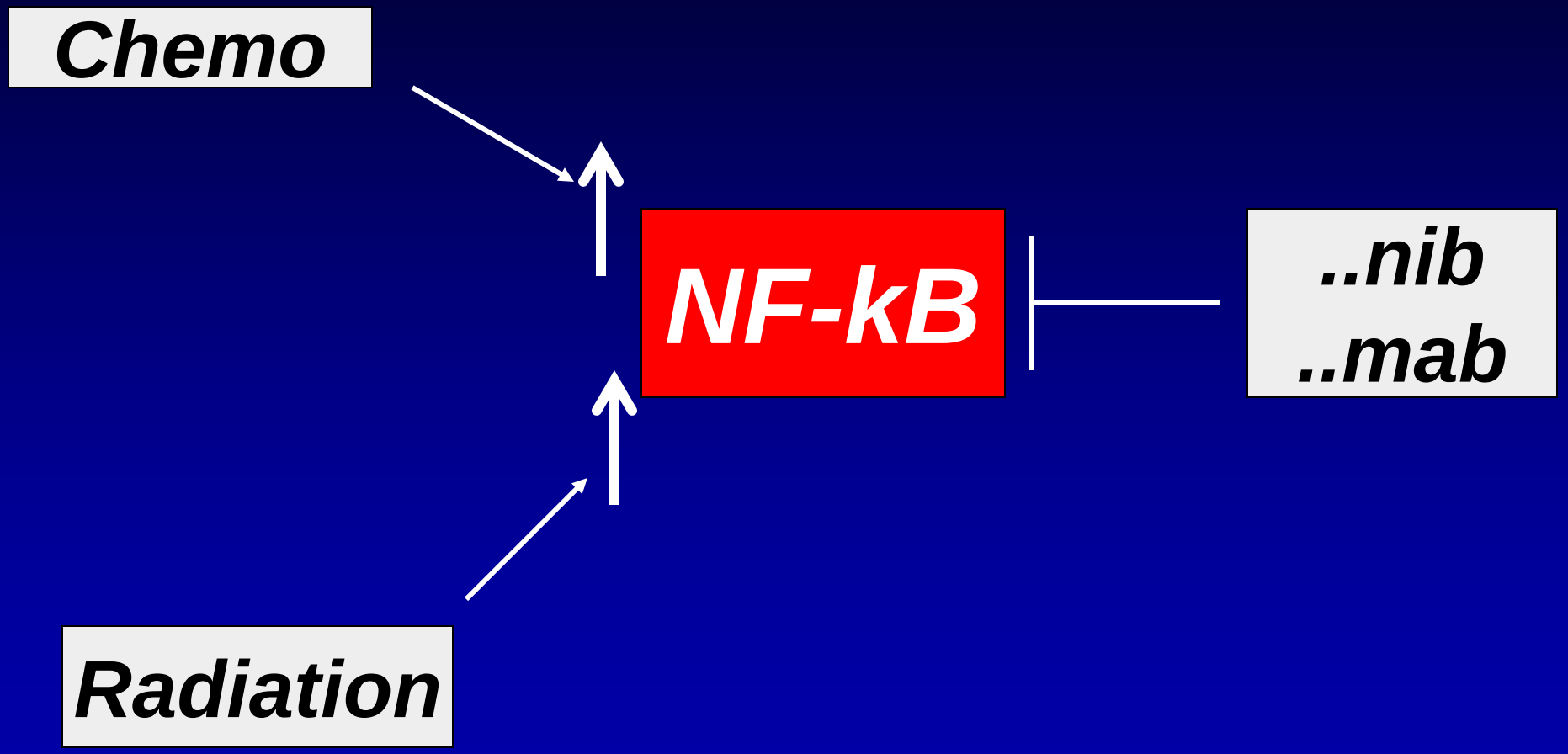
Kumar A, Takada Y, Boriek AM, Aggarwal BB. *Journal of Molecular Medicine* 2004;82:434-48.

Inflammatory networking in cancer

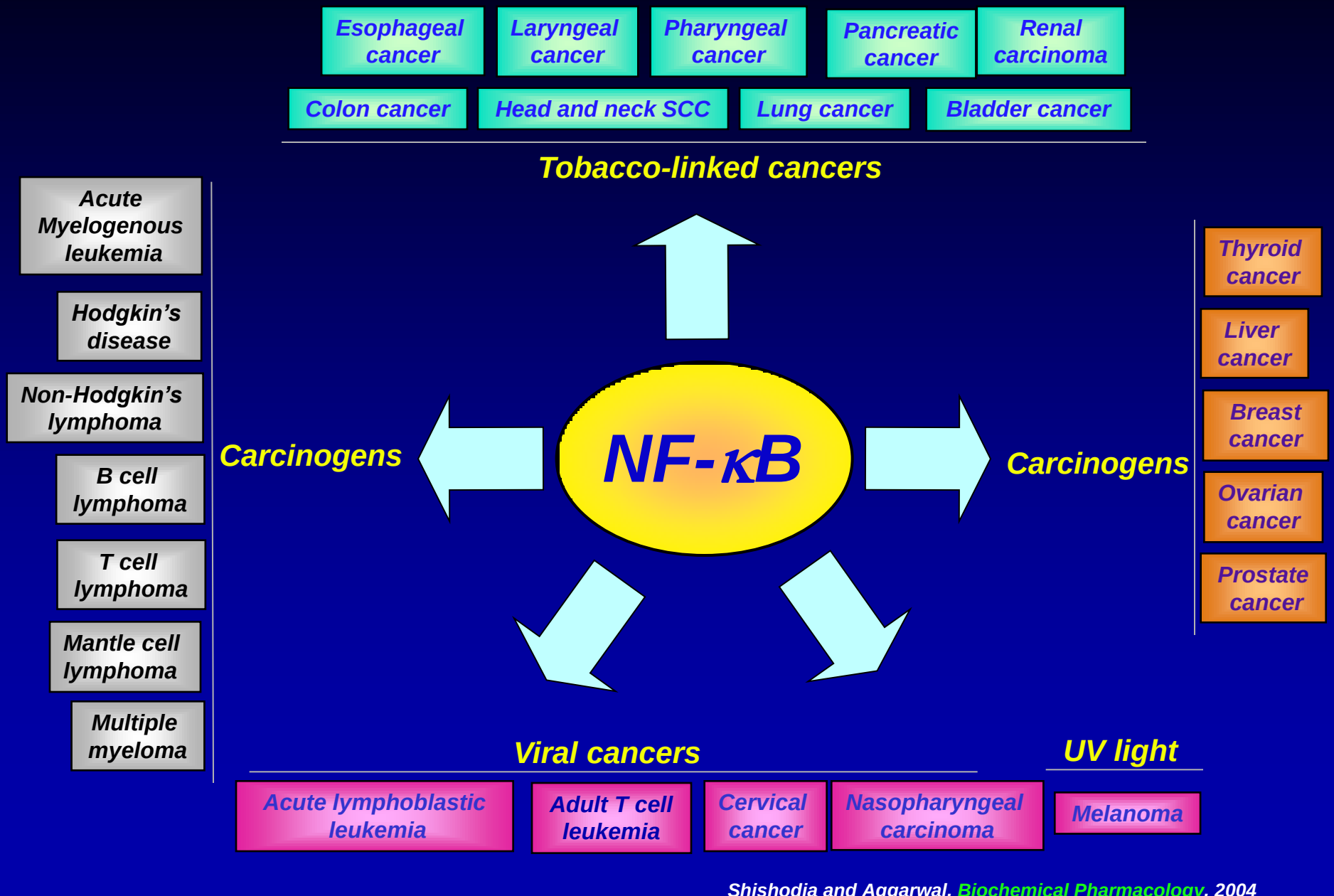


Aggarwal BB, et al. Inflammation and cancer: How hot is the link? Biochemical Pharmacology. 2006

Regulation of Inflammatory Network



Constitutive activation of NF-κB has been linked with most cancers



Shishodia and Aggarwal, *Biochemical Pharmacology*, 2004

NF-κB addiction and its role in cancer:

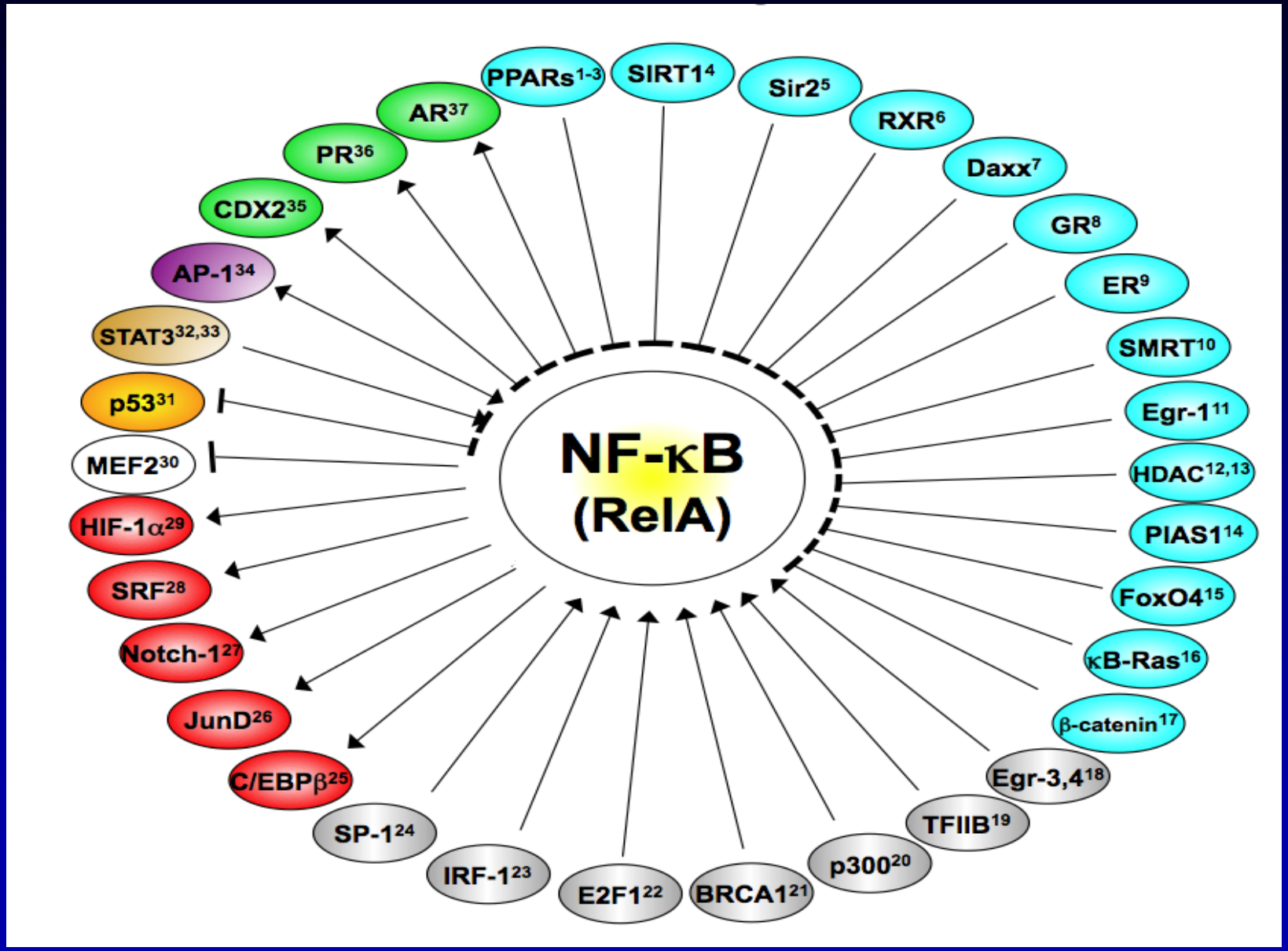
"One size does not fit all"

Chaturvedi MM, Sung B, Yadav VR, Kannappan R, and Aggarwal BB

ONCOGENE

(2011 Apr 7;30(14):1615-30)

Cross Talk between NF-κB and other transcription factors

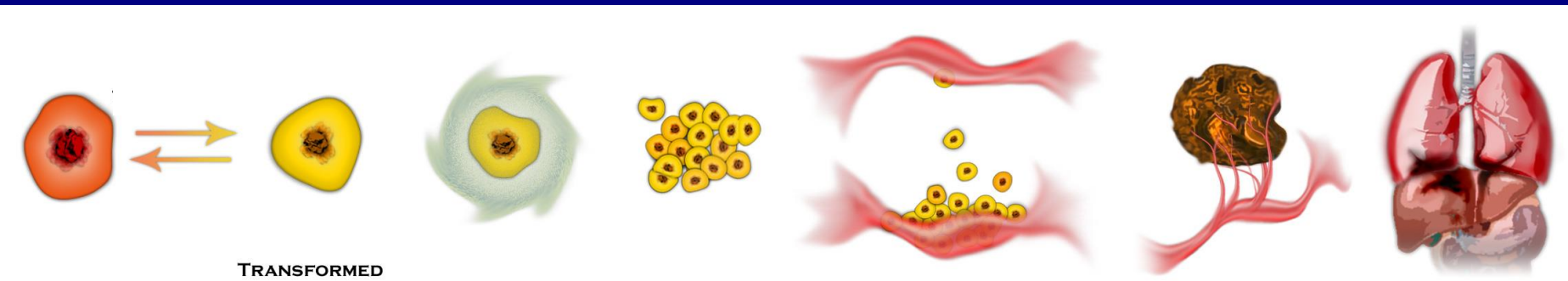


Chaturvedi etal, 2010

Role of inflammation in tumorigenesis

NF-κB

- DNA damage, Oncogenes
- Bcl-xl, Bcl-2, Survivin, C-FLIP, cIAP-1, cIAP-2, XIAP
- Cyclin D1, C-myc, TNF, IL-1, IL-6, COX2
- MMP-9, uPA, ICAM-1, ELAM-1, VCAM-1
- VEGF
- CXCR4, TWIST



Normal cell → Transformation → Survival → Proliferation → Invasion → Angiogenesis → Metastasis

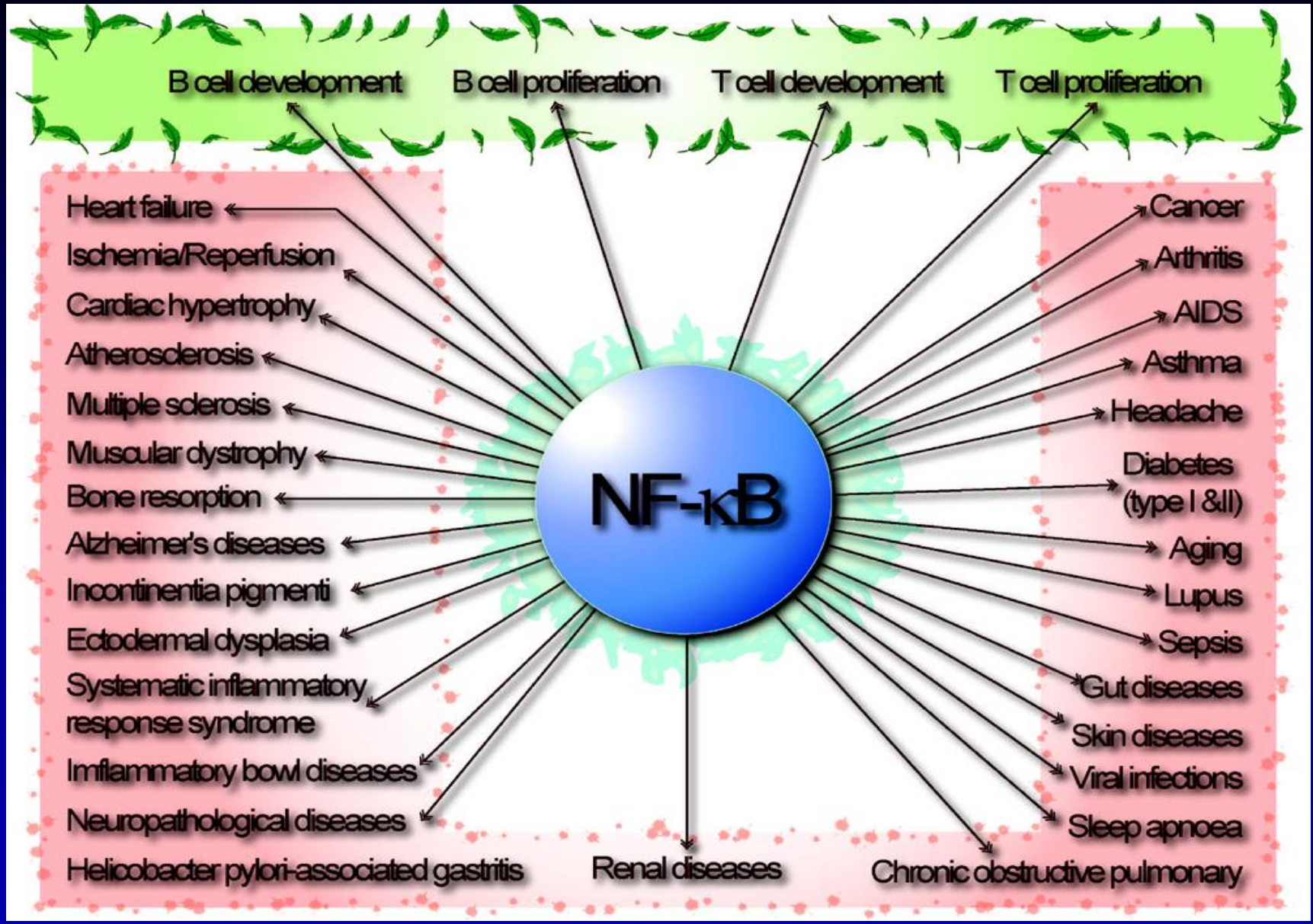
10-20 Years

10 Years

Inflammation

Aggarwal etal, Clinical Cancer Res, 2010

NF-kappa B activation has been linked to most major diseases



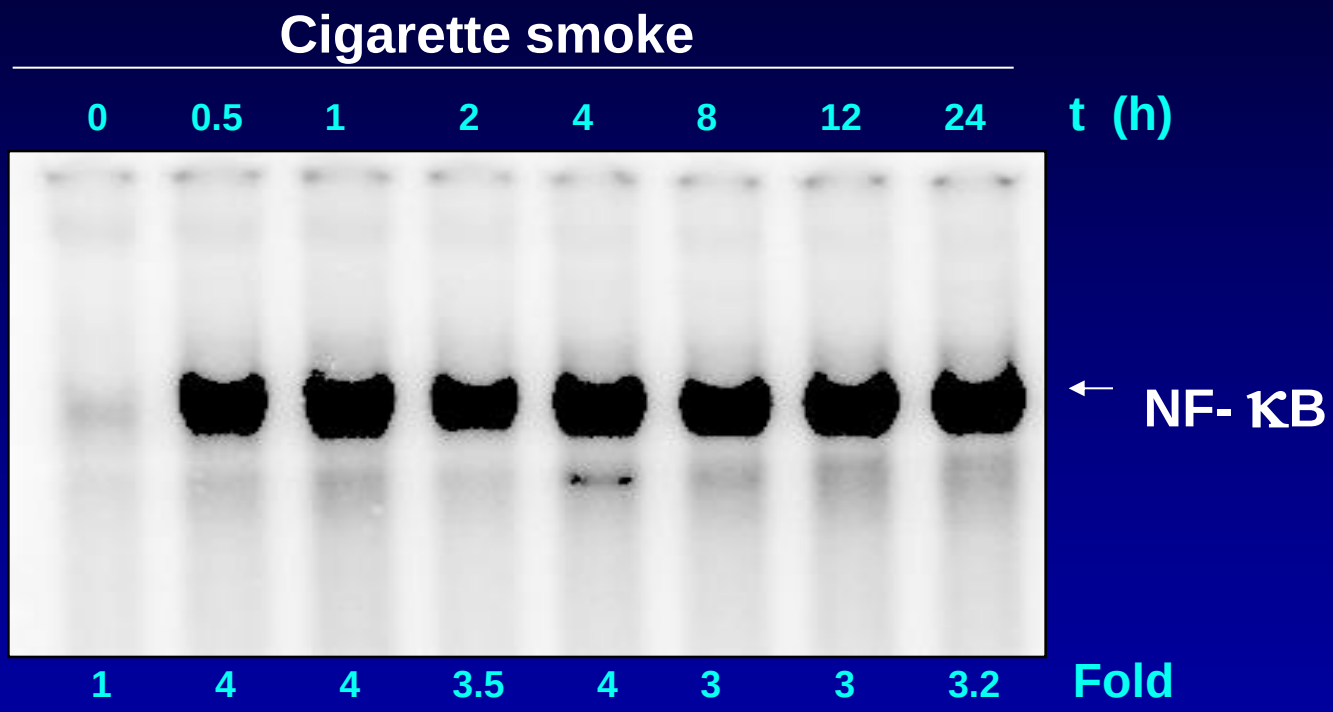
Kumar A, Takada Y, Boriek AM, Aggarwal BB. *Journal of Molecular Medicine* 2004;82:434-48.

Cigarette Smoke Activates Nuclear Factor-κB and Induces Cyclooxygenase-2

Anto R. J., Mukhopadhyay A., Gairola C. G. and Aggarwal B. B.,

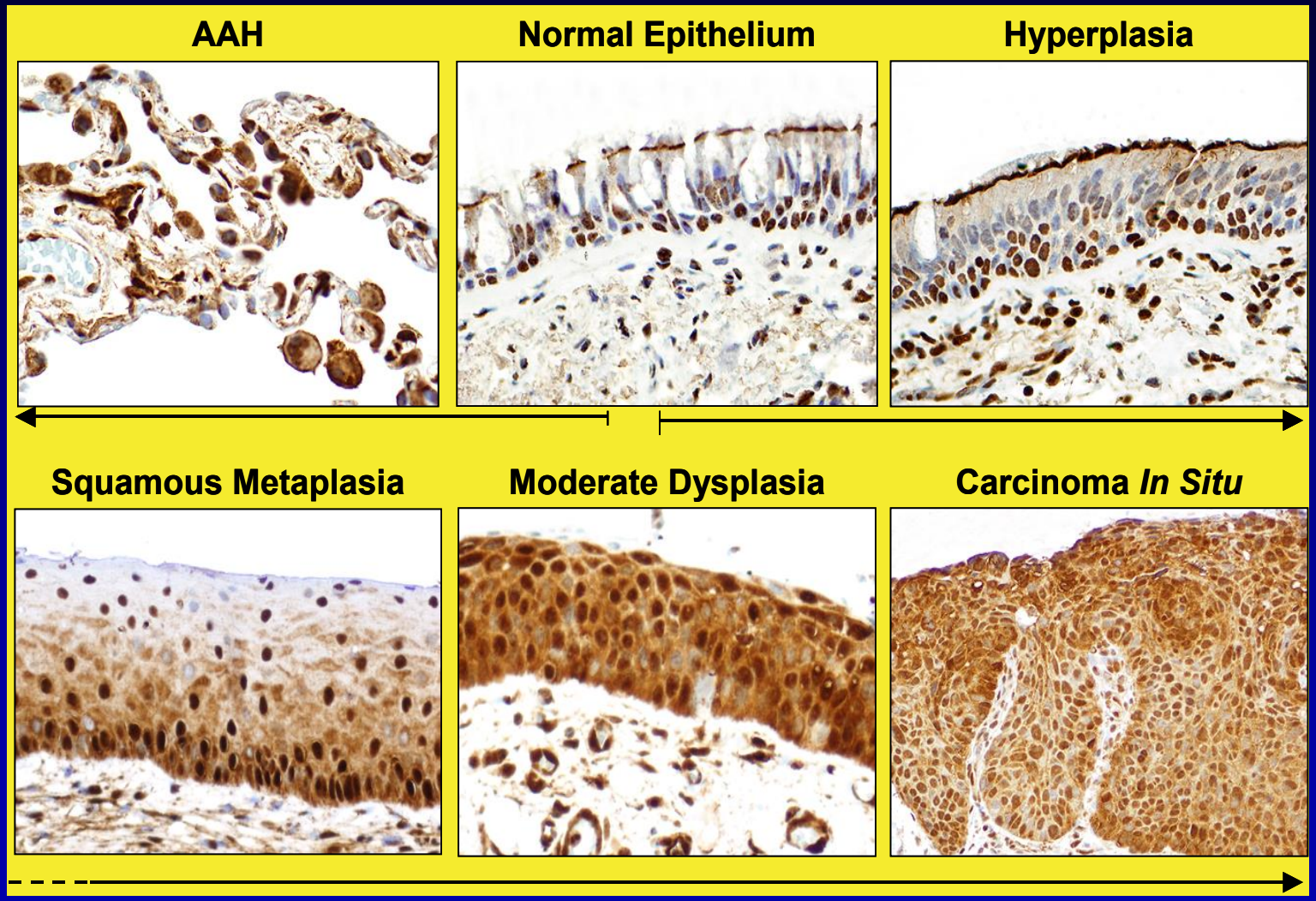
Carcinogenesis, 23, 1511, 2002

Cigarette smoke-induced NF-κB activation is persistent



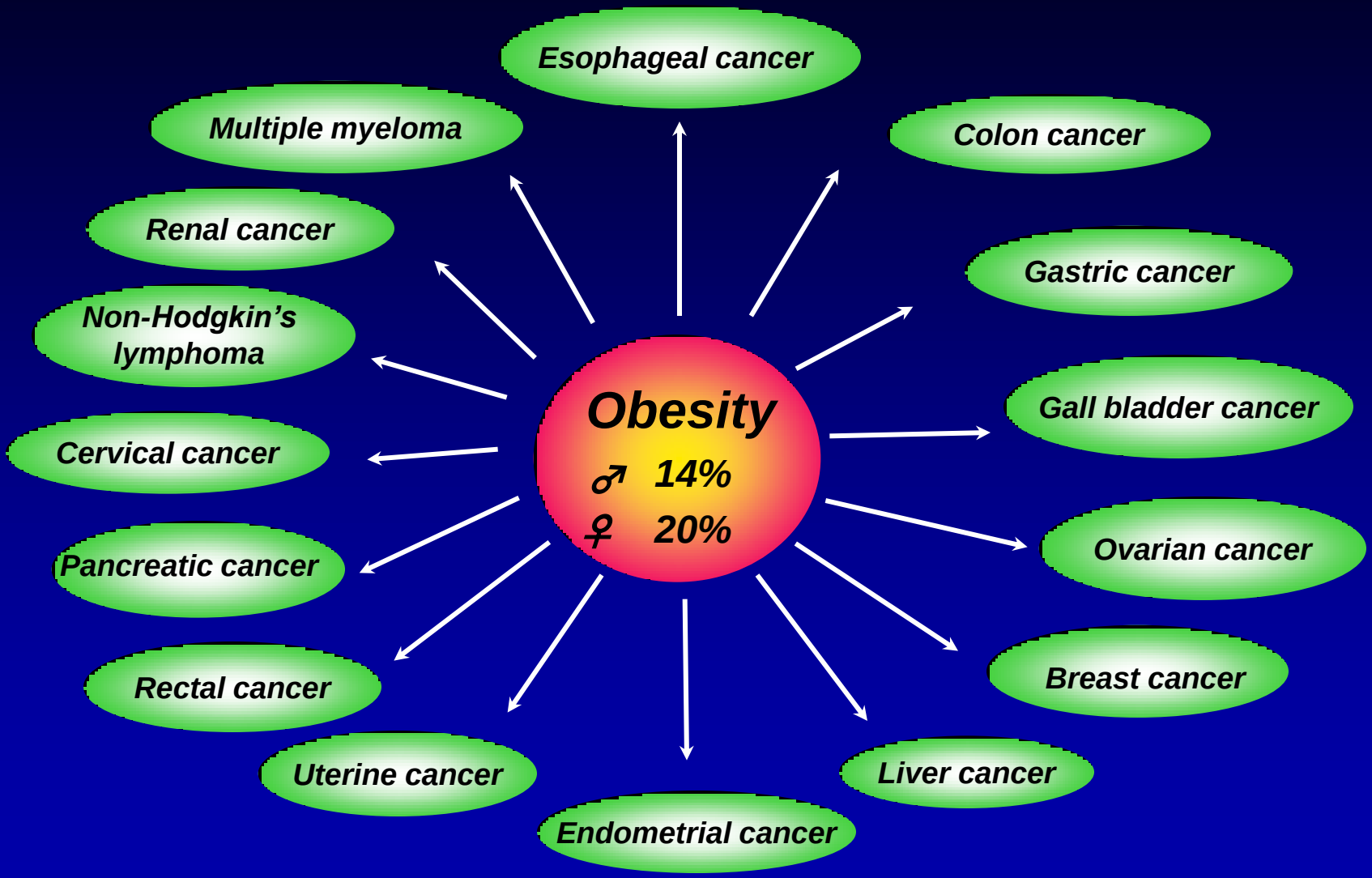
Shishodia S, and Aggarwal BB. Cancer Research. 2004;64:5004-12.

NF-κB expression in the pathogenesis of lung cancer



Tang et al, 2006

Obesity and Cancer



Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

NF-κB

Hypothalamic inflammation

Overweight
Glucose intolerance
Hypertension

Aging

IKKb/NF-kB disrupts adult hypothalamic neural stem cells to mediate a neurodegenerative mechanism of dietary obesity and pre-diabetes. Li, J., .. Nature Cell Biol. 14, 999–1012 (2012).

Hypothalamic IKKb/NF-kB and ER stress link overnutrition to energy imbalance and obesity. Zhang, X. et al. Cell 135, 61–73 (2008).

Neural dysregulation of peripheral insulin action and blood pressure by brain endoplasmic reticulum stress. Purkayastha,S.etal. PNAS 108, 2939–2944 (2011).

Uncoupling the mechanisms of obesity and hypertension by targeting hypothalamic IKK-b and NF-kB. Purkayastha,S.,..Nature Med. 17, 883–887 (2011).

NF-κB:

a pivotal transcription factor in chronic inflammatory diseases.

Barnes PJ, Karin M.

New England Journal of Medicine.
1997 Apr 10;336(15):1066-71.

NF-kB in cancer development and progression

Karin M.

Nature. 2006 May 25;441(7092):431-6.

Several age-related chronic diseases such as metabolic syndrome, cardiovascular disease, and neurodegenerative disease have an inflammatory component

January 11th, 2013

A yin-yang symbol superimposed on a scanning electron micrograph of a mouse tissue alveolar macrophage. Macrophages are immune cells that mediate inflammation, but they often play protective roles as well.

NF-κB

NF-κB: the enemy within.

Aggarwal BB. Cancer Cell. 2004 Sep;6(3):203-8.

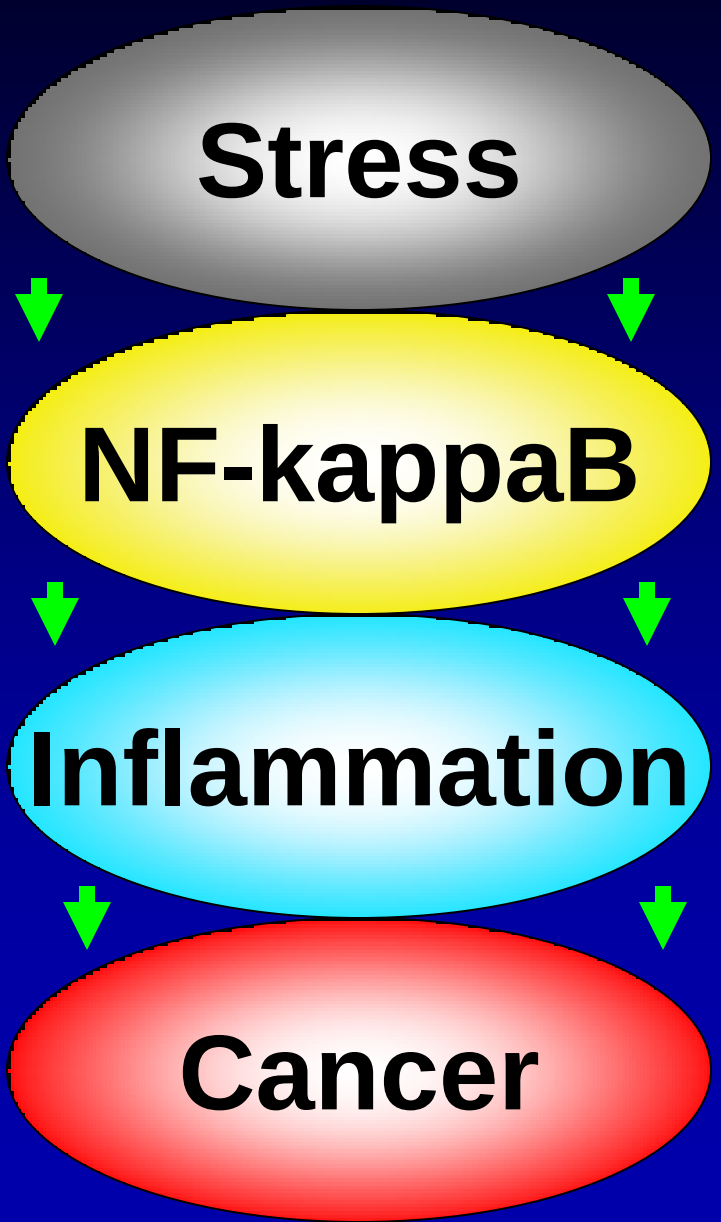
NF-κB : a friend or a foe in cancer?

Shishodia S, Aggarwal BB.
Biochem Pharmacol. 2004;68:1071-80.

NF-κB in Cancer:
A Matter of Life and Death.

Aggarwal BB, Sung B.
Cancer Discovery. 2011 Nov;1(6):469-71.

Working Hypothesis



Nearly 43% of patients with ulcerative colitis develop colorectal cancer after 25-35 years!

Ekbom A, 1998

Inflammatory bowel disease: a survey of the epidemiology in Asia.

Goh K, Xiao SD. Journal of Digestive Diseases. 2009 Feb;10(1):1-6.

Prevalence of rates of Ulcerative Colitis:

JAPAN	*7.9 per 100,000*
INDIA	*44.3 per 100,000*
USA	*229.0 per 100,000*

- *Migrant studies of South Asians in the UK, where second-generation immigrants have assumed incidence rates as high as the indigenous whites and Asian Jews who develop high incidence rates comparable to Jews from Europe or North America in Israel point to the role of environmental factors.*
- *Studies have suggested a change in diet to a more Westernized one may underlie this epidemiological change in the Asian population.*
- *It is likely that there are racial groups amongst Asians who are more susceptible to IBD and who will demonstrate a higher frequency of IBD when exposed to putative environmental factors.*

Neutralizing tumor-promoting chronic inflammation: a magic bullet?

Coussens LM, Zitvogel L, Palucka AK.

Science.
2013 Jan 18;339(6117):286-91.

A Fire Extinguisher!

How to suppress NF-κB activation safely?

Cancer Drugs in the United States

Hagop M. Kantarjian, Tito Fojo, Michael Mathisen, and Leonard A. Zwelling

In 2011, health care spending in the United States was estimated at $2.7 trillion, making it the sixth largest economy in the world, larger than the national budget of France.

National health care spending is approximately 18% of the US gross domestic product, more than $8,000 per person, compared with 6% to 9% in Europe and elsewhere, with apparently similar patient outcomes.

Total Medicare expenditures in 2011 were $549 billion.

A study comparing the Canadian universal health care pro- gram in older patients with the Medicare program in the United States suggested that adopting more- prudent health care strategies could have saved $2.56 trillion from 1980 to 2009, or approximately one fifth of our national debt, without compromising benefit.

Drug Sale

- *In 2011, global spending on prescription drugs topped $954 billion.*
- *The United States accounts for more than a third of the global pharmaceutical market, with $340 billion in annual sales followed by the EU and Japan.*
- *Emerging markets such as China, Russia, South Korea and Mexico outpaced that market, growing a huge 81 percent.*
- *The top ten best-selling drugs of 2013 totaled $75.6 billion in sales, with the anti-inflammatory drug Humira being the best-selling drug worldwide at $10.7 billion in sales.*
- *The second and third best selling were Enbrel and Remicade, respectively.The top three best-selling drugs in the United States in 2013 were Abilify ($6.3 billion,) Nexium ($6 billion) and Humira ($5.4 billion).*
- *The best-selling drug ever, Lipitor (from mold), averaged $13 billion annually and netted $141 billion total over its lifetime before Pfizer's patent expired in November 2011.*

Cancer drugs in the United States:

HEALTH

F.D.A. Approves First Gene-Altering Leukemia Treatment, Costing $475,000

By DENISE GRADY AUG. 30, 2017

in the near future. Dr. Scott Gottlieb, the F.D.A. commissioner, said that more than 550 types of experimental gene therapy were being studied.

The approval was based largely on a trial in 63 severely ill children and young adults who had a remission rate of 83 percent within three months — a high rate, given that relapsed or treatment-resistant disease is often quickly fatal.

Cancer drugs in the United States:

Table 1. Cost of Targeted Therapy

Agent	Target	FDA-Approved Indication	Monthly or Per-Cycle Cost
Imatinib	BCR-ABL	CML	$6,982
Dasatinib	BCR-ABL	CML	$9,817
Nilotinib	BCR-ABL	CML	$9,163
Bosutinib	BCR-ABL	CML	$9,817
Sorafenib	VEGF, multikinase	RCC, HCC	$10,555
Sunitinib	VEGF, multikinase	RCC, GIST	$11,957
Everolimus	mTOR	RCC, breast	$8,984
Temsirolimus	mTOR	RCC	$6,355
Pazopanib	VEGF, multikinase	RCC	$7,778
Bevacizumab	VEGF	RCC, colon, lung	$11,684
Erlotinib	EGFR	Pancreatic, NSCLC	$5,756
Cetuximab	EGFR	Colon, head/neck	$24,092
Lapatinib	HER2	Breast	$5,120
Trastuzumab	HER2	Breast	$5,295
Brentuximab	CD30	Hodgkin lymphoma	$16,768*
Crizotinib	ALK1	NSCLC	$11,946
Ipilimumab	CTLA-4	Melanoma	$36,540†
Vemurafenib	BRAF	Melanoma	$12,282
Ruxolitinib	JAK2	Myelofibrosis	$8,400
Lenalidomide	IMID	Myeloma	$10,103

Cancer drugs in the United States:
Justum Pretium--the just price. Kantarjian HM1, Fojo T, Mathisen M, Zwelling LA. J Clin Oncol. 2013;31(28):3600-4.

Anti-inflammatory cuts risk of heart attack

***Jennifer Couzin-Frankel* Aug. 27, 2017**

- *A clinical trial of more than 10,000 heart attack patients*
- *Drug tested was Canakinumab (Anti-IL-1 Antibody) from Novartis,*
- *Nearly 2% of people in the placebo group were diagnosed with lung cancer during the study compared with 1% on the treatment. The actual disparity in number of cases between the two groups was small, with 129 lung cancers in all.*
- *Study was done by Peter Libby at Brigham and Women's Hospital in Boston with Paul Ridker. who showed that high levels of inflammation molecules in a person's blood can help predict a heart attack, as indicated by c-reactive protein (CRP).*
- *Ridker and Libby now focused on the monoclonal antibody canakinumab (approved for juvenile arthritis), because it selectively targets a molecule called IL-1β.*
- *The heart attack patients who enrolled all had high CRP levels and were given the best treatments available, including aggressive statin therapy. Half also received four infusions of canakinumab each year, at one of three different doses.*
- *People receiving the placebo had about a 4.5% risk of a second cardiovascular event after a year versus 3.86% for those on the medium dose of the drug. This meant they were about 15% less likely to suffer a heart attack or stroke or die from cardiovascular disease.*
- *Over about 3.5 years, 535 of 3344 people in the placebo group suffered such an "event," compared with 642 of 4547 getting the medium and high doses.*
- *The heart data appeared in The New England Journal of Medicine and the cancer analysis in The Lancet.*
- *Canakinumab is expensive, at about $16,000 per infusion.*
- *About 1% of those on canakinumab died from an infection during the multiyear trial, nearly double the rate of infection deaths on placebo.*
- *Current focus is now on testing the much cheaper but less targeted anti-inflammatory methotrexate in a similar population. Thus blocking inflammation can prevent heart disease. "This is as big as anything we've seen in a while."*

Biologically targeted cancer therapy and marginal benefits:

are we making too much of too little or are we achieving too little by giving too much?

Fojo T, Parkinson DR.

Clinical Cancer Research. 2010 Dec 15;16(24):5972-80.

Medical Oncology Branch, Center for Cancer Research, Bethesda, Maryland, USA.

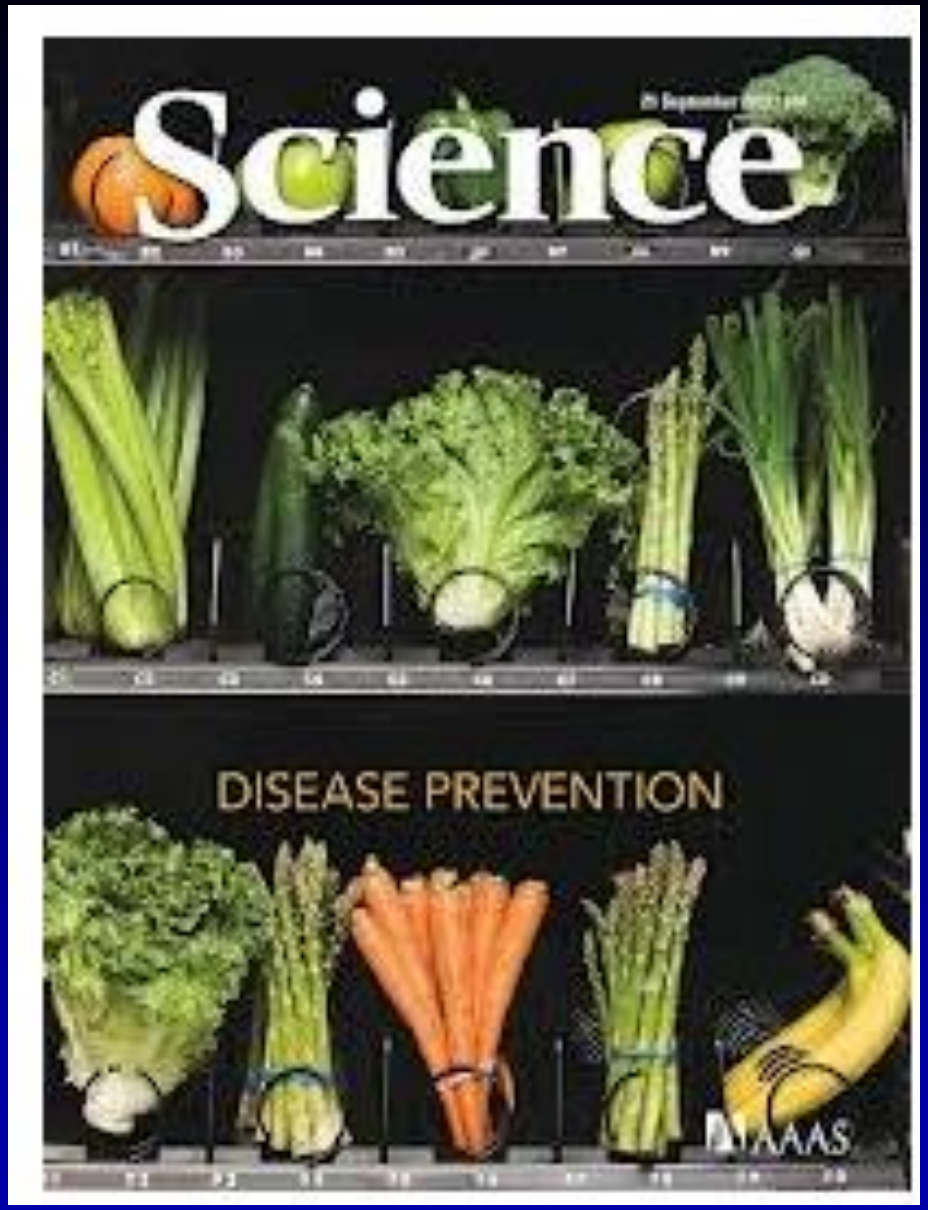
Wonders of Modern Medicine

Table 3. Estimates of Drug Costs According to Quality-Adjusted Life Years (QALYs) for Regimens Discussed in Text

Drug	Disease	Regimen	Dose[c]	PFS or time on therapy[d]	Amount needed[e]	Cost/ mg or cost/ tablet	Total Cost[e]	Increase in OS[f]	Cost per QALY[g]
Bevacizumab (Avastin®)	NSCLC (ref. 33)	15 mg/kg q 21 days	900 mg every 21 days	5 cycles[T]	4500 mg	$6[70]/mg	$30,150	0.3 mos[NS]	$1,206,000
Erlotinib (Tarceva®)	Pancreatic cancer (ref. 9)	150 mg daily	150 mg/day 1 tablet/day	3.75 mos[P]	114 tablets	$160[76]/ tablet	$18,327	0.33 mos	$659,772
Bevacizumab (Avastin®)	Breast cancer (ref. 24)	10 mg/kg q 14 days	600 mg every 14 days	7.1 months[T]	9255 mg	$6[70]/mg	$62,009	1.5 mos[NS]	$496,072
Bevacizumab (Avastin®)	NSCLC (ref. 33)	7.5 mg/kg q 21 days	450 mg every 21 days	6 cycles[T]	2700 mg	$6[70]/mg	$18,090	0.5 mos[NS]	$434,160
Cetuximab (Erbitux®)	NSCLC (ref. 12)	Loading: 400 mg/m^2 M: 250 mg/m^2/wk	L: 600 mg M: 375 mg	18 wks[T]	6975 mg	$5[76]/mg	$40,176	1.2 mos	$401,760
Cetuximab (Erbitux®)	CRC (ref. 15)	Loading: 400 mg/m^2 M: 250 mg/m^2/wk	L: 600 mg M: 375 mg	18 weeks[P]	6975 mg	$5[76]/mg	$40,176	1.7 mos[NS]	$283,595
Cetuximab (Erbitux®)	NSCLC (ref. 50)	Loading: 400 mg/m^2 M: 250 mg/m^2/wk	L: 600 mg M: 375 mg	13 wks[T]	5100 mg	$5[76]/mg	$29,376	1.3 mos[NS]	$271,163
Bevacizumab (Avastin®)	NSCLC (ref. 32)	15 mg/kg q 21 days	900 mg every 21 days	7 cycles[T]	6300 mg	$6[70]/mg	$42,210	2 mos	$253,260

When Solution is Simple, God is Answering!

Albert Einstein



Sept 21st, 2012

Pharmaceutical vs Nutraceuticals

TIPS 1323 No. of Pages 16 ARTICLE IN PRESS

Trends in Pharmacological Sciences

CellPress

Review

Serendipity in Cancer Drug Discovery: Rational or Coincidence?

Sahdeo Prasad,[1] Subash C. Gupta,[2] and Bharat B. Aggarwal[1,3,*]

Natural products as sources of new drugs over the last 25 years

Newman DJ, Cragg GM (2007). Journal of Natural Products. 70: 461–77.

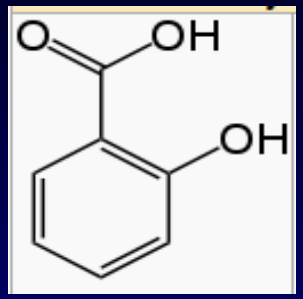
A 2007 report found that of the 974 small molecule new chemical entities developed between 1981 and 2006, 63% were natural derived or semisynthetic derivatives of natural products

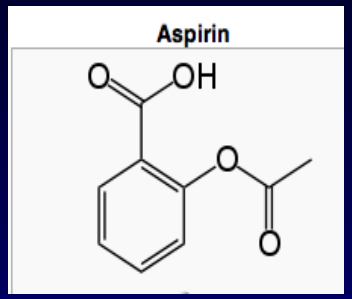
Aspirin
(Willow Tree)
Metformin
Steroids
Artimisinin
weet worm tree Artemisia annua,
Paclitaxel Pacific yew tree Taxus brevifolia
Camptotheca
(Camptothecin · Topotecan · Irinotecan · Rubitecan · Belotecan);
Podophyllum (Etoposide · Teniposide);
Anthracyclines
(Aclarubicin · Daunorubicin · Doxorubicin · Epirubicin · Idarubicin
· Amrubicin · Pirarubicin · Valrubicin · Zorubicin);
Anthracenediones
(Mitoxantrone · Pixantrone).
Arabinose nucleosides (marine invertebrates)

Steroids
NSAID
Celebrex
Metformin
Statins
Natural Products & Traditional Medicine

Aspirin

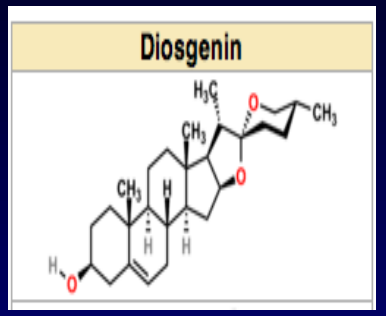
(Salicylic acid; bark and leaves of willow tree)





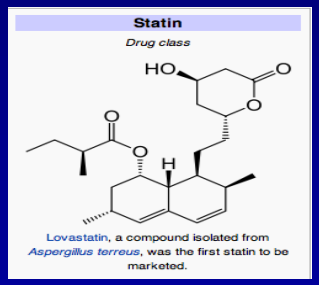
Steroids

(Fenugreek; Diosgenin)



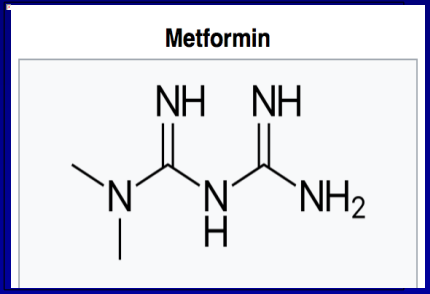
Statins

(Aspergillus terreus)



Metformin

(Galega officinalis; goat's rue)



The Greek physician Hippocrates wrote in the 5th century BC about a bitter powder extracted from willow bark that could ease aches and pains and reduce fevers. Fruits and vegetables are natural sources of salicylic acid, particularly blackberries, blueberries, cantaloupes, dates, raisins, guavas, apricots, green pepper, olives, tomatoes, radish, mushrooms and chicory. Some herbs and spices contain quite high amounts. Of the legumes, seeds, nuts, and cereals, only almonds, water chestnuts and peanuts have significant amounts.

Galega name derives from gale (milk) and ega (to bring on), as Galega has been used as a galactogogue in small domestic animals (hence the name "Goat's rue").

Carl Djerassi worked on a new synthesis of cortisone based on diosgenin, a steroid sapogenin derived from a Mexican wild yam.

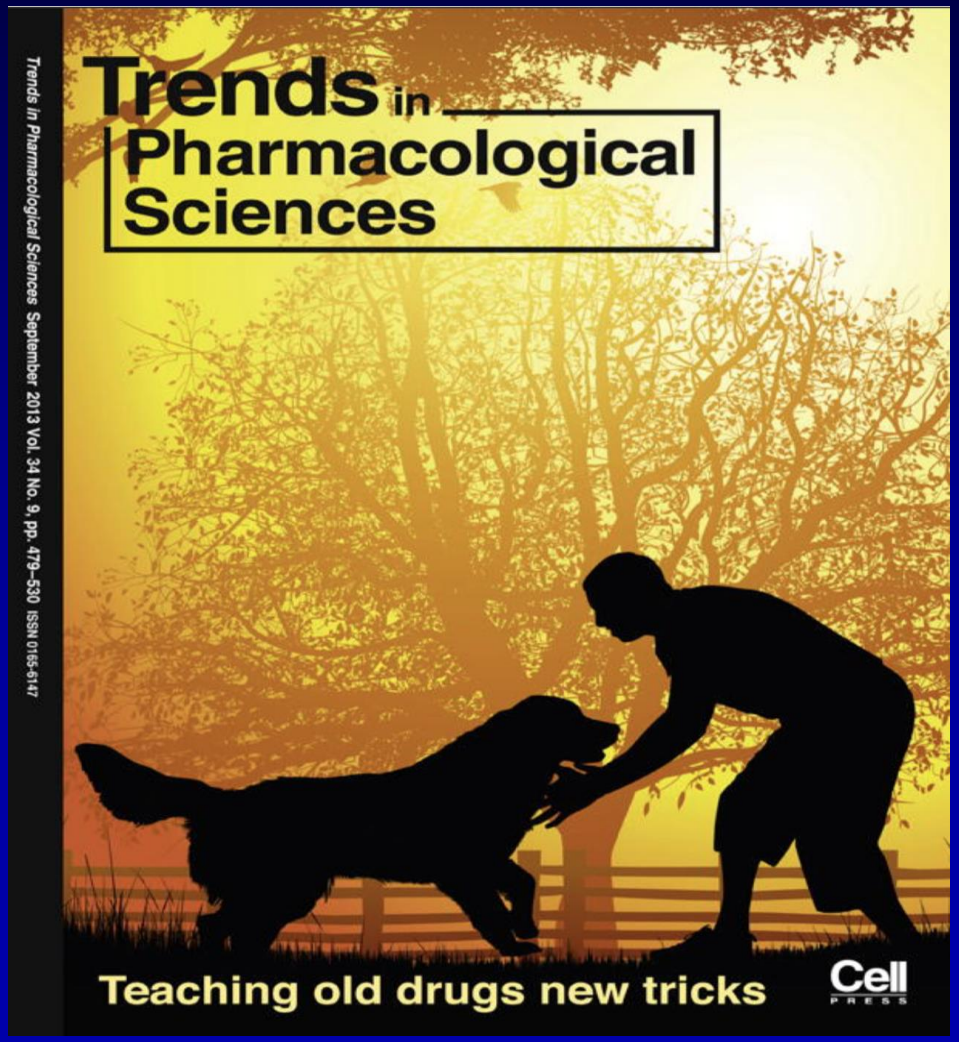
Review

Cell PRESS

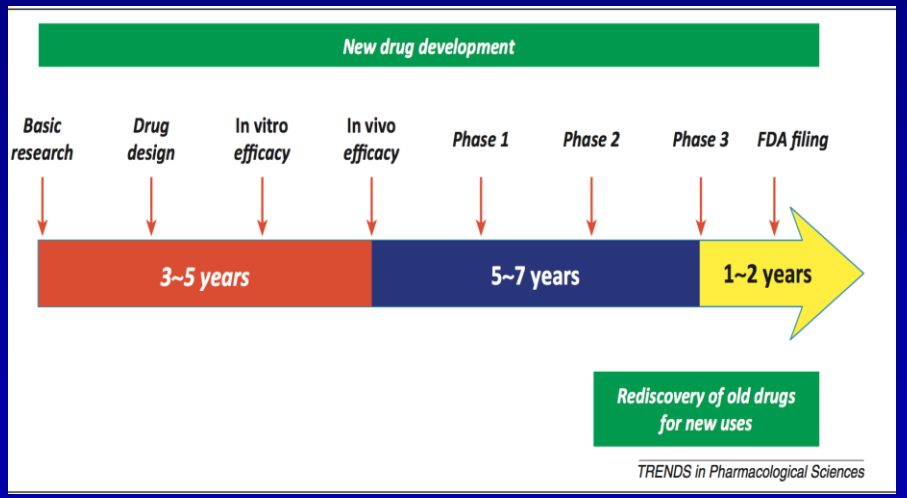
Cancer drug discovery by repurposing: teaching new tricks to old dogs

Subash C. Gupta[1], Bokyung Sung[1], Sahdeo Prasad[1], Lauren J. Webb[2], and Bharat B. Aggarwal[1]

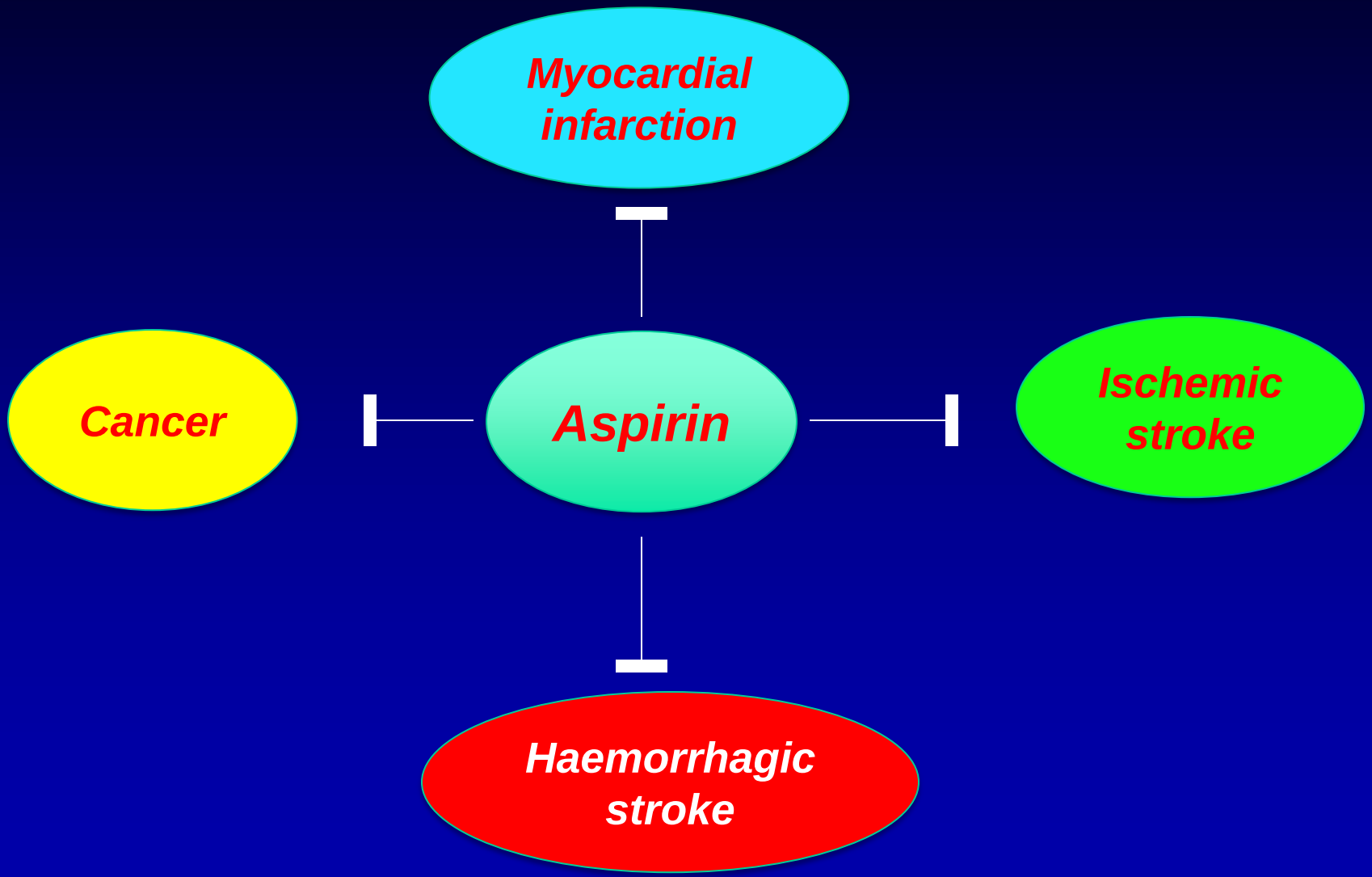
[1] Cytokine Research Laboratory, Department of Experimental Therapeutics, The University of Texas MD Anderson Cancer Center, Houston, TX, USA
[2] Department of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX 78712, USA



2013



Prevention by Aspirin



***Aspirin* and cancer**

***Metformin* and cancer**

***Statins* and cancer**

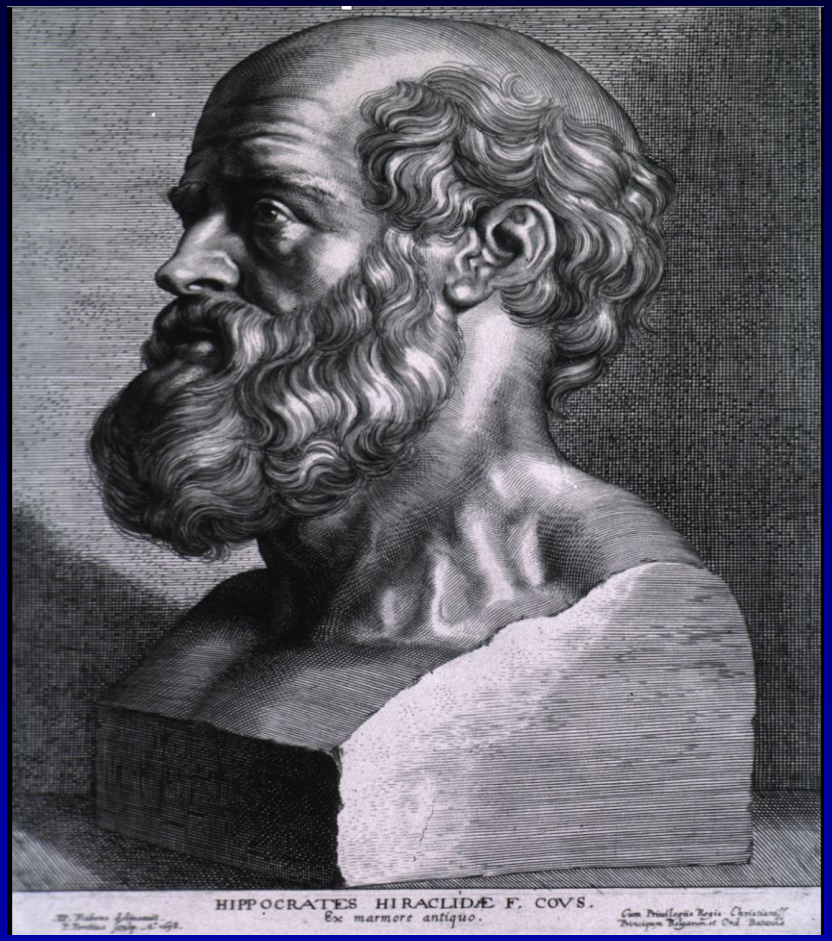
To treat/prevent most chronic diseases, we need to "dial down" but not "turn off" of "multiple", not "single" gene

….Sloan School of Management at M.I.T. and the Harvard Business School has created Pharmer's Market, however, we need a Farmer's Market…

New York Times, November, 2009

Hippocrates: Father of Western Medicine

Advocated the Healing effects of foods

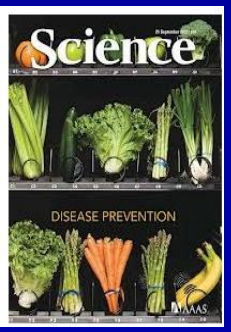


Chia is grown commercially for its seeds rich in α-linolenic acid.

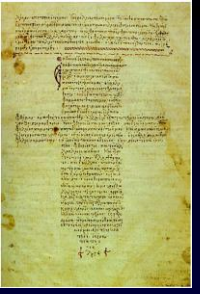
aaaa

Hippocrates proclaimed ~2500 years ago

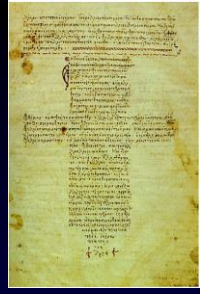
"Let food be thy medicine and medicine be thy food"



Sept 21st, 2012



Hippocratic Oath
(5th century BC)



- *…. I swear by Apollo, the healer, Asclepius, Hygieia, and Panacea, and I take to witness all the gods, all the goddesses, to keep according to my ability and my judgment, the following Oath and agreement:*
- *To consider dear to me, as my parents, him who taught me this art; to live in common with him and, if necessary, to share my goods with him; To look upon his children as my own brothers, to teach them this art; and that by my teaching, I will impart a knowledge of this art to my own sons, and to my teacher's sons, and to disciples bound by an indenture and oath according to the medical laws, and no others.*
- *I will prescribe regimens for the good of my patients according to my ability and my judgment and never do harm to anyone.*
- *I will give no deadly medicine to any one if asked, nor suggest any such counsel; and similarly I will not give a woman a pessary to cause an abortion.*
- *But I will preserve the purity of my life and my arts.*
- *I will not cut for stone, even for patients in whom the disease is manifest; I will leave this operation to be performed by practitioners, specialists in this art.*
- *In every house where I come I will enter only for the good of my patients, keeping myself far from all intentional ill-doing and all seduction and especially from the pleasures of love with women or men, be they free or slaves.*
- *All that may come to my knowledge in the exercise of my profession or in daily commerce with men, which ought not to be spread abroad, I will keep secret and will never reveal.*
- *If I keep this oath faithfully, may I enjoy my life and practice my art, respected by all humanity and in all times; but if I swerve from it or violate it, may the reverse be my life.*

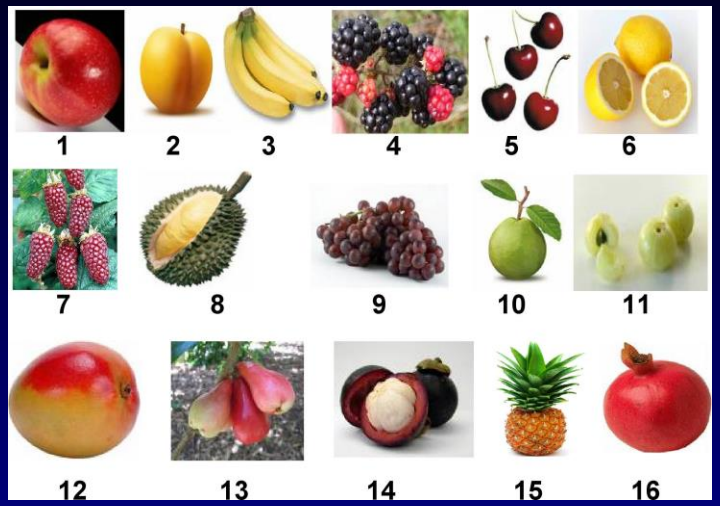
Hippocrates proclaimed ~2500 years ago

Hippocratic oath has morphed into hypocritical oath.

First do no harm has become first make more money.

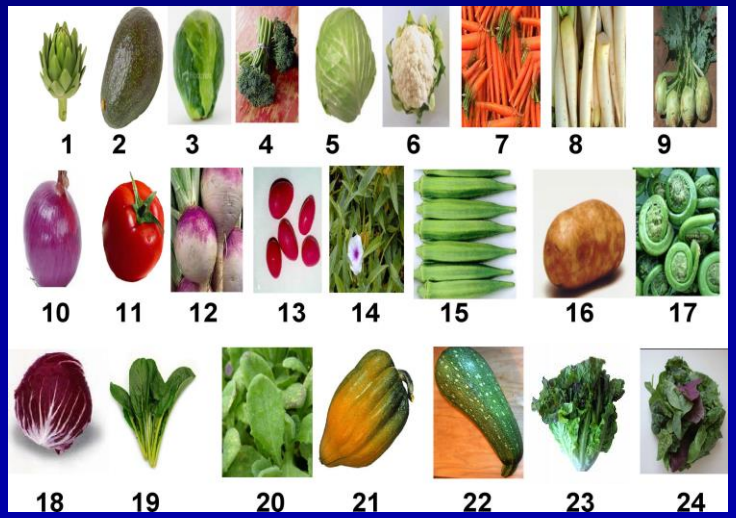
NYT August 6th, 2017

Farmer's Market



Fruits

Spices & condiments



Vegetables

Cereals

Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

Farmer's Market

Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

Farmer's Market

Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

Farmer's Market

Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009

Ayurveda

Science of Long Life!

The origin of Ayurveda dates back to around 5,000 BCE, originated as an oral tradition.

Ayurveda consist of the Charaka Samhita, the Sushruta Samhita and the Bhela Samhita, written all around 6th century BC.

From traditional Ayurvedic medicine to modern medicine:

identification of therapeutic targets for suppression of inflammation and cancer.

Aggarwal BB, Ichikawa H, Garodia P, Weerasinghe P, Sethi G, Bhatt ID, Pandey MK, Shishodia S, Nair MG.

Expert Opinions in Therapeutic Targets. 2006 Feb;10(1):87-118.

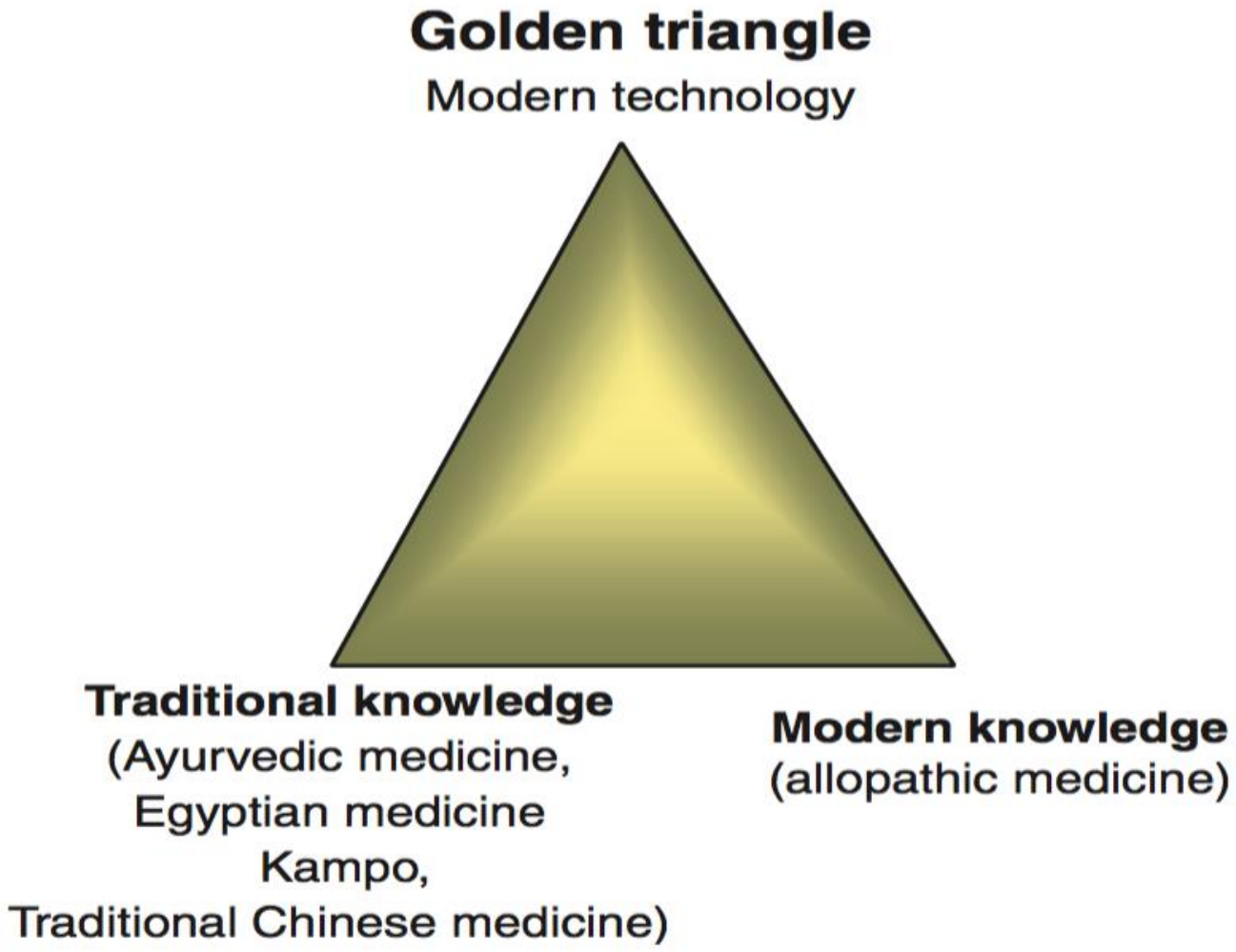


Figure 1. Relationship between Ayurveda and modern medicine.

Traditional Ayurvedic medicine to modern medicine:

identification of targets for suppression of inflammation and cancer

Emblica Officinalis (Amla)

***Embelin** suppresses osteoclastogenesis induced by receptor activator of NF-κB ligand (RANKL) and tumor cells in vitro through inhibition of the NF-κB cell signaling pathway.*

Reuter S, Prasad S, Phromnoi K, Kannappan R, Yadav VR, Aggarwal BB.
Molecular Cancer Research
2010 Oct;8(10):1425-36.

***Embelin,** an inhibitor of X chromosome-linked inhibitor-of-apoptosis protein (XIAP), blocks NF-kB signaling pathway leading to suppression of NF-kB-regulated antiapoptotic and metastatic gene products.*

Ahn KS, Sethi G, Aggarwal BB.
Molecular Pharmacology
2007 Jan;71(1):209-19. Epub 2006 Oct 6.

Embelia ribes
(false black pepper),

Embelia ribes, commonly known as false black pepper, white-flowered Embelia, vidanga, vaividang, or vai vidang, vavding, is a species in the Primulaceae.

In Ayurveda, it is considered widely beneficial in variety of diseases and is also used in homeopathy.[4]

In India, it is one of the widely and commonly used in Siddha and Ayurveda as herbs.Ayurvedic uses[edit]

Vavding water given to New Moms to prevent Gas and Stomach Aches

Useful against tapeworms, useful in snake bite (resists poison).

Sushruta describes the fruit as anthelmintic, restorative and tonic, and recommends their use along with liquorice root, for the purpose of strengthening the body and preventing the effects of age.

Embelin suppresses osteoclastogenesis induced by receptor activator of NF-κB ligand and tumor cells in vitro through inhibition of the NF-κB cell signaling pathway.
Reuter S, Prasad S, Phromnoi K, Kannappan R, Yadav VR, Aggarwal BB.
Mol Cancer Res. 2010 Oct;8(10):1425-36.

Embelin, an inhibitor of X chromosome-linked inhibitor-of-apoptosis protein, blocks nuclear factor-kappaB (NF-kappaB) signaling pathway leading to suppression of NF-kappaB-regulated antiapoptotic and metastatic gene products.
Ahn KS, Sethi G, Aggarwal BB.
Mol Pharmacol. 2007 Jan;71(1):209-19. Epub 2006 Oct 6.

From ancient medicine to modern medicine:

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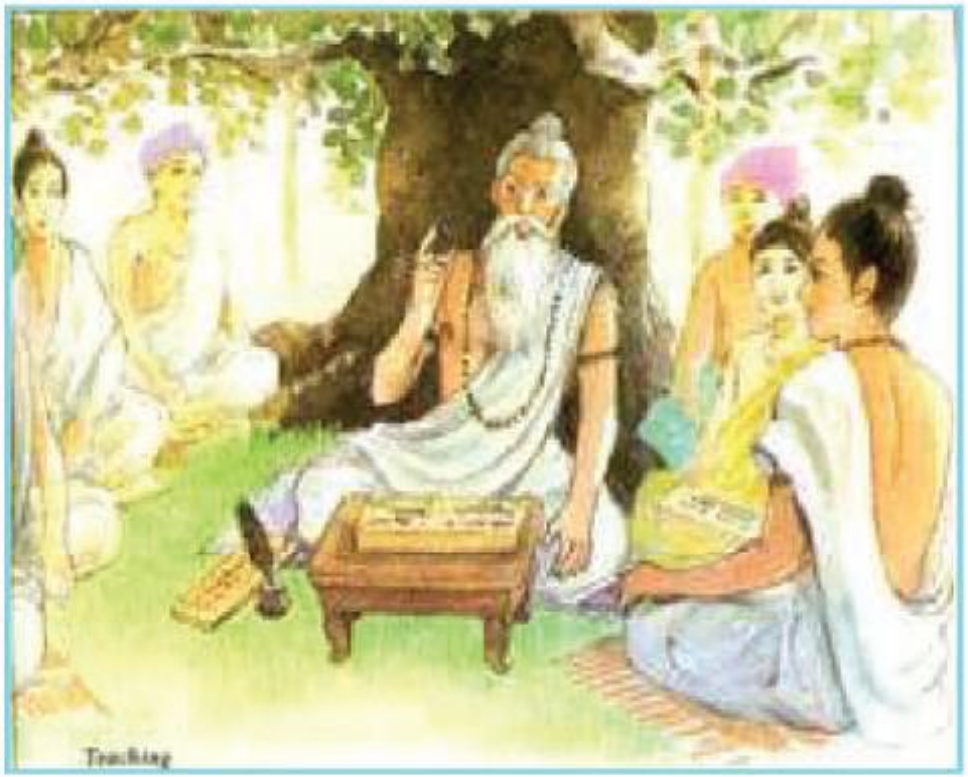
Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB.

J Soc Integr Oncol.
2007 Winter;5(1):25-37.



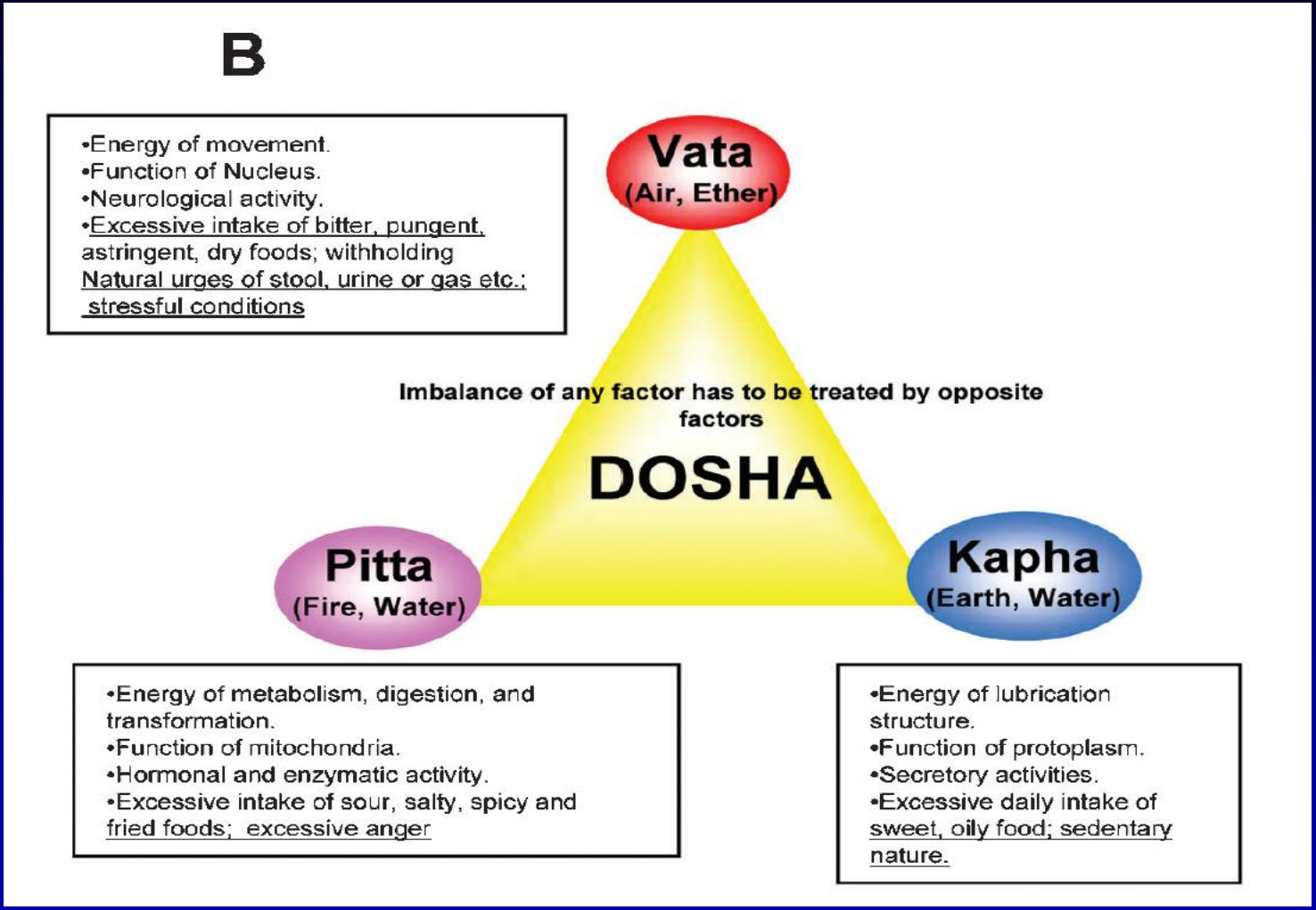
Ancient sages and physicians
teaching and discussing Ayurveda

From ancient medicine to modern medicine:

Ayurvedic concepts of health and their role in inflammation and cancer.

Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. J Soc Integr Oncol. 2007 Winter;5(1):25-37.

Ayurvedic Concept of Disease Origin



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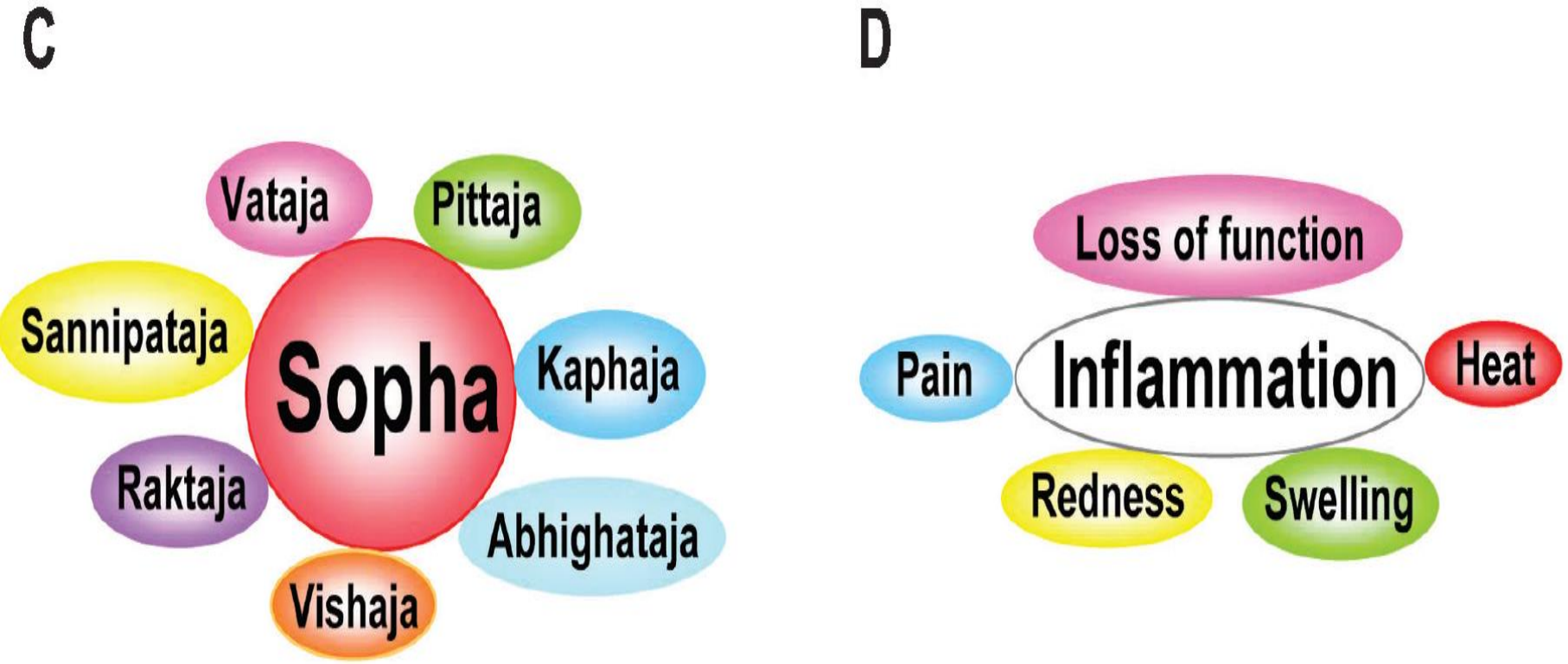
Ayurvedic concepts of health and their role in inflammation and cancer.

Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. J Soc Integr Oncol. 2007 Winter;5(1):25-37.

Ayurvedic Concept of Inflammation



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Ayurvedic Concept of Cancer

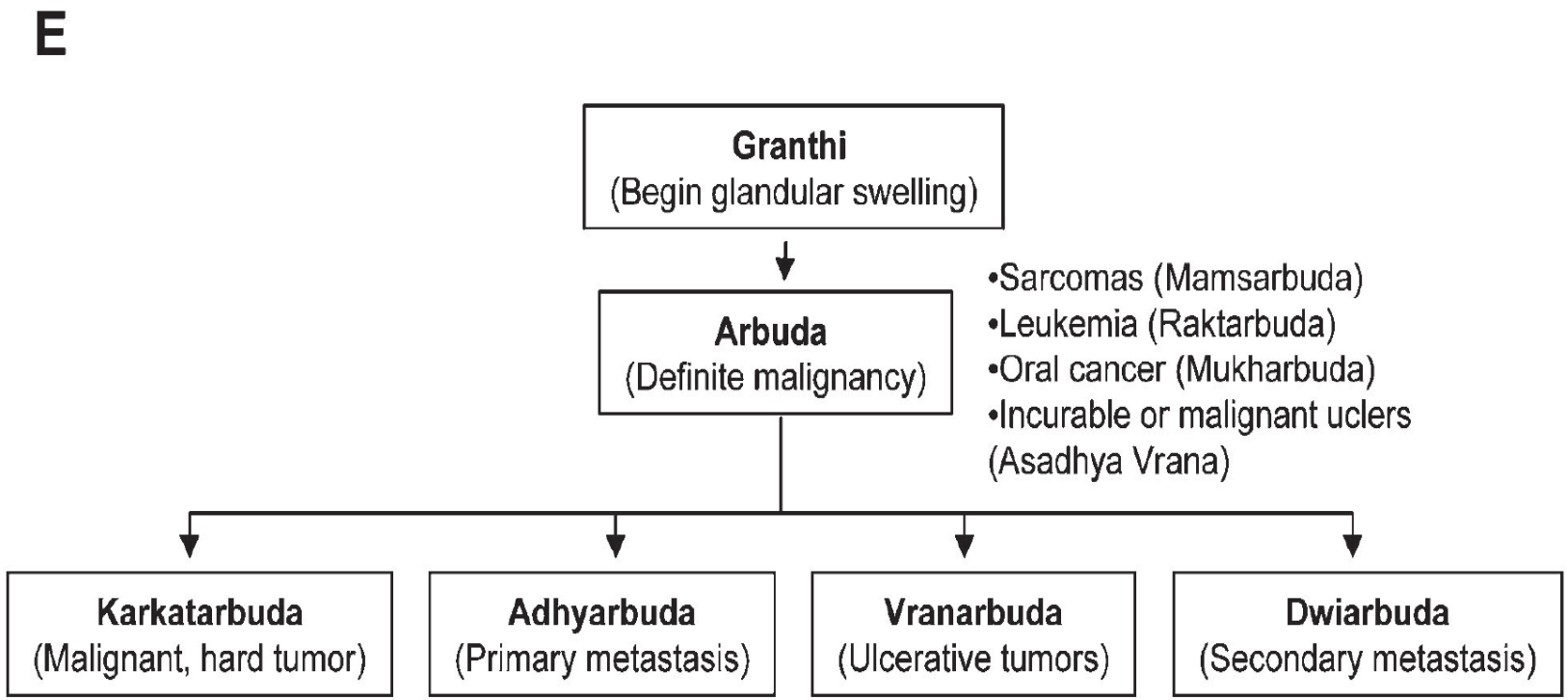


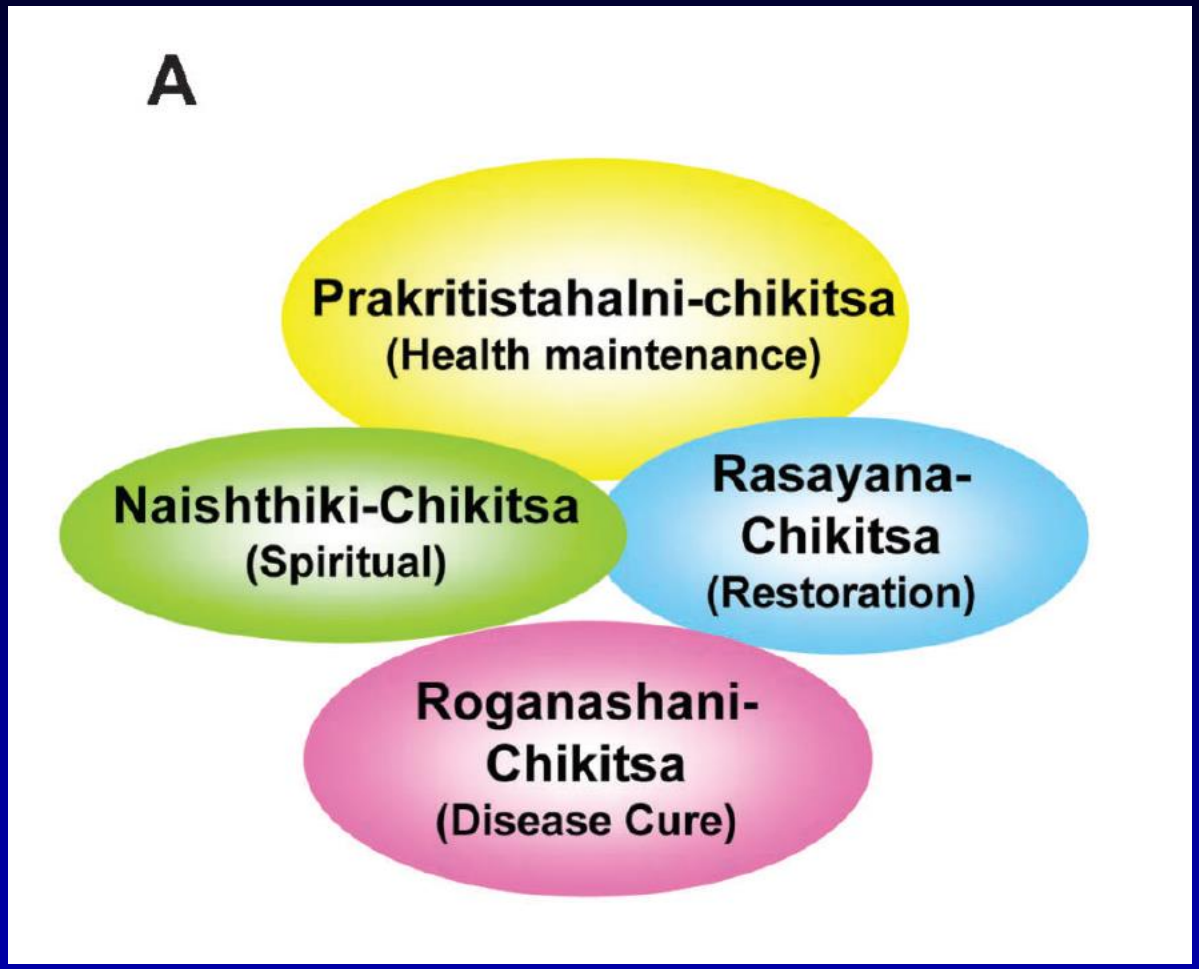
Figure 1. Ayurvedic concept of inflammation and cancer. *A*, Teaching of ayurveda in ancient times. *B*, The role of tridoshas in the pathogenesis of the disease. Aggravating factors are *underlined*. *C*, Different types of sophas (inflammation/swelling). *D*, Different manifestations of inflammation. *E*, Development and progression of cancer through different stages.

From ancient medicine to modern medicine:

Ayurvedic concepts of health and their role in inflammation and cancer.

Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. J Soc Integr Oncol. 2007 Winter;5(1):25-37.

Ayurvedic Treatments



From ancient medicine to modern medicine:

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Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. ***J Soc Integr Oncol. 2007 Winter;5(1):25-37.***

Ayurvedic treatment of Cancer

From ancient medicine to modern medicine:

Ayurvedic concepts of health and their role in inflammation and cancer.

Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. J Soc Integr Oncol. 2007 Winter;5(1):25-37.

Ayurvedic herbs for Cancer

Figure 3. A picture of ayurvedic plants that have potential in the prevention and treatment of cancer.

From ancient medicine to modern medicine:

Ayurvedic concepts of health and their role in inflammation and cancer.

Garodia P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. J Soc Integr Oncol. *2007 Winter;5(1):25-37.*

Current Drug Targets, 2011, *12*, 1595-1653

Identification of Novel Anti-inflammatory Agents from Ayurvedic Medicine for Prevention of Chronic Diseases: "Reverse Pharmacology" and "Bedside to Bench" Approach

Bharat B. Aggarwal*, Sahdeo Prasad, Simone Reuter, Ramaswamy Kannappan, Vivek R. Yadav, Byoungduck Park, Ji Hye Kim, Subash C. Gupta, Kanokkarn Phromnoi, Chitra Sundaram, Seema Prasad, Madan M. Chaturvedi and Bokyung Sung

Aggarwal etal, 2011

The guggul for chronic diseases: ancient medicine, modern targets.

Shishodia S, Harikumar KB, Dass S, Ramawat KG, Aggarwal BB.

Anticancer Res. 2008 Nov-Dec;28(6A):3647-64.

Guggul is one of the most ancient medicines described in Ayurveda.

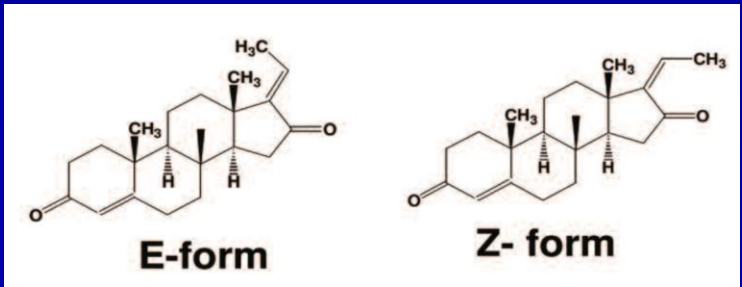
The Veda says, "Yakshma (disease), it cannot appear in sunlight.

Guggulu is the best medicine, because it develops through the rays of hot sun on specific circumstances.

Guggulu has an aromatic odor. It removes the disease, like a deer that runs away on seeing the horse.

A mixture of Guggulu and common salt remove the disease along with their complications"

Structure of guggulsterone



A

अथर्ववेदः कां. १९ सू ३८

न तं यक्ष्मा अरुन्धते नैनं शपथो अश्नुते।
यं भेषजस्य गुल्गुलोः सुरभिर्गन्धो अश्नुते।।१।।
विष्वेञ्चस्तस्माद् यक्ष्मा मृगा अश्वा इवेरते
यद् गुल्गुलु सैन्धवं यद् वाप्यासि समुद्रियम।।२।।
उभयोरग्रभं नामास्मा अरिष्टतातये।।३।।

B

Guggulsterone

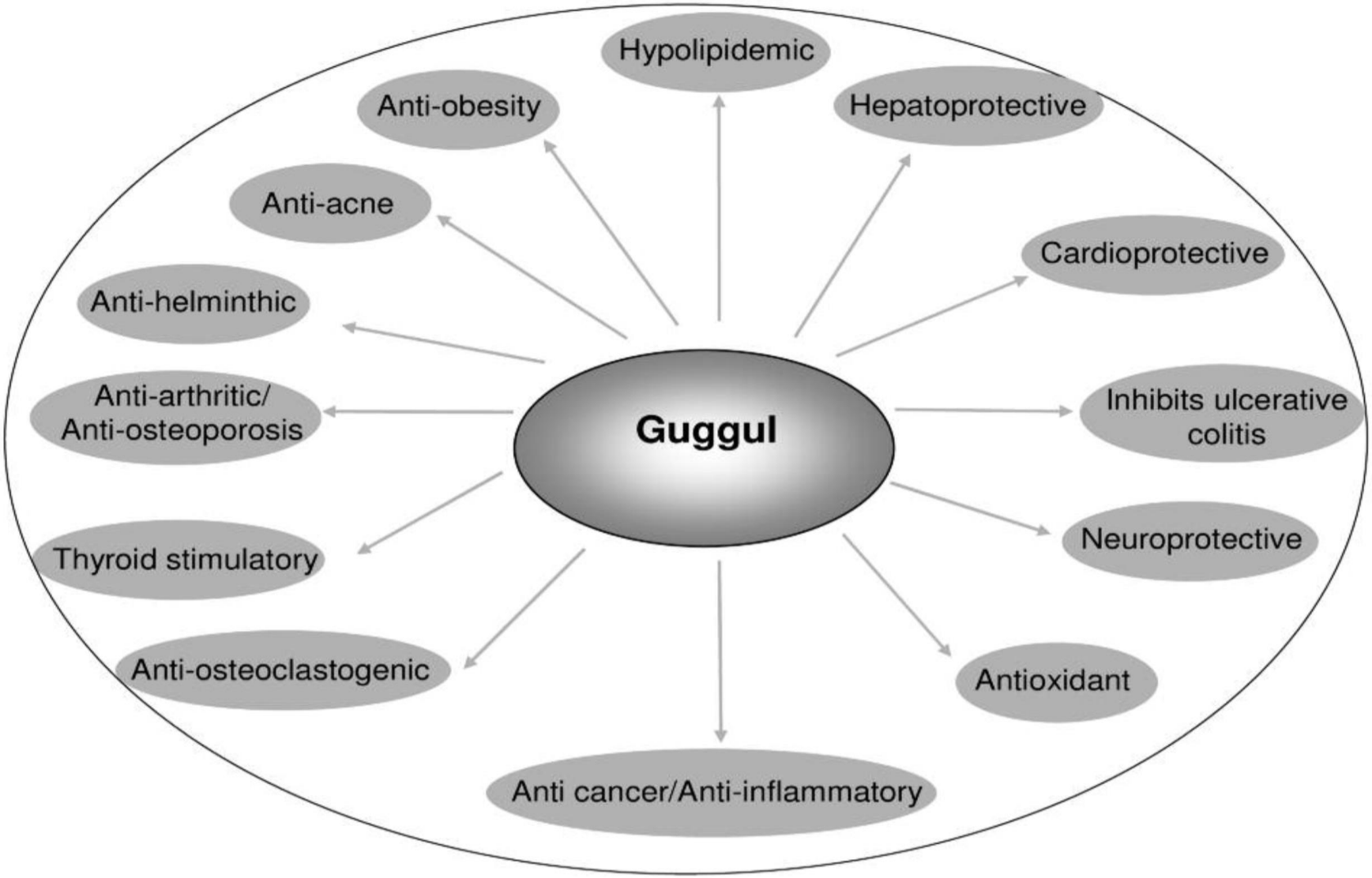


Figure 5. *Use of guggul for chronic proinflammatory diseases.*

Guggulsterone inhibits osteoclastogenesis induced by receptor activator of NF-kB ligand and by tumor cells by suppressing NF-kB activation.

Ichikawa H, Aggarwal BB.
Clin Cancer Res. 2006 Jan 15;12(2):662-8.

Guggulsterone [4,17 (20)-pregnadiene-3,16-dione], a plant sterol derived from the gum resin (guggulu) of the tree Commiphora mukul.

The resin has been used in Ayurvedic medicine for centuries to treat a variety of ailments, including obesity, bone fractures, arthritis, inflammation, cardiovascular disease, and lipid disorders.

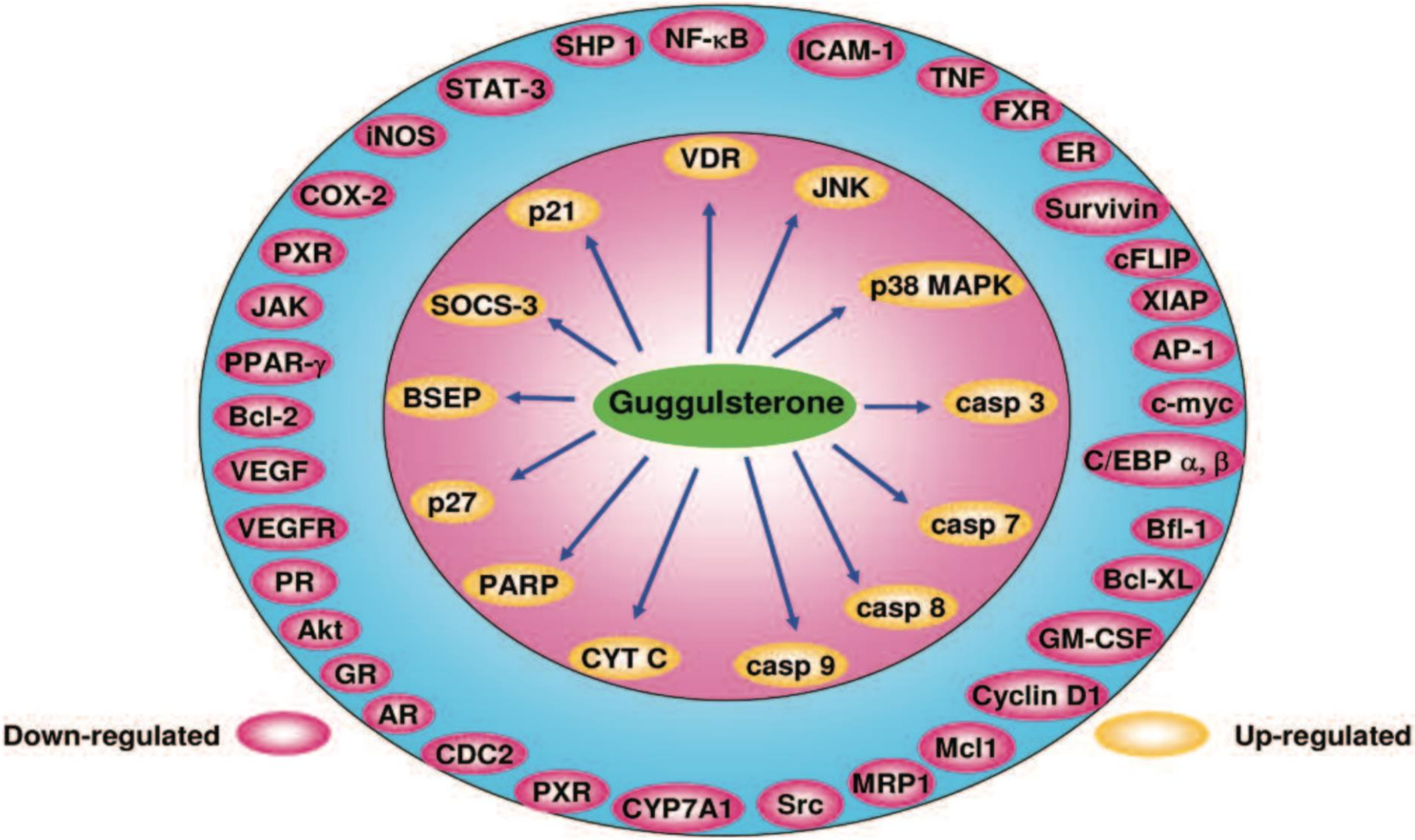
The anti-arthritic and anti- inflammatory activity of gum guggul was shown as early as 1960 by Gujral et al. followed by a report of activity in experimental arthritis induced by mycobacterial adjuvant.

Guggulsterone Suppresses Osteoclastogenesis and another on the effectiveness of guggul for treating osteoarthritis of the knee.

Guggulsterone is an antagonist for the bile acid receptor farnesoid X receptor.

Guggulsterone enhances transcription of the bile salt export pump, thereby regulating cholesterol homeostasis.

Guggulsterone



Guggulsterone

Table II. *Clinical studies with gum guggul, its ethyl acetate fraction ether soluble fractions, and guggulsterone.*

Study	Patients	Dose	Response
Double-blind randomized controlled study	60 obese pts 60 non-obese pts	GG 2 g, 2×/day × 3 wks EE 500 mg, 3x/day x 3 wks	Reduced serum lipid levels in HL patients (107)
Double-blind randomized controlled study	48 pts	GE 500 mg, 3×/day × 4 wks	Reduced total cholesterol and TG (110)
Double blind randomized controlled study	40 HL pts	GG 4.5 g/day × 16 wks	Reduced total cholesterol and TG (111)
Double blind randomized controlled study	10[a]	GS, 25 mg, 2×/day × 8 wks	Decreased serum cholesterol levels (109)
Multicenter clinical trial Open trial (double study)	205[b]	GL 500 mg/day	Decreased serum cholesterol and TG in 70-80% subjects (112)
Multicenter clinical trial Open trial (double study)	125	GL 500 mg/day	Average fall in cholesterol and TG was 11% and 16.8% (112)
Multicenter clinical trial Open trial (double study)	108	Clofibrate therapy	Average fall in cholesterol and TG was 10% and 21.6% (112)
Randomized double blind	31 HL pts[c] 30 HL pts[d]	GL 50 mg 2×/day × 24 wks Placebo capsules 2×/day × 24 wks	Decreased the cholesterol (65) No decrease in cholesterol level (65)
Double blind randomized placebo controlled	33 HC pts 34 HC pts 36 HC pts	GL 1 g, 3×/day × 8 wks GL 2 g, 3×/day, × 8 wks Placebo, 3×/day × 8 wks	Increased the level of LDL (82) Increased the level of LDL (82) Decreased the LDL levels (82)
Cardiovascular disease	200[c]	GG with Innula racemosa for 6 mts	Decreased total cholesterol, TG and TBP. Improved EKG and pain (85, 86)
Rheumatoid Arthritis	30	GG, 500 mg 3×/day, 1 month	Improved WOMAC score, improvement after 2 months (89)

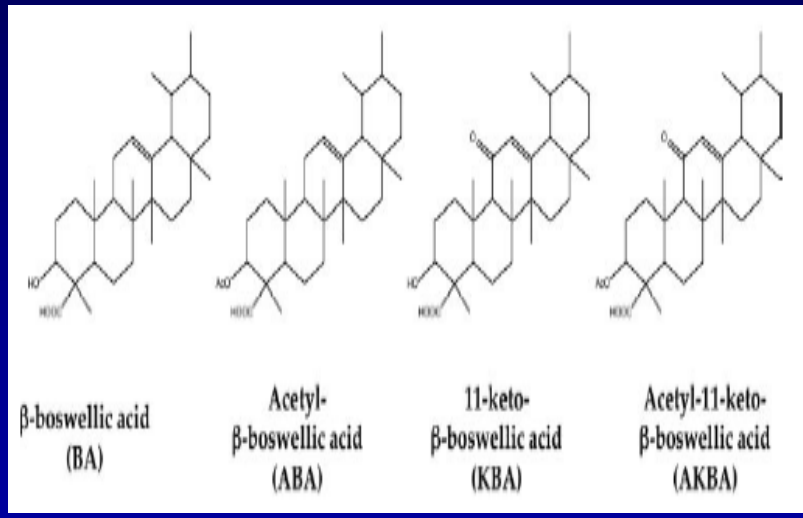
GG, gum guggul; EE, ether extract; GE, guggul extract; GL, guggulipid; TG, triglycerides; TBP, total blood lipid, EKG, electrocardiogram; mts, months; pts, patients; WOMAC, Western Ontario MacMaster; HL, hyperlipidemia; HC, hypercholesterolemia. a, healthy individuals; b, After 8 -week diet and placebo therapy; c, All patients had a low fat diet with fruits and vegetables for 1 week prior to treatment; d, Pts were suffering with ischemic heart disease, abnormal EKG and chest pain.

Boswellia serrata
Frankincense
Shallaki, Salai Guggul

The gum-resin of plant Boswellia serrata (also known as Salai guggul) is used in the Ayurvedic system of medicine for the treatment of rheumatic diseases, respiratory diseases, and liver disorders.

The active component of this resin as boswellic acid (BA),3 a pentacyclic triterpenic acid, and its derivatives (acetyl--BA,
Acetyl-11-keto-beta-boswellic acid (AKBA).

This pentacyclic terpenoid active against a large number of inflammatory diseases, including cancer, arthritis, chronic colitis, ulcerative colitis, Crohn's disease, and bronchial asthma, but the mechanism is poorly understood.



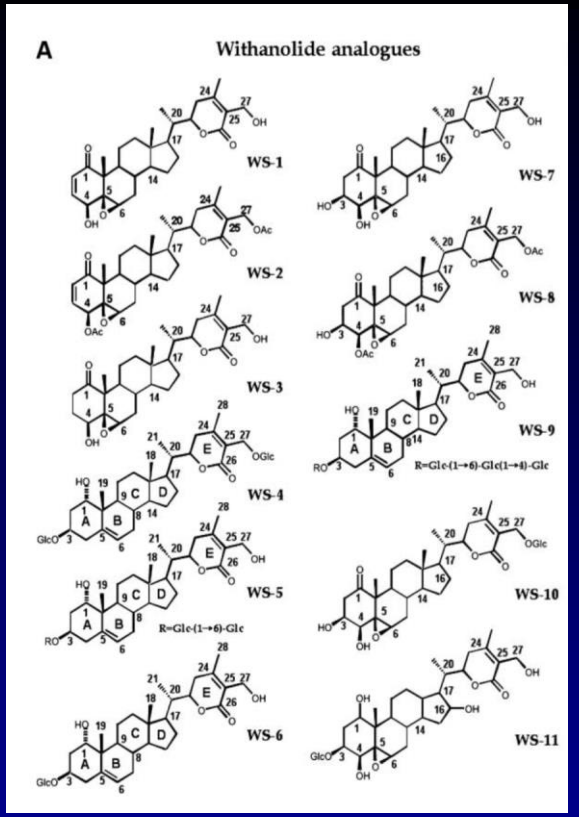
AKBA potentiates apoptosis, inhibits invasion, and abolishes osteoclastogenesis by suppressing NF-kB and NF-kB-regulated gene expression.

Takada Y, Ichikawa H, Badmaev V, Aggarwal BB.

J Immunol. 2006 Mar 1;176(5):3127-40.

Withanolides

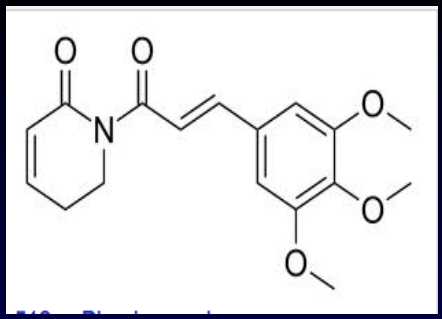
The plant Withania somnifera Dunal (Ashwagandha), also known as Indian ginseng, is widely used in the Ayurvedic system of medicine to treat tumors, inflamma- tion, arthritis, asthma, and hypertension.



Withanolides potentiate apoptosis, inhibit invasion, and abolish osteoclastogenesis through suppression of NF-kB activation and NF-kB-regulated gene expression.

Ichikawa H, Takada Y, Shishodia S, Jayaprakasam B, Nair MG, Aggarwal BB.
Mol Cancer Ther. 2006 Jun;5(6):1434-45.

Long pepper
(Piper longam)



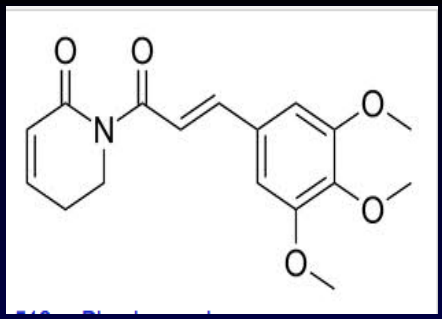
Selective killing of cancer cells by a small molecule targeting the stress response to ROS.

Raj L, Ide T, Gurkar AU, Foley M, Schenone M, Li X, Tolliday NJ, Golub TR, Carr SA, Shamji AF, Stern AM, Mandinova A, Schreiber SL, Lee SW.

Nature.

2011 Jul 13;475(7355):231-4. doi: 10.1038/nature10167.

Long pepper
(Piper longam)

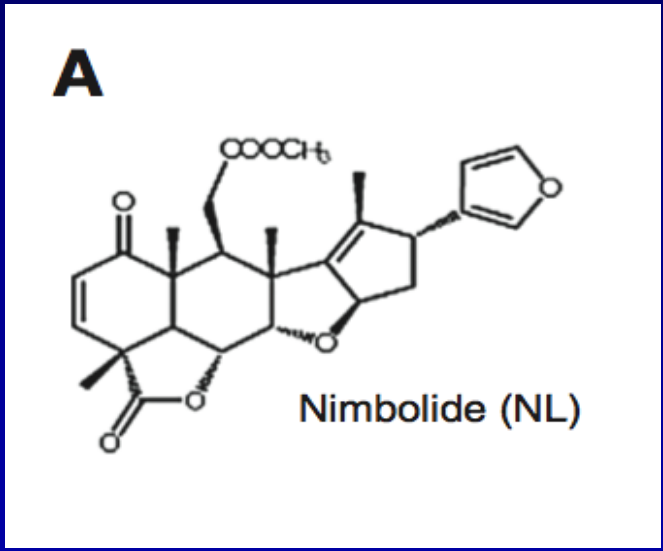


Piperlongumine chemosensitizes tumor cells through interaction with cysteine 179 of IκBα kinase, leading to suppression of NF-κB-regulated gene products.

Han JG, Gupta SC, Prasad S, Aggarwal BB.
Mol Cancer Ther.
2014 Oct;13(10):2422-35.

NEEM tree (Azadirachta indica)

Sanskrit- "sarva roga nivarini"
(the curer of all ailments).



Nimbolide

2010

THE JOURNAL OF BIOLOGICAL CHEMISTRY VOL. 285, NO. 46, pp. 35406–35417, November 12, 2010

Modification of Cysteine 179 of IκBα Kinase by Nimbolide Leads to Down-regulation of NF-κB-regulated Cell Survival and Proliferative Proteins and Sensitization of Tumor Cells to Chemotherapeutic Agents*

Received for publication, July 6, 2010, and in revised form, September 6, 2010 Published, JBC Papers in Press, September 9, 2010, DOI 10.1074/jbc.M110.161984

Subash C. Gupta[‡], Sahdeo Prasad[‡], Simone Reuter[‡], Ramaswamy Kannappan[‡], Vivek R. Yadav[‡], Jayaraj Ravindran[‡], Padmanabhan S. Hema[§], Madan M. Chaturvedi[‡1], Mangalam Nair[§], and Bharat B. Aggarwal[‡2]

From the [‡]Cytokine Research Laboratory, Department of Experimental Therapeutics, University of Texas M. D. Anderson Cancer Center, Houston, Texas 77030 and the [§]Organic Chemistry Section, National Institute for Interdisciplinary Science and Technology (Council for Scientific and Industrial Research), Trivandrum, 695 019 Kerala, India

2013

Published OnlineFirst June 13, 2013; DOI: 10.1158/1078-0432.CCR-13-0080

Clinical Cancer Research

Cancer Therapy: Preclinical

Nimbolide, a Limonoid Triterpene, Inhibits Growth of Human Colorectal Cancer Xenografts by Suppressing the Proinflammatory Microenvironment

Subash C. Gupta[1,2], Sahdeo Prasad[1], Dhanya R. Sethumadhavan[3], Mangalam S. Nair[3], Yin-Yuan Mo[2], and Bharat B. Aggarwal[1]

THE JOURNAL OF BIOLOGICAL CHEMISTRY VOL. 288, NO. ??, pp. 1–xxx, ???? ??, 2013

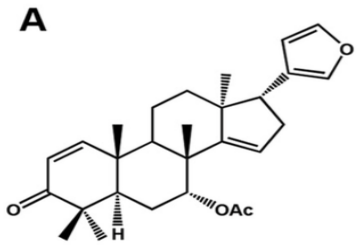
Azadirone, a Limonoid Tetranortriterpene, Induces Death Receptors and Sensitizes Human Cancer Cells to Tumor Necrosis Factor-related Apoptosis-inducing Ligand (TRAIL) through a p53 Protein-independent Mechanism

EVIDENCE FOR THE ROLE OF THE ROS-ERK-CHOP-DEATH RECEPTOR PATHWAY

Received for publication, January 20, 2013, and in revised form, September 11, 2013 Published, JBC Papers in Press, September 27, 2013, DOI 10.1074/jbc.M113.455188

Subash C. Gupta[‡§], Sajin K. Francis[¶], Manglam S. Nair[¶], Yin-Yuan Mo[§], and Bharat B. Aggarwal[‡1]

From the [‡]Cytokine Research Laboratory, Department of Experimental Therapeutics, The University of Texas MD Anderson Cancer Center, Houston, Texas 77030, the [¶]Organic Chemistry Section, National Institute for Interdisciplinary Science and Technology (CSIR), Trivandrum, 695 019 Kerala, India, and the [§]Cancer Institute, University of Mississippi Medical Center, Jackson, Mississippi 39216



Azadirone, a limonoidal triterpene originally identified from the oil of the neem tree, traditionally called "nature's drug store" .

In east Africa, the tree is known as "Mwarobaini" in Swahili, which literally means "the tree of the 40," because it is considered as a treatment for 40 different diseases.

In India, the tree is known as a "village pharmacy" because of its tremendous therapeutic potential.

2013

Role of Nutraceuticals in Cancer Chemosensitization

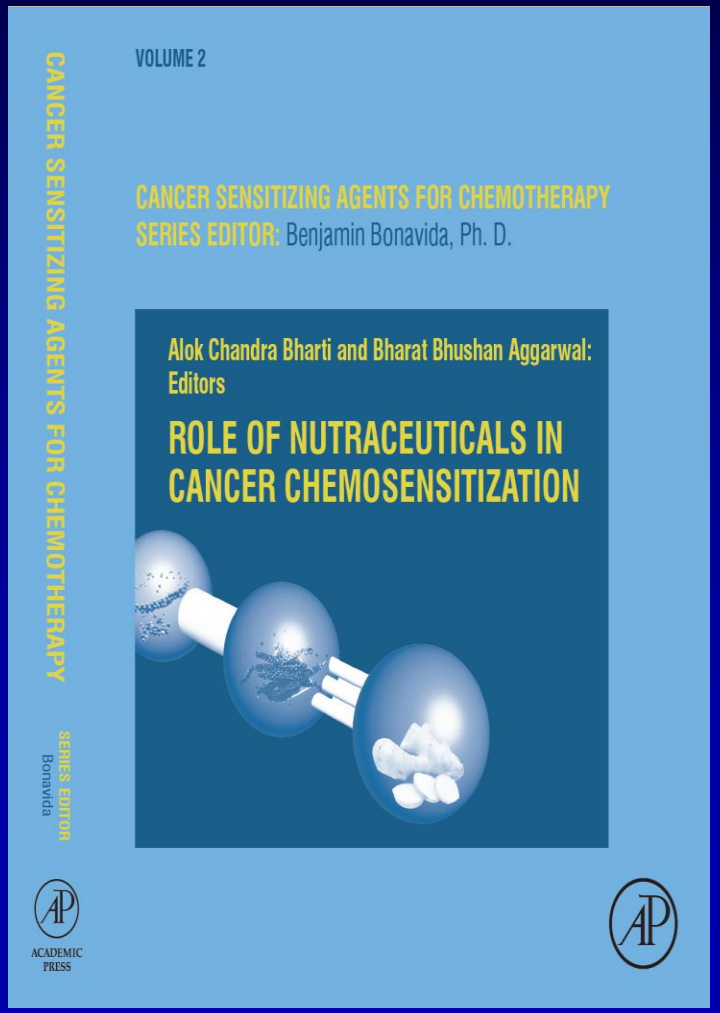
Alok Chandra Bharti & Bharat Bhushan Aggarwal

***Although chemotherapy** is routinely used in the treatment of almost all cancers, the development of eventual resistance to chemotherapy is one of the major problems in the treatment.*

***Thus chemosensitization** to Cancer is needed.*

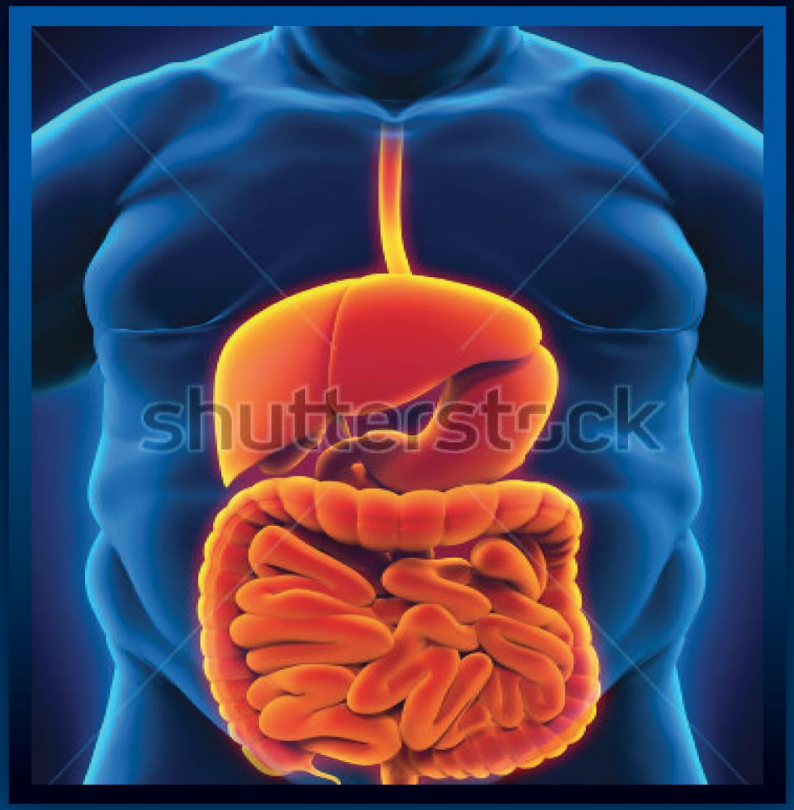
The compounds derived from natural sources, which are usually multi-targeted can overcome chemoresistance. This includes:

- *Curcumin,*
- *Resveratrol,*
- *Indole 3-carbinol,*
- *Tocotrienols,*
- *Ursolic acid,*
- *Fisetin,*
- *Celastrol,*
- *gambogic,*
- *Butein,*
- *Catechins,*
- *Silymarin.*



Immunonutrition

Interactions of Diet, Genetics, and Inflammation



Edited by

Bharat B. Aggarwal • David Heber

CRC Press
Taylor & Francis Group

Forecasting nutrition research in 2020.

Journal of American College Nutrition 2014;33(4):340-6.

*Hackman RM1, **Aggarwal BB,** Applebaum RS, deVere White RW, Dubick MA, Heber D, Ito T, Johnson GH,*
Keen CL, Winters BL, Stohs SJ.

Department of Nutrition ,
University of California , Davis , California.

Pomegranate juice, total pomegranate ellagitannins, and punicalagin suppress inflammatory cell signaling in colon cancer cells.

Adams LS1, Seeram NP, Aggarwal BB, Takada Y, Sand D, Heber D.
Center for Human Nutrition, David Geffen School of Medicine, University of California, Los Angeles, California 90095, USA. *J Agric Food Chem. 2006 Feb 8;54(3):980-5.*

The present study examined the effects of PJ on inflammatory cell signaling proteins in the HT-29 human colon cancer cell line.

At a concentration of 50 mg/L PJ significantly suppressed TNFalpha-induced COX-2 protein expression by 79%, total pomegranate tannin extract (TPT) 55%, and punicalagin 48%.

Additionally, PJ reduced phosphorylation of the p65 subunit and binding to the NFkB response element 6.4-fold.
TPT suppressed NFkB binding 10-fold, punicalagin 3.6-fold, whereas ellagic acid was ineffective.
PJ also abolished TNFa-induced AKT activation, needed for NFkB activity.

The polyphenolic phytochemicals in the pomegranate can play an important role in the modulation of inflammatory cell signaling in colon cancer cells.

Farmaceuticals!

Refers to medically valuable compounds produced from modified agricultural crops or animals.

Antiinflammatory life style

Spices


Asian ginger)
(*Alpinia galanga*)


Cloves
(*Eugenia carvophyllu*)


Fennel
(*Foeniculum vulgare*)


Fenugreek
(*Trigonella foenum graecum*)


Gamboge
(*Garcinia hanburyi*)


Holy basil
(*Ocimum sanctum*)


Onion
(*Allium cepa*)


Onion seed
(*Nigella sativa*)


Poppy seed
(*Papaver somniferum*)


Pomegranate
(*Punica granatum*)


Red chili
(*Capsicum annum*)


Sesame seed
(*Sesamum indicum*)


Turmeric
(*Curcuma longa*)

Ayurvedic Medicine


Aloe
(*Aloe vera*)


Ashwagandha
(*Withania somnifera*)


Boswellia
(*Boswellia serrata*)


Beauty berry
(*Callicarpa macrophylla*)


Chitrak
(*Plumbago zeylanica*)


False pepper
(*Embelia ribes*)


Guggulu
(*Commiphora mukul*)


Himalayan fir
(*Abies webbiana*)


Indigo
(*Polygonum tinctorium*)


Neem
(*Azadirachta indica*)


Picroliv
(*Picrorhiza kurroa*)


Pinecone ginger
(*Zingiber zerumbet*)


Rohitukine
(*Dysoxylum binectariferum*)


Veldt-grape
(*Cissus quadrangularis*)


Peacock ginger
(*Kaempferia pulchra*)

Fruits & Vegetables


Artichoke
(*Cynara cardunculus*)


Cauliflower
(*Brassica oleracea*)


Grapes
(*Vitis vinifera*)


Mullberry
(*Morus nigra*)


Soybean
(*Glycine max*)

Traditional Chinese Medicine


Evodia
(*Evodia rutaecarpa*)


Goldenseal
(*Hydrastis canadensis*)


God of thunder vine
(*Tripterygium wilfordii*)


Indigo
(*Polygonum tinctorium*)


Lacquer tree
(*Rhus verniciflua*)


Magnolia
(*Magnolia officinalis*)


Smoke tree
(*Cotinus coggygria*)

Song gen
(*Phellinus linteus*)

Others

Cottonseed oil
(*Gossypium*)

Cashew nut
(*Anacardium occidentale*)

Cork bush
(*Mundulea sericea*)

Elephant's foot
(*Elephantopus scaber Linn*)

Fire lily
(*Gloriosa superba*)

Ginger lily
(*Hedychium coronarium*)

Hop
(*Humulus lupulus L.*)

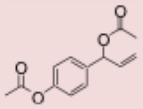
Horse chestnut
(*Aesculus hippocastanum*)

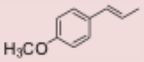
Palm
(*Elaeis guineensis*)

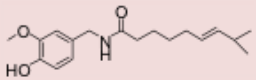
Oleander
(*Nerium oleander*)

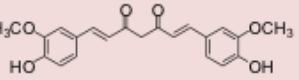
Tropical rose mallow
(*Hibiscus vitifolius*)

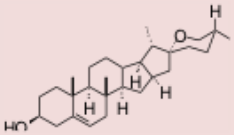
Spices

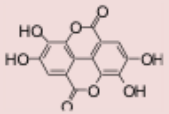

1'-Actoxychav-icolacetate

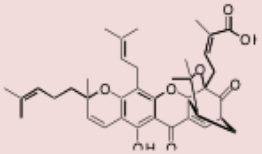

Anethole

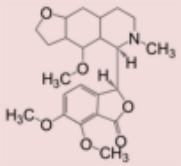

Capsaicin

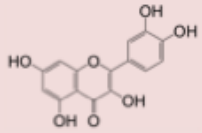

Curcumin


Diosgenin


Ellagicacid


Gambogic acid


Noscapine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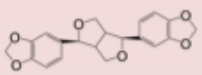
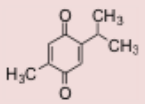

Sesamin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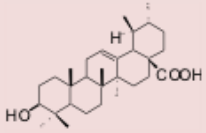
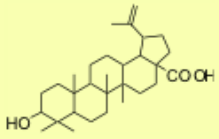
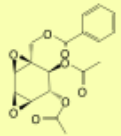
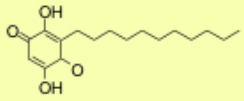
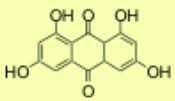

Ursolicacid

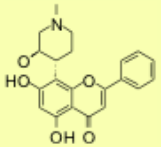
Ayurvedic Medicine

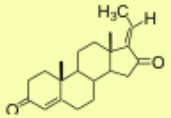

Betulinicacid

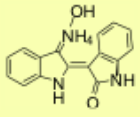

Crotepoxide

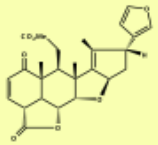

Embelin

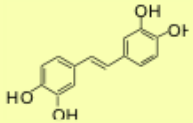

Emodin

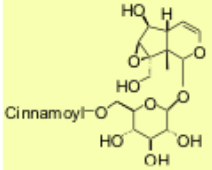

Flavopiridol

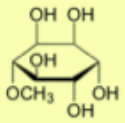

Guggulusterone

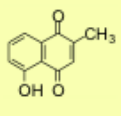

Indirubin 3'-monoxime

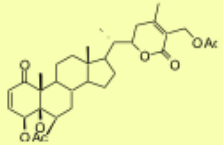

Nimbolide

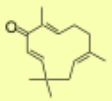

Piceatannol


Picroliv

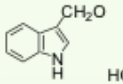

Pinitol

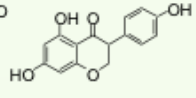

Plumbagin

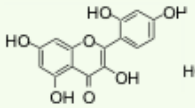

Withanolide

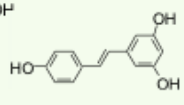

Zerumbone

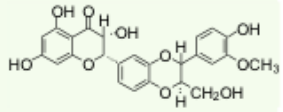
Fruits & Vegetables


Indole 3-carbinol

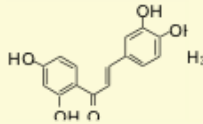

Genistein

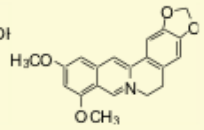

Morin

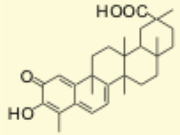

Resveratrol

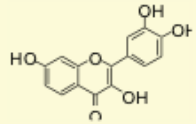

Silymarin

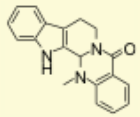
Traditional Chinese Medicine

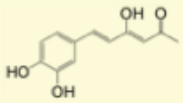

Butein

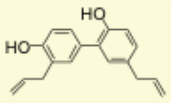

Berberin

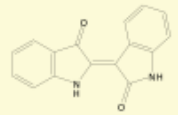

Celastrol


Fisetin

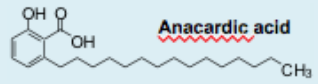

Evodiamine


Hispolon


Honokiol


Indirubin

Others


Anacardic acid

Coronarin-D

Deguelin

Gossypin

Gossypol

Isodeoxyelephantopin

Pentamethoxyflavone

Oleandrin

Thiocolchicoside

γ-Tocotrienol

Xanthohumol

Resveratrol can block NF-kB Activation

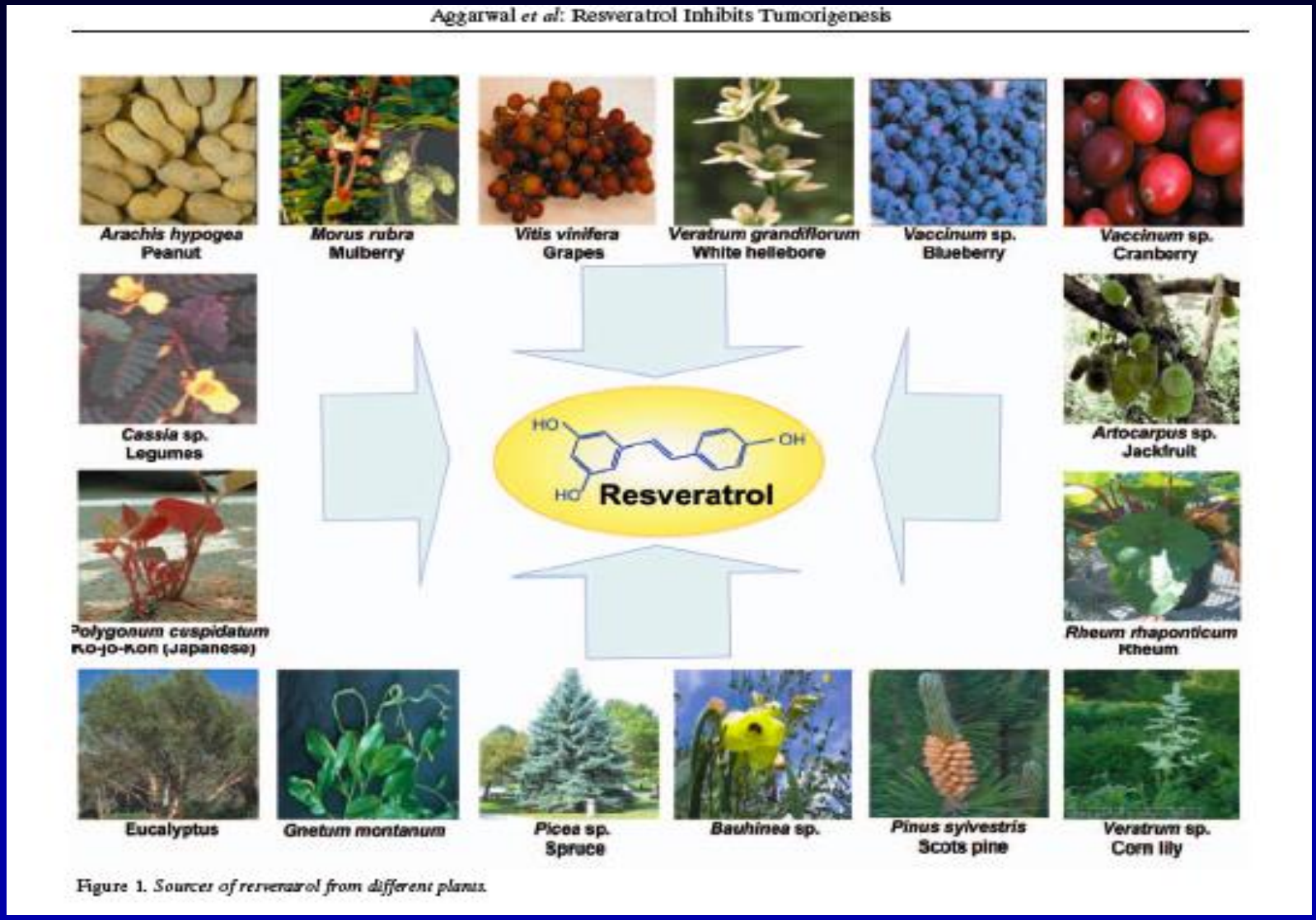


Figure 1. *Sources of resveratrol from different plants.*

Aggarwal etal, 2004

Indole-3-Carbinol can block NF-kB activation

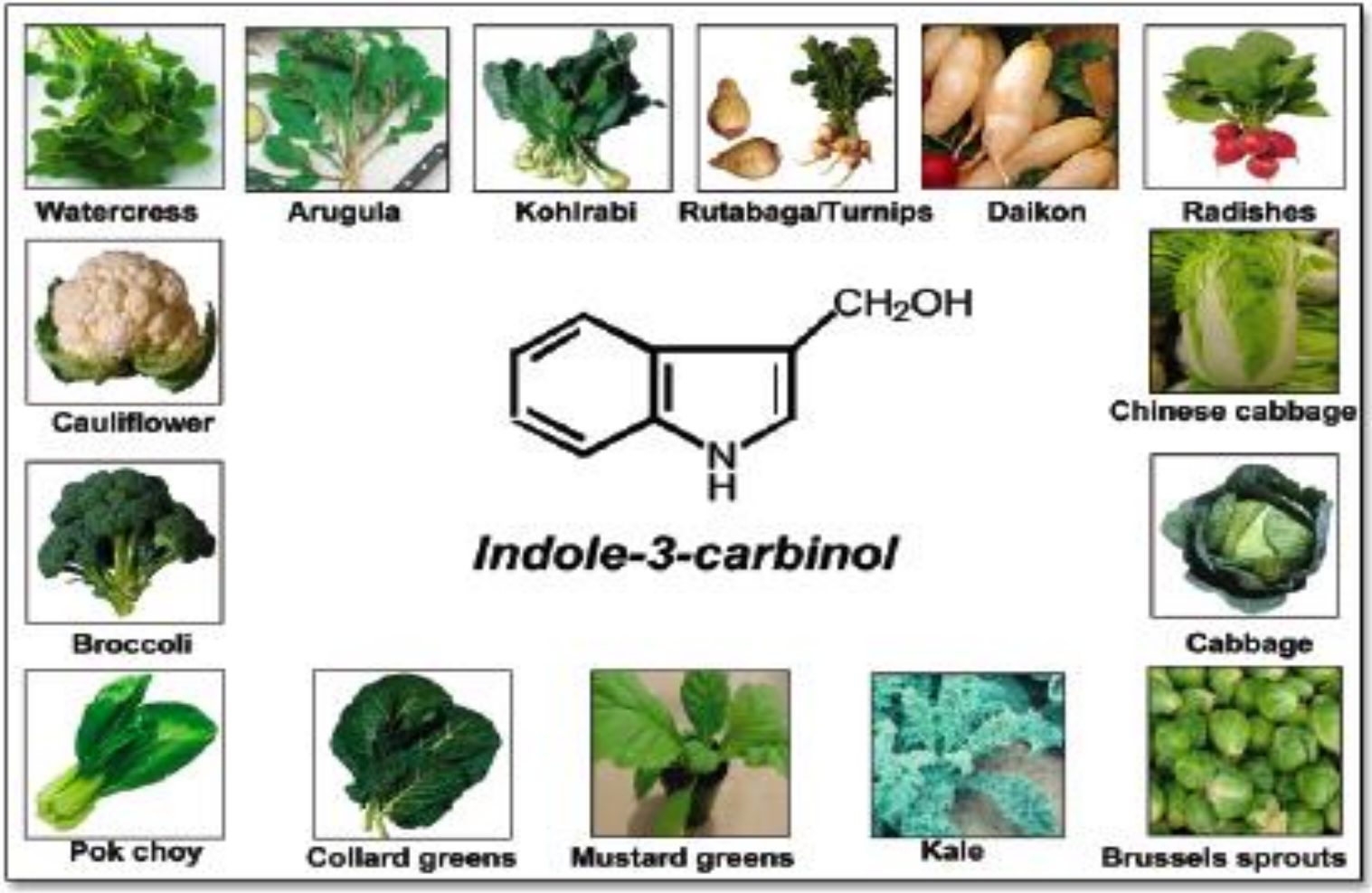


Figure 1. I3C is produced by members of the family Cruciferae, and particularly members of the genus *Brassica*.

Aggarwal etal, 2004

2010

Biochemical Pharmacology xxx (2010) xxx–xxx

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journal homepage: www.elsevier.com/locate/biochempharm

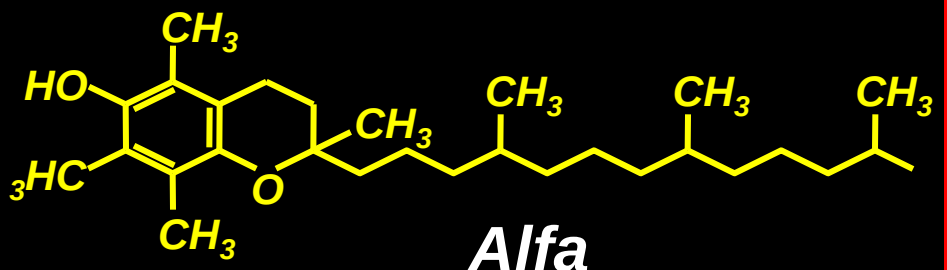
Commentary

Tocotrienols, the vitamin E of the 21st century: Its potential against cancer and other chronic diseases

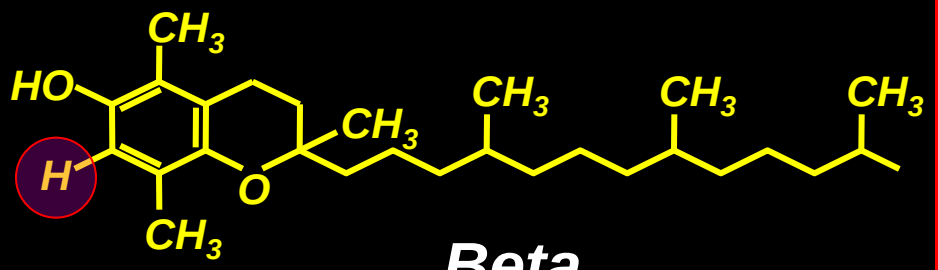
Bharat B. Aggarwal *, Chitra Sundaram, Seema Prasad, Ramaswamy Kannappan

Cytokine Research Laboratory, Department of Experimental Therapeutics, The University of Texas, M.D. Anderson Cancer Center, 1515 Holcombe Boulevard, Box 143, Houston, TX 77030, USA

Tocopherols
37,323 pub



Alfa



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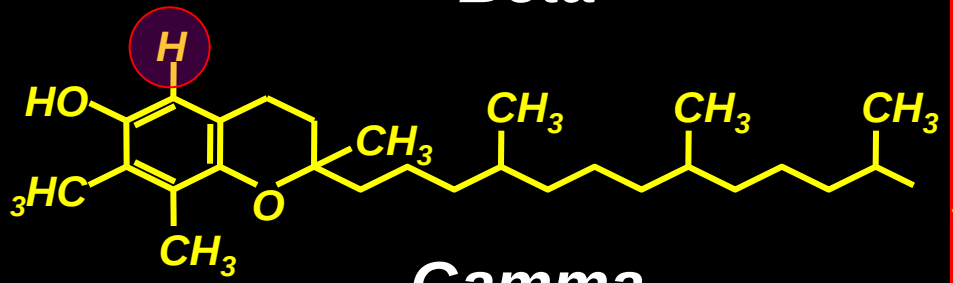
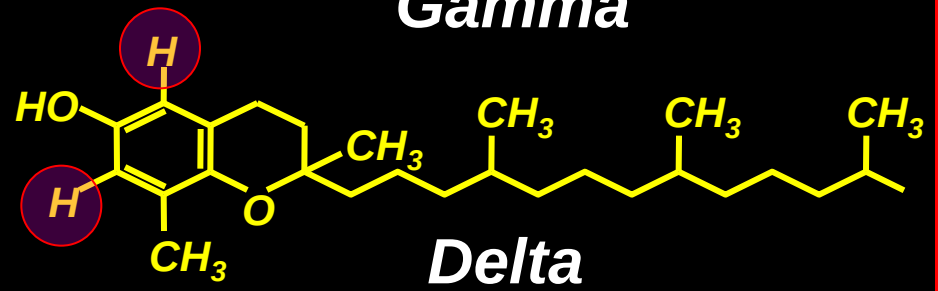


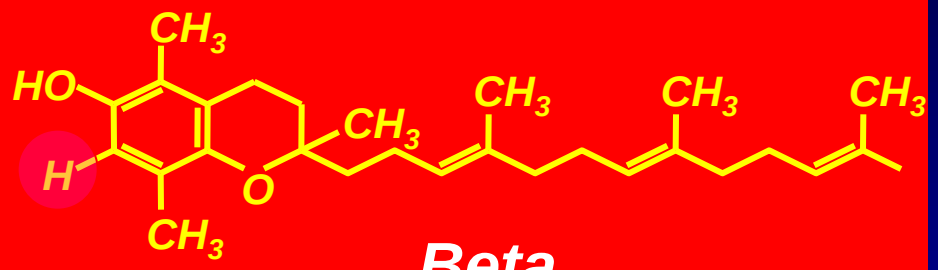
Gamma



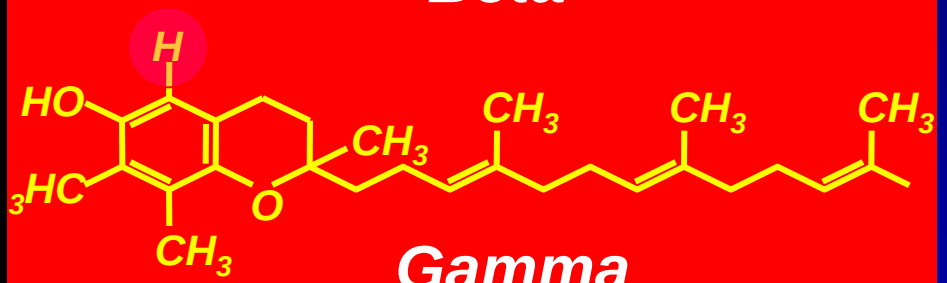
Delta

Tocotrienols
1127 pub

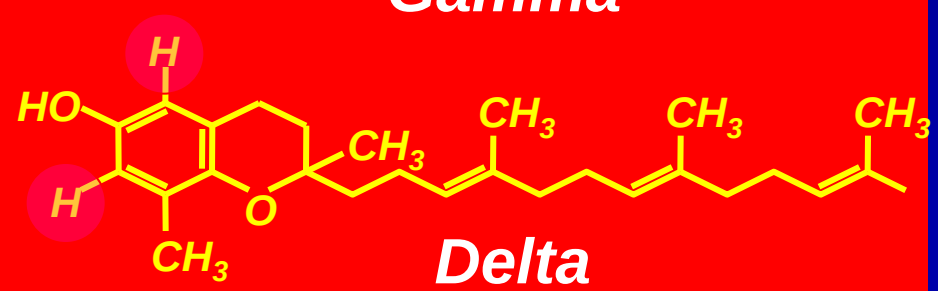
Alfa



Beta



Gamma



Delta

Natural Sources of Tocotrienols

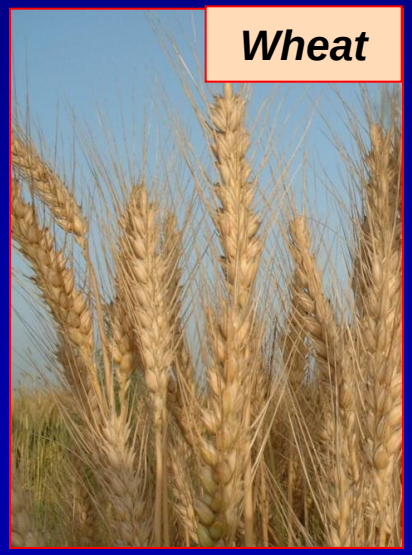
http://www.tocotrienol.org/index.html

Elaeis guineensis

Oryza sativa

Hordeum distichon

Avena sativa



Triticum vaccinium

Sources of tocotrienols

Red annatto

Palm oil
940 mg/kg

Barley
910 mg/kg

Rice bran
465 mg/kg

Grape fruit seed oil
380 mg/kg

Oat
210 mg/kg

Hazelnut
209 mg/kg

Maize
200 mg/kg

Wheat germ oil
189 mg/kg

Olive oil
180 mg/kg

Buckthorn Berry 130 mg/kg

Rye
92 mg/kg

Flax seed oil
25.1 mg/kg

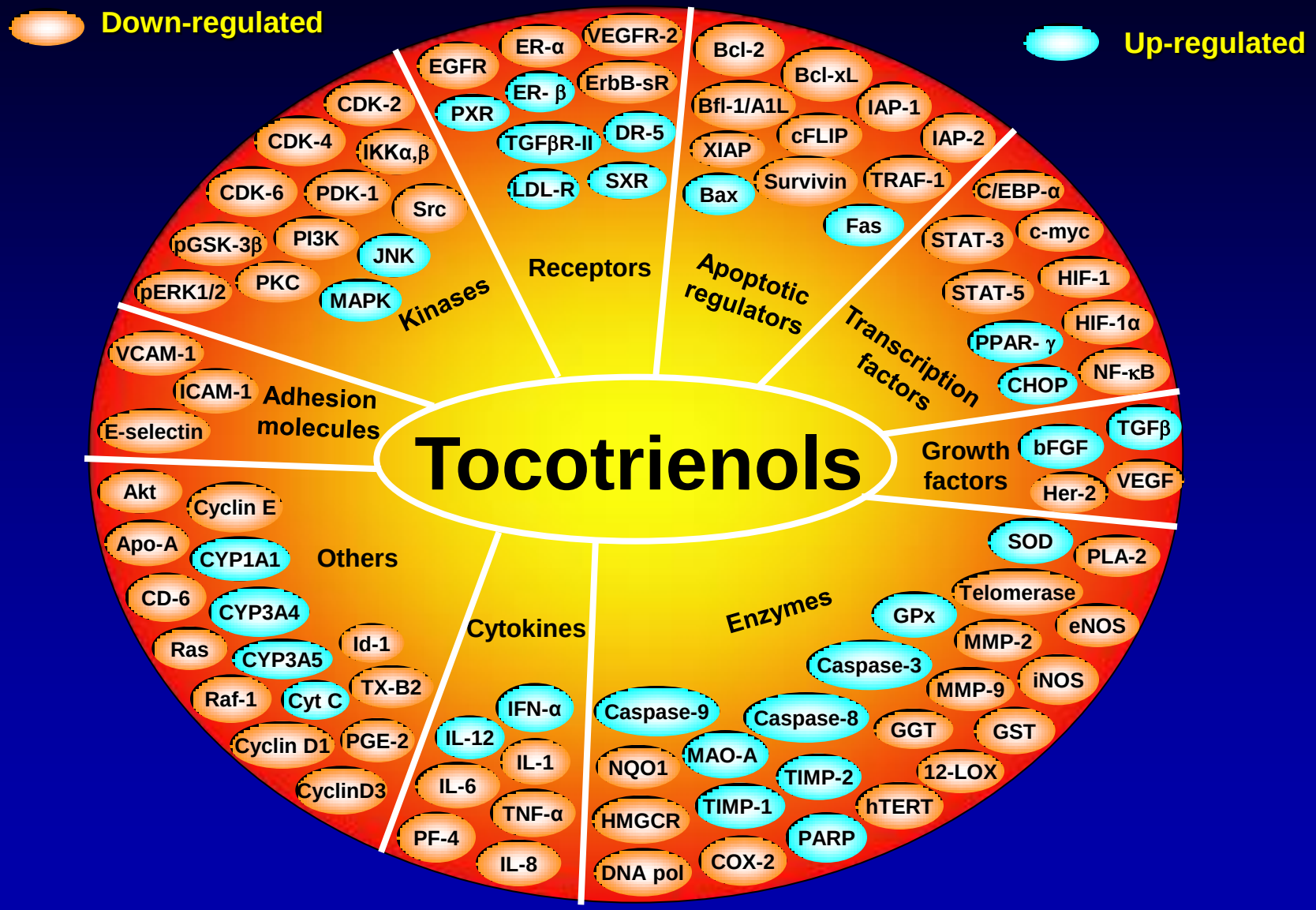
Poppy seed oil
20.5 mg/kg

Safflower oil
11.8 mg/kg

From: Red annatto, Barrie, Tan; Palm oil, Schroeder,2006; Rice bran, Sookwong,2010; Grape fruit seed oil, maize, Wheat germ oil-Hassanein, 2009; Hazel nut, Amaral, 2006; Olive oil, Cunha, 2006; Buckthorn berry, Kallio, 2002; Rye-milagros Delgado-Zamarreno, 2009; Oat and barley, Panfili, Fratianni.200; Flax oil, poopy oil, safflower oil, Bozan, 2008

From Aggarwal et al, 2010

Molecular targets modulated by tocotrienols



From Aggarwal etal, 2010

From exotic spice to modern drug?

Singh S.

Cell. 2007 Sep 7;130(5):765-8.

The global demand for more affordable therapeutics and concerns about side effects of commonly used drugs are refocusing interest on Eastern traditional medicines, particularly those of India and China.

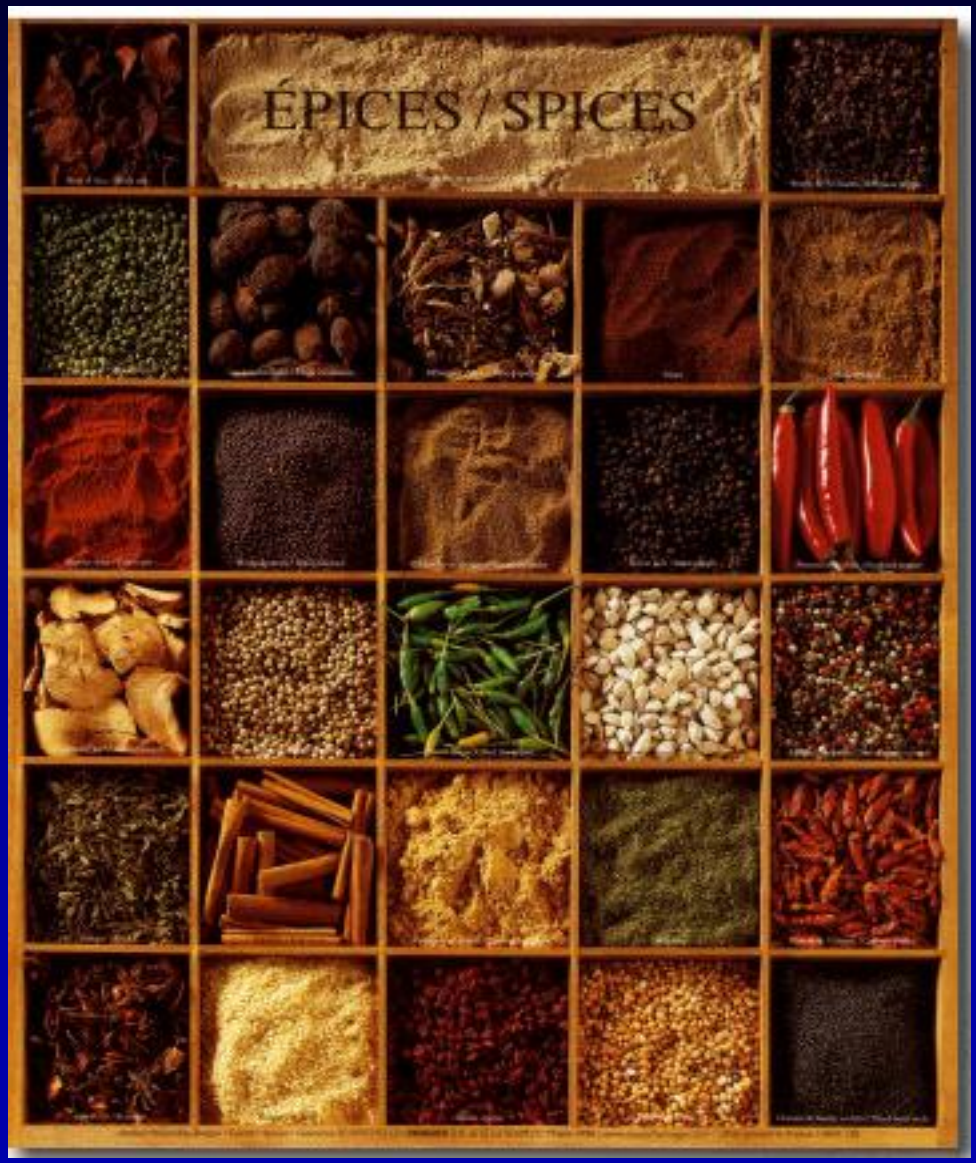
Add spices to your life!

Spice Route

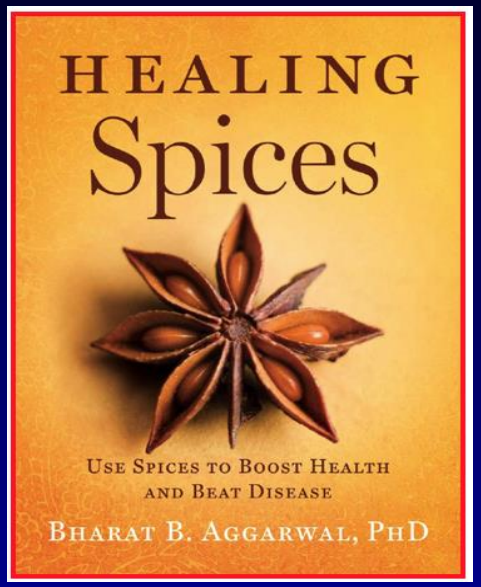
Vasco da Gama lands at Calicut, May 20, 1498.

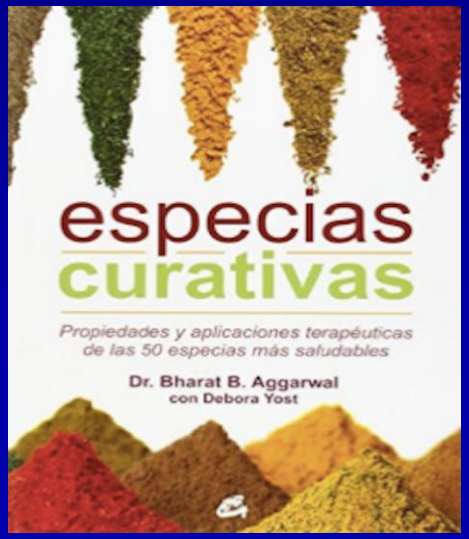
The route followed in Vasco da Gama's first voyage (1497 - 1499).

Dietary Spices



Healing Spices





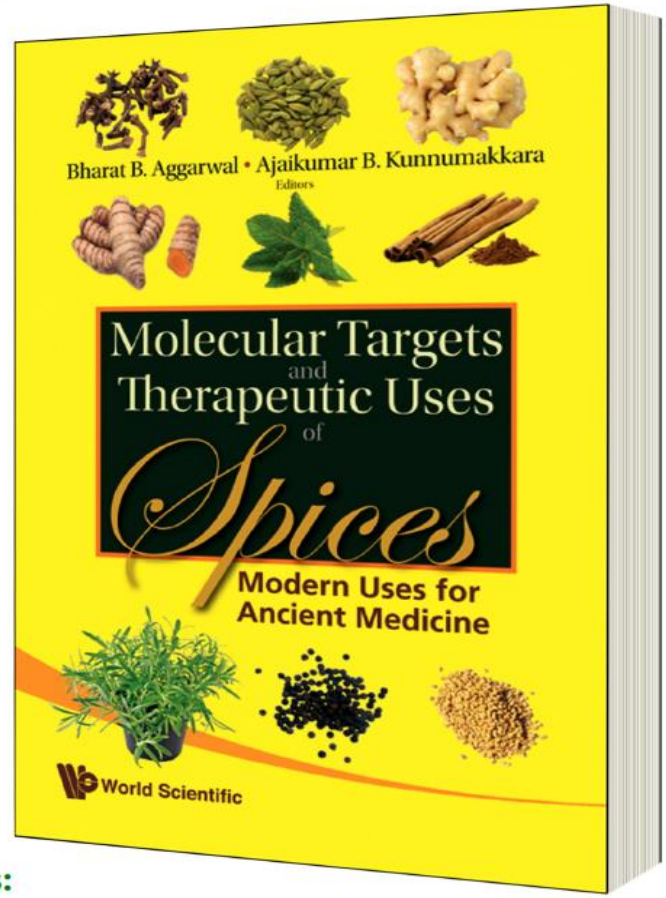
TNF blockers

Connecting Great Minds

MOLECULAR TARGETS AND THERAPEUTIC USES OF SPICES

Modern Uses for Ancient Medicine

edited by Bharat B Aggarwal *(The University of Texas M D Anderson Cancer Center, Houston, Texas, USA)* & Ajaikumar B Kunnumakkara *(National Institute of Health, Bethesda, MD, USA)*



Most therapeutics available today are highly toxic,

Contents:

Add Spice to your Life!

Curry in Hurry!

Spice it up!

Spice Queen!

Spice Goddess!

Spicy Names

Anise
Ginger
Rosemary
Mace
Pepper
Basil
Tulsi
Sage
Jasmine
Angelica
Curry
Chilli

Healing with Spices

Julie Chugh

Spices

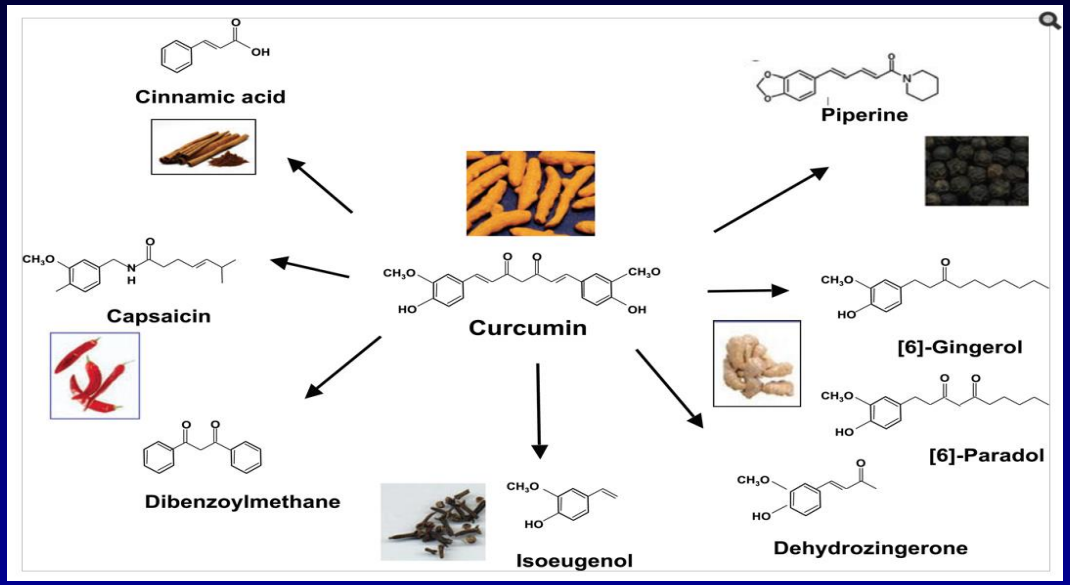
Allspice 	Almond 	Amchur 	Aniseed 	Asafoetida 
Basil 	Bay Leaves 	Black Cumin 	Black Pepper 	Caraway 
Cardamom 	Celery 	Chili 	Cinnamon 	Clove 
Cocoa 	Coconut 	Coriander 	Cumin 	Curry Leaf 
Fennel 	Fenugreek 	Galangal 	Garlic 	Ginger 

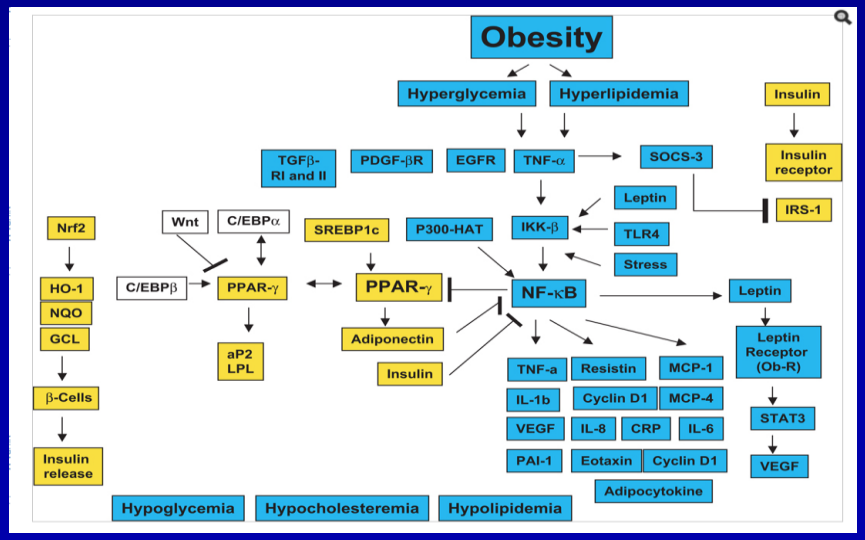
Spices

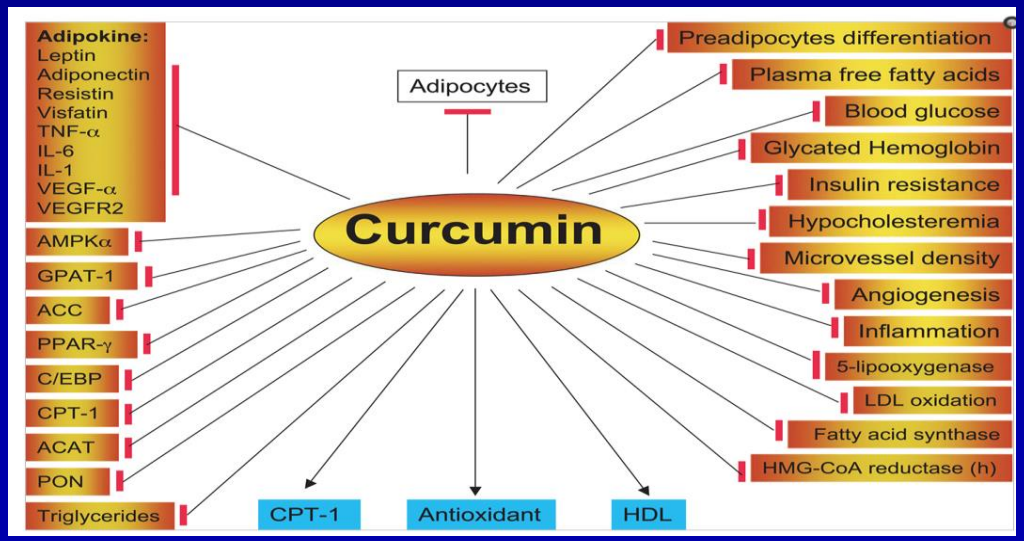
Horseradish 	Juniper Berry 	Kokum 	Lemongrass 	Marjoram 
Mint 	Mustard Seed 	Nutmeg 	Onion 	Oregano 
Parsley 	Pomegranate 	Pumpkin Seed 	Rosemary 	Saffron 
Sage 	Sesame Seed 	Star Anise 	Tomato 	Tamarind 
Thyme 	Turmeric 	Vanilla 	Wasabi 	

Targeting inflammation-induced obesity and metabolic diseases by curcumin and other nutraceuticals.

Aggarwal BB. Annual Review Nutrition 2010 Aug 21;30:173-99.







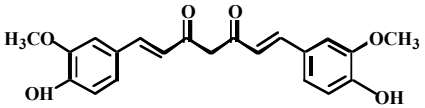
Molecular Targets of Nutraceuticals Derived from Dietary Spices

Potential Role in Suppression of Inflammation and Tumorigenesis

Aggarwal B, Van Kuiken ME,
Iyer LH, Harikumar KB, Sung B

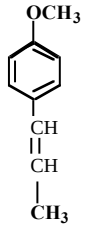
Experimental Biology & Medicine
2009 234(8):825-49.

Spices as NF-κB Inhibitors



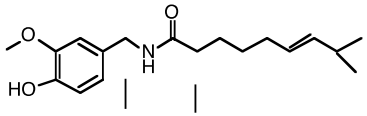
Curcuma longa
Turmeric

Curcumin



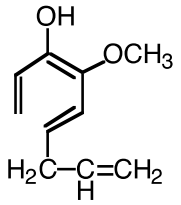
Foeniculum vulgare
Fennel

Anethole



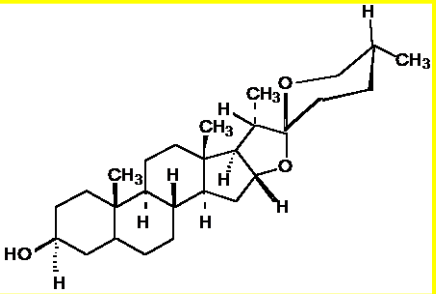
Capsicum annum
Red chilli

Capsaicin



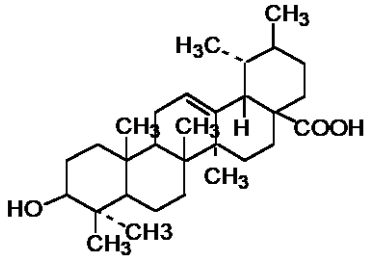
Eugenia caryophyllata
Cloves

Eugenol



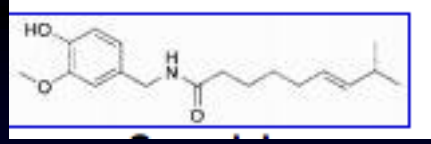
T. foenum-graecum
Fenugreek

Diosgenin



Ocimum sanctum
Holi basil

Ursolic Acid



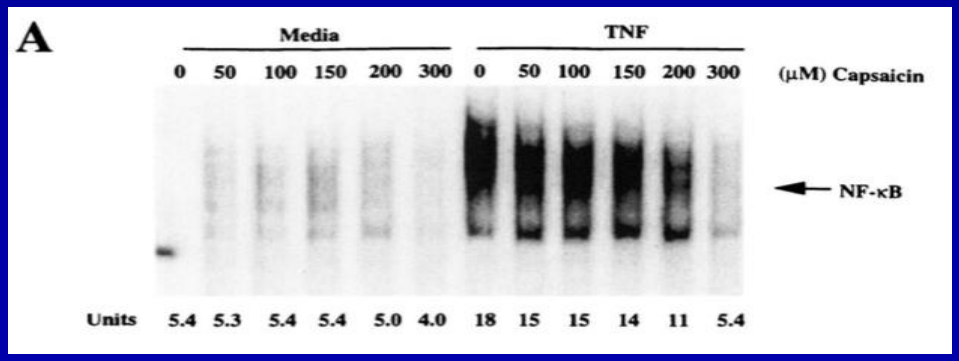
Red chilli

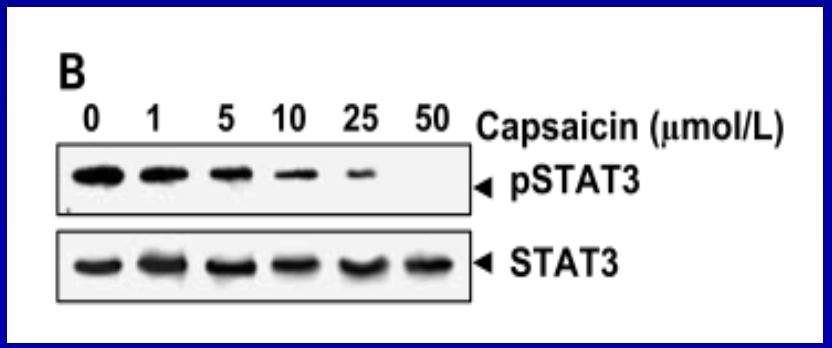
Capsaicin (8-methyl-N-vanillyl-6-nonenamide) is a potent inhibitor of NF-kB activation by diverse agents.

Singh S, Natarajan K, Aggarwal BB.
Journal of Immunology 1996 Nov 15;157(10):4412-20.

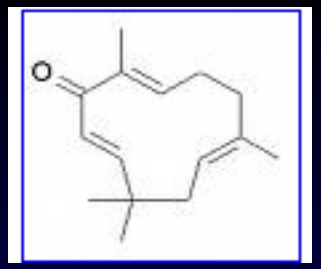
Capsaicin is a novel blocker of constitutive and interleukin-6-inducible STAT3 activation.

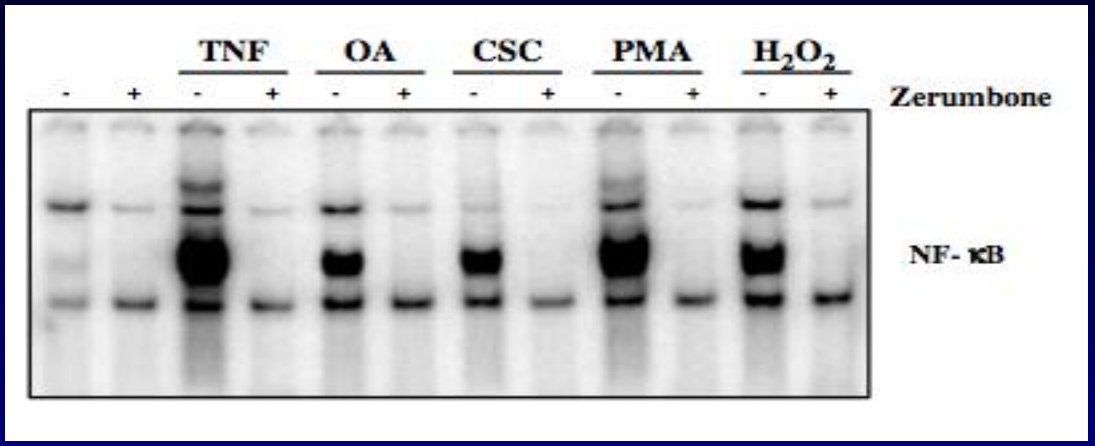
Bhutani M, Pathak AK, Nair AS, Kunnumakkara AB, Guha S, Sethi G, Aggarwal BB.
Clinical Cancer Research. 2007 May 15;13(10):3024-32.





Ginger



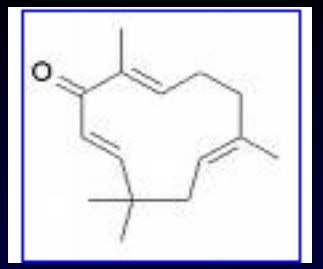


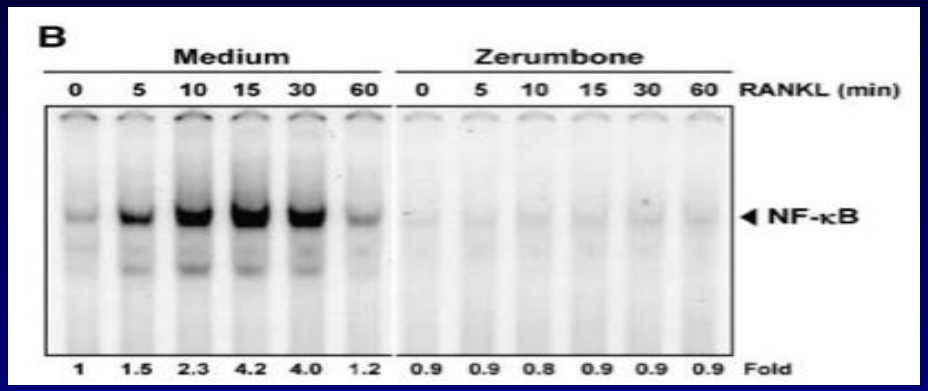
Zerumbone abolishes NF-kB and IkBa kinase activation leading to suppression of antiapoptotic and metastatic gene expression, upregulation of apoptosis, and downregulation of invasion.

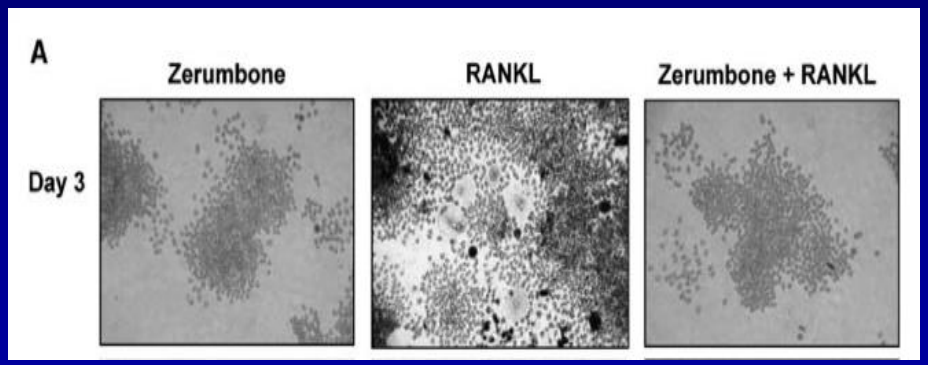
Takada Y, Murakami A, Aggarwal BB.

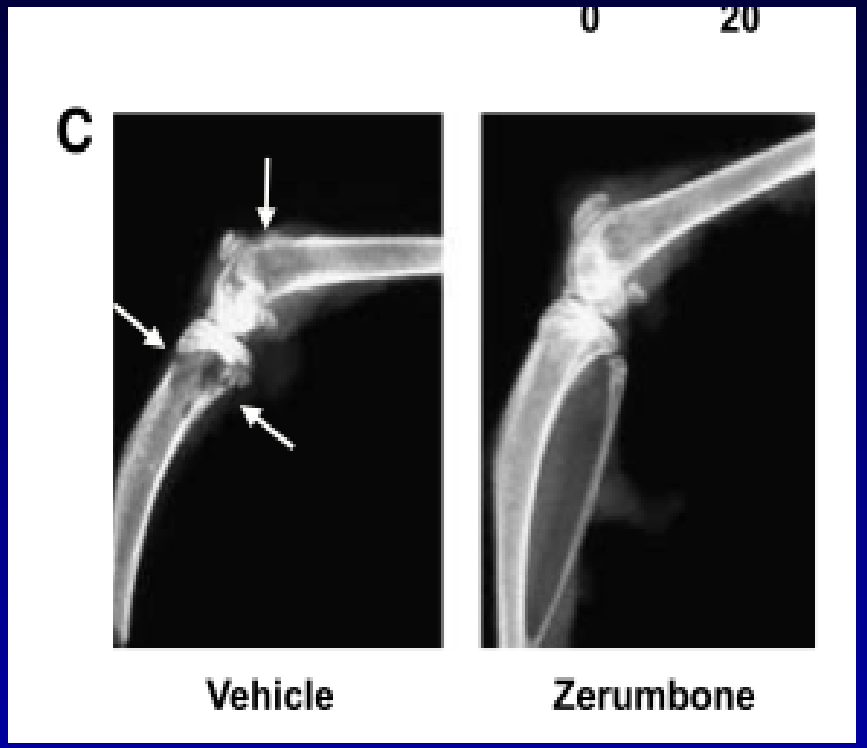
Oncogene.

Ginger





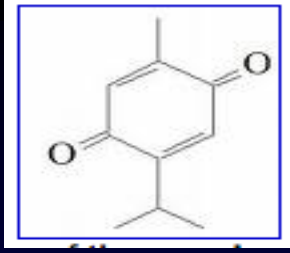


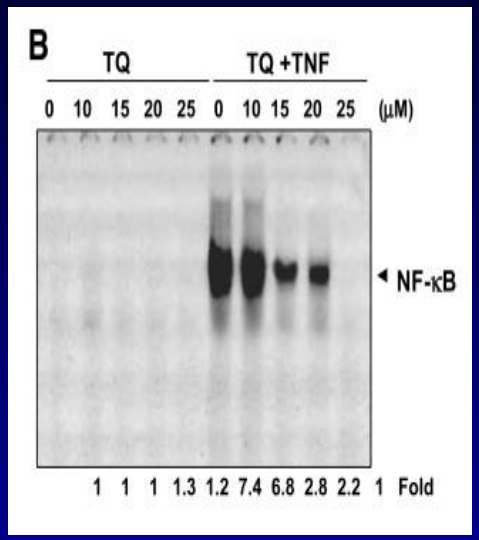


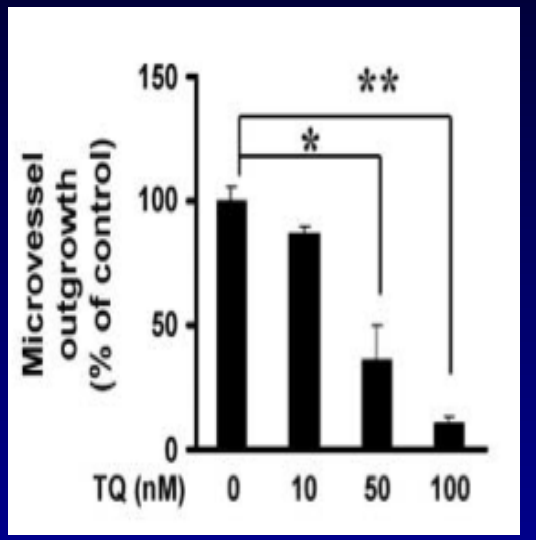
Zerumbone abolishes RANKL-induced NF-kB activation, inhibits osteoclastogenesis, and suppresses human breast cancer-induced bone loss in athymic nude mice.

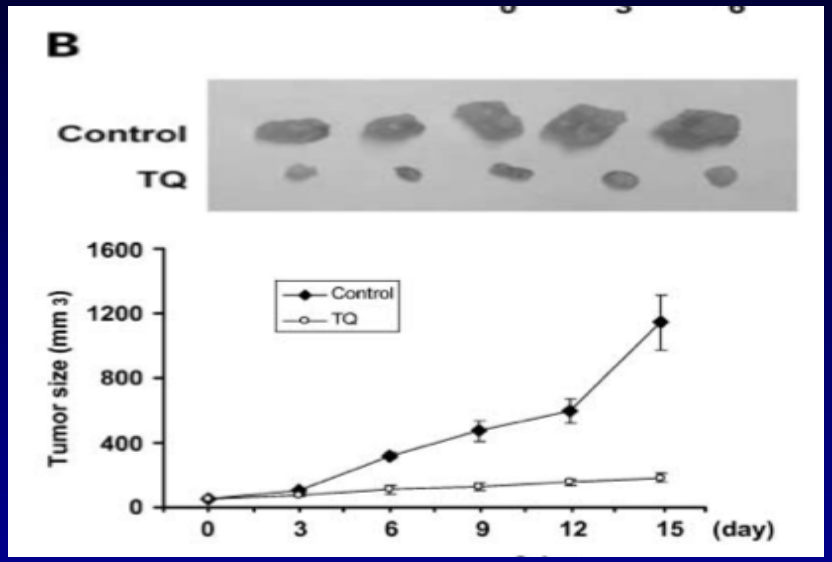
Sung B, Murakami A, Oyajobi BO, Aggarwal BB.
Cancer Research. 2009 Feb 15;69(4):1477-84.

Black cumin









Targeting NF-kB activation pathway by thymoquinone: role in suppression of antiapoptotic gene products and enhancement of apoptosis.

Sethi G, Ahn KS, Aggarwal BB.

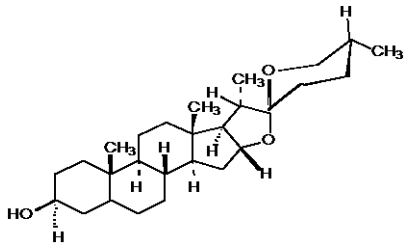
Molecular Cancer Research. 2008 Jun;6(6):1059-70.

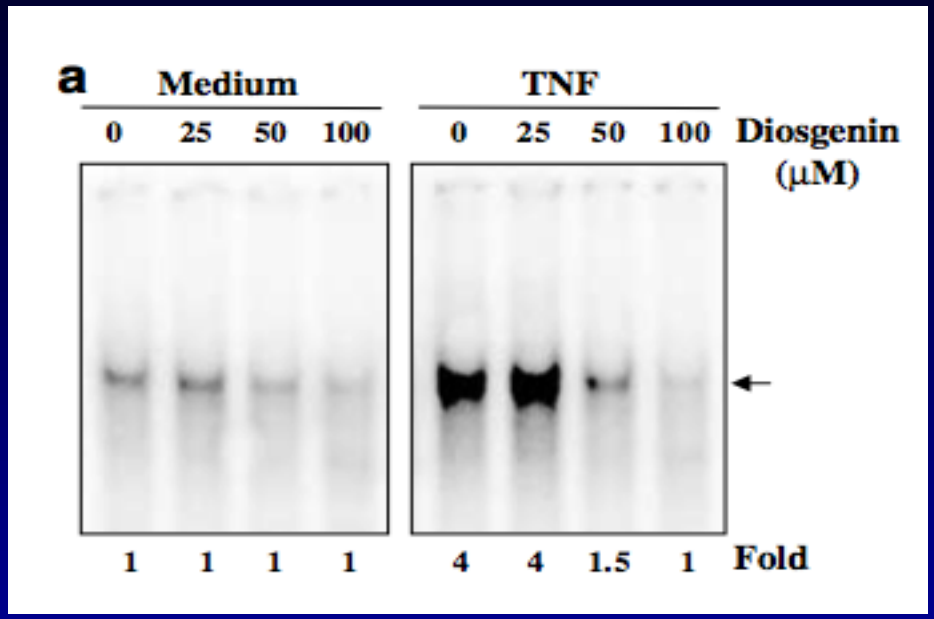
Thymoquinone inhibits tumor angiogenesis and tumor growth through suppressing AKT and extracellular signal-regulated kinase signaling pathways.

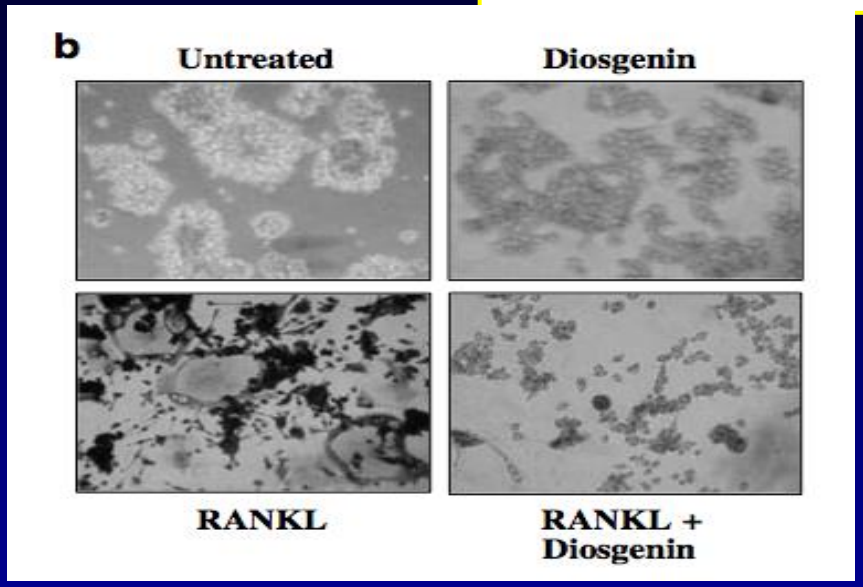
Yi T, Cho SG, Yi Z, Pang X, Rodriguez M, Wang Y, Sethi G, Aggarwal BB, Liu M.

Molecular Cancer Therapeutics. 2008 Jul;7(7):1789-96.

Fenugreek



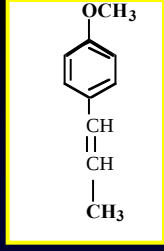


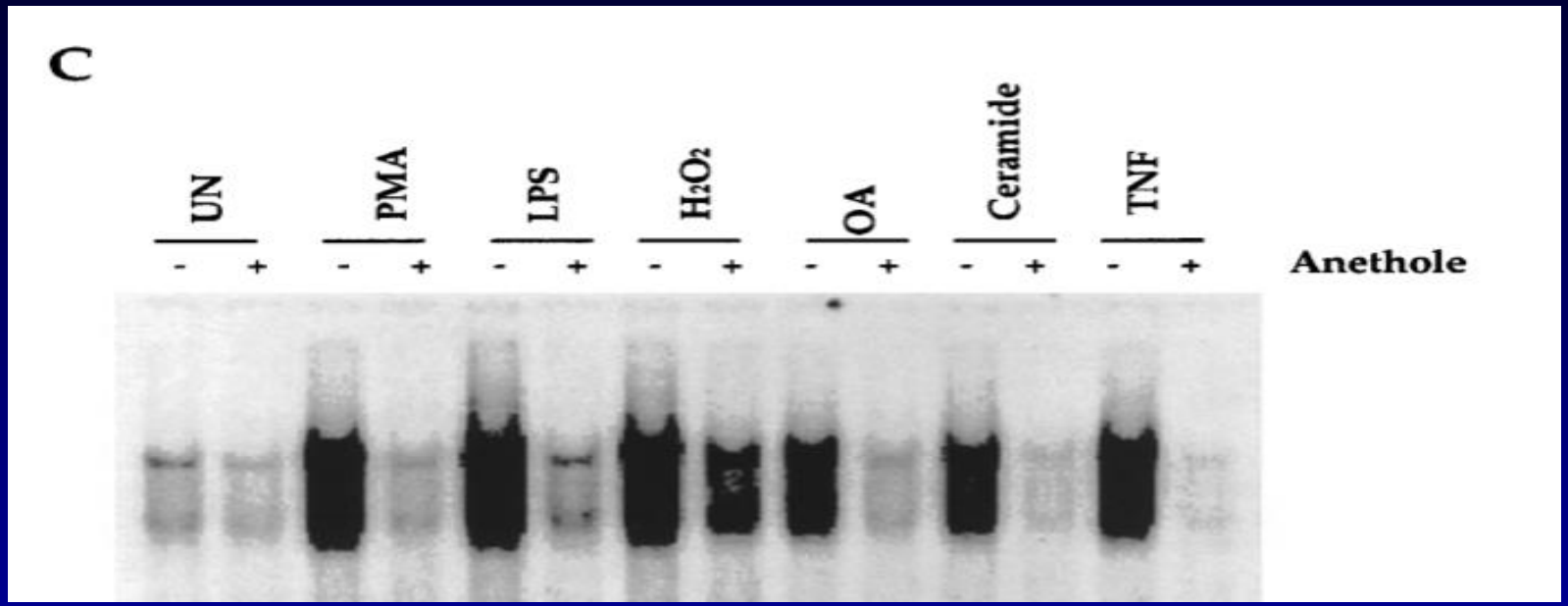


Diosgenin inhibits osteoclastogenesis, invasion, and proliferation through the downregulation of Akt, IkB kinase activation and NF-kB-regulated gene expression.

Shishodia S, Aggarwal BB.
Oncogene. 2006;25(10):1463-73.

Fennel





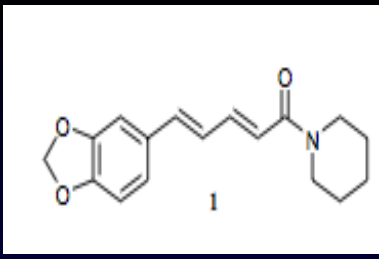
***Anethole* blocks both early and late cellular responses transduced by TNF: effect on *NF-kB*, AP-1, JNK, MAPKK and apoptosis.**

Chainy GB, Manna SK, Chaturvedi MM, Aggarwal BB.

Oncogene.

2000 Jun 8;19(25):2943-50.

Black pepper
(Piper indica)

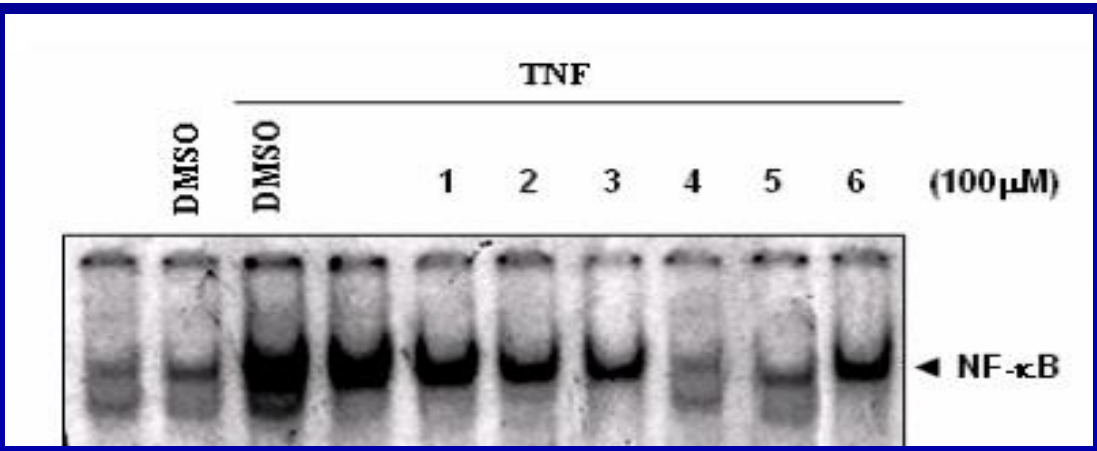


NPC Natural Product Communications

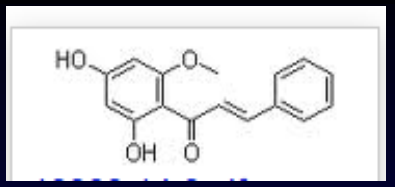
2010
Vol. 5
No. 8
1253 - 1257

Inhibitory Effects of Black Pepper (*Piper nigrum*) Extracts and Compounds on Human Tumor Cell Proliferation, Cyclooxygenase Enzymes, Lipid Peroxidation and Nuclear Transcription Factor-kappa-B

Yunbao Liu[1], Vivek R. Yadev[2], Bharat B. Aggarwal[2] and Muraleedharan G. Nair[1*]



Cardamom

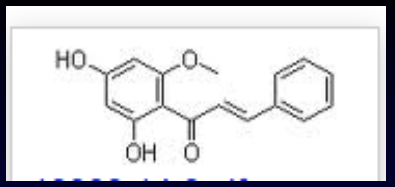


Cardamonin Sensitizes Tumor Cells to TRAIL Through ROS- and CHOP-Mediated Upregulation of Death Receptors and Downregulation of Survival Proteins.

Yadav VR, Prasad S, Aggarwal BB.

British Journal of Pharmacology
2012 Feb;165(3):741-53.

Cardamom



OPEN ACCESS Freely available online

PLOS ONE

RANKL Signaling and Osteoclastogenesis Is Negatively Regulated by Cardamonin

Bokyung Sung[1☯], Sahdeo Prasad[1☯], Vivek R. Yadav[1], Subash C. Gupta[1], Simone Reuter[1], Norio Yamamoto[2], Akira Murakami[3], Bharat B. Aggarwal[1*]

1 Cytokine Research Laboratory, Department of Experimental Therapeutics, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America, **2** Food Science Research Center, House Wellness Foods Corporation, Itami, Japan, **3** Division of Food Science and Biotechnology, Graduate School of Agriculture, Kyoto University, Kyoto, Japan

Food as Medicine:

Kiwifruit, Chinese gooseberry," (Actinidia deliciosa, Actinidiaceae)

- *Kiwifruit provides fiber, potassium, folate, phosphorus, copper, and vitamins A, C, E, and K*
- *Kiwifruit is also a good source of fiber, which contributes to its laxative effect.*
- *One of the interesting compounds present in kiwifruit is actinidin, an enzyme that helps to hydrolyze proteins.*
- *Plant pigments present in kiwifruit include carotenoids and chlorophylls, and some cultivars also contain anthocyanins.*
- *The fruit of A. chinensis was used as a juice to quench thirst, aid digestion, clear heat, and reduce irritability, inflammation, and vomiting*

Haldi (Turmeric) is Healthy

Bharat B. Aggarwal, Ph.D.

Anti-Inflammation Research Institute, San Diego, California;

Former Professor & Chief, Cytokine Research, Department of Experimental Therapeutics, The University of Texas, M.D. Anderson Cancer Center, Houston, Texas, U.S.A.

Former Senior Scientist, Genentech Inc., South San Francisco, California
PDF, University of California, San Francisco; Ph.D., University of California, Berkeley, CA

Plenary Talk on Wednesday, August 3rd, 2016
Hosted by Dr. Sanni Raju, Ph.D., R.Ph., CEO & Chairman
Natreon Inc.; 2D Janine Place ; New Brunswick, NJ 08901
(732) 296-1080; (732) 296-1075; info@natreoninc.com

Turmeric (Curcuma Longa)

Turmeric (Curcuma Longa)

Turmeric/curcumin supplement sales grow 26%, total herbal supplements sales top $6 billion for the first time

By Stephen DANIELLS, 03-Sep-2014
Last updated on 03-Sep-2014 at 17:55 GMT

Related tags: Herbal dietary supplements, Turmeric, Curcumin, Cranberry, Yohimbe, Black cohosh, American Botanical Council

Turmeric's rise is impressive, given it ranked third in 2011 and 2012. Making up the rest of the five top-selling herbal supplements in the natural channel were grass (wheat and barley; *Triticum aestivum* and *Hordeum vulgare*, respectively); flaxseed (*Linum usitatissimum*) and/or flax oil; aloe vera (*Aloe vera*); and spirulina/blue-green algae (*Arthrospira* spp.).

Estimated total sales of herbal dietary supplements in the US reached $6 billion for the first time, an increase of 7.9% from 2012 to 2013. Sales in both the mainstream market channel (food, drug, and mass-market stores, plus club and convenience stores) and the natural channel grew by 7.7% and 8.8%, respectively, in 2013 over 2012, said the report.

Haldi, an Indian restaurant on the Curry Hill strip of Lexington Avenue, specializing in the cooking of the city of Kolkata in West Bengal.

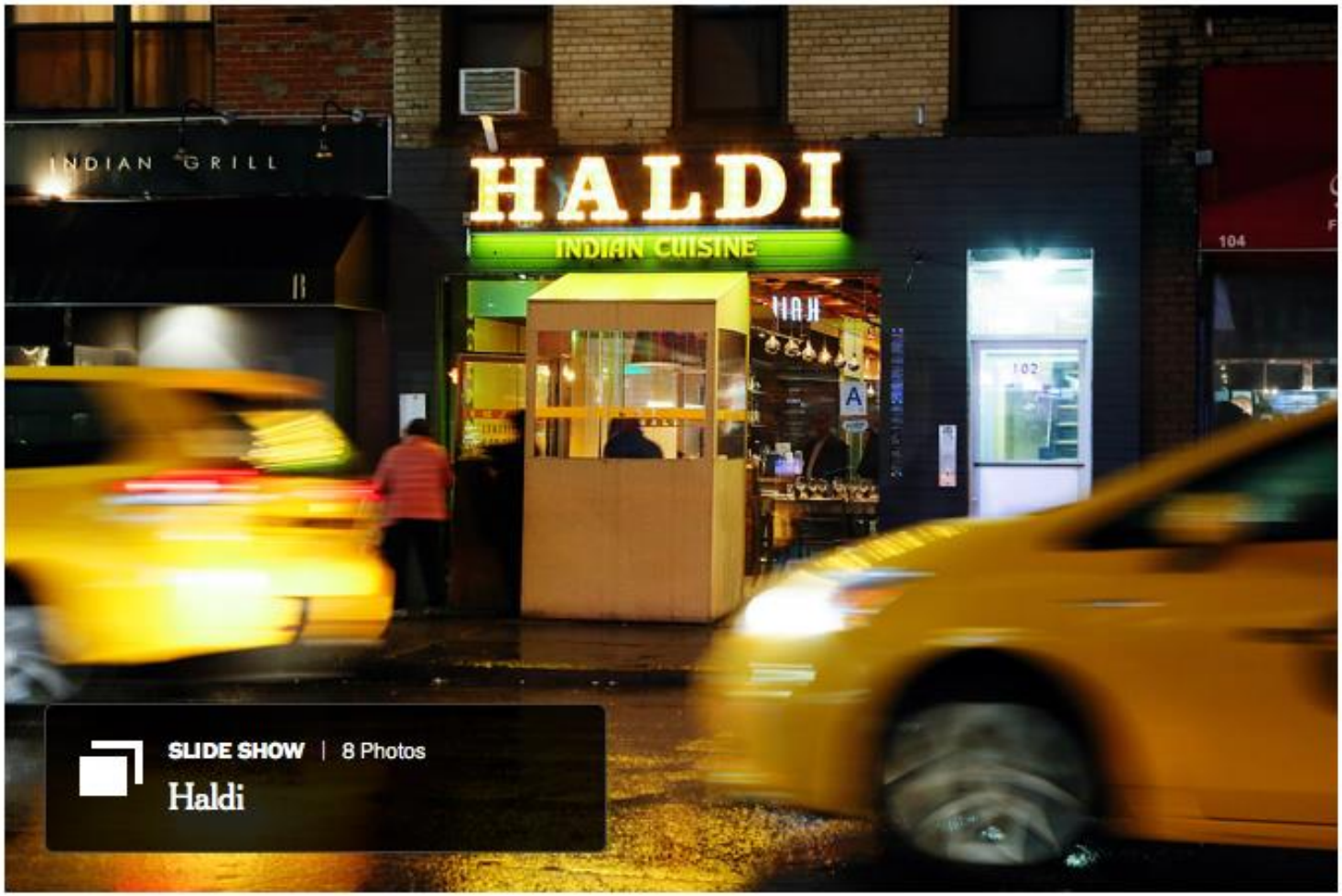
Eric Marsh Moran for The New York Times

In Curry Hill, a New Kid on the Block

Haldi in Midtown South

Haldi NYT Critics' Pick

MARCH 19, 2015



Eric Marsh Moran for The New York Times

Haldi means turmeric in Hindi, thus the sunny yellow chairs, under chandeliers of green bottles and copper wok-like pans called kadhais, inverted and fixed to the ceiling.

Eric Marsh Moran for The New York Times.Haldi

Turmeric Cookies and Latte

Fig 1

Capsules

Candy

Cream

Soup

Gummy

Drinks

Face Cream

Drink

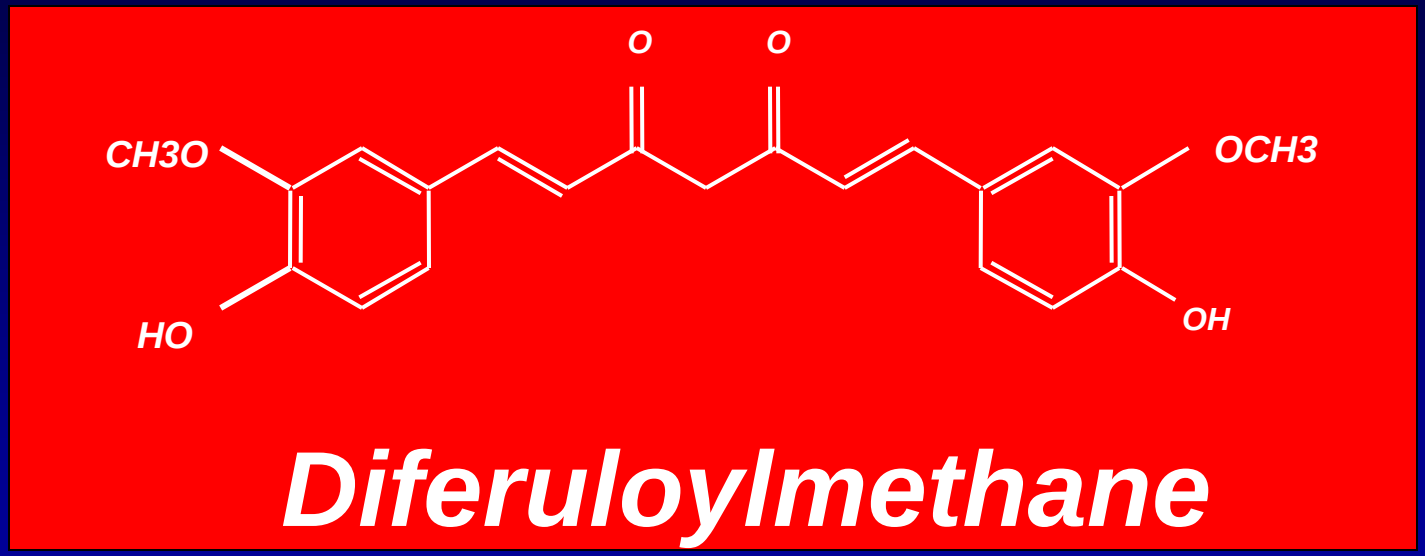
Soap

A golden journey!

Curcumin:

Getting Back to Our Roots!

Structure of Curcumin
From turmeric (curry powder)



Diferuloylmethane

Milobedzka J., von Kostnecki St, and Lampe V: Zur Kenntnis des curcumins. Ber Deutsch Chem Ges, 1910, 43, 2163-2170

Curcumin data base

1186 curcumin analogs,

195 molecular targets,

9075 peer reviewed publications,

489 patents and

176 varieties of C. longa

Database (Oxford). 2015 Jul 27;2015:bav070.
Curcumin Resource Database.
Kumar A, Chetia H, Sharma S, Kabiraj D, Talukdar NC, Bora U

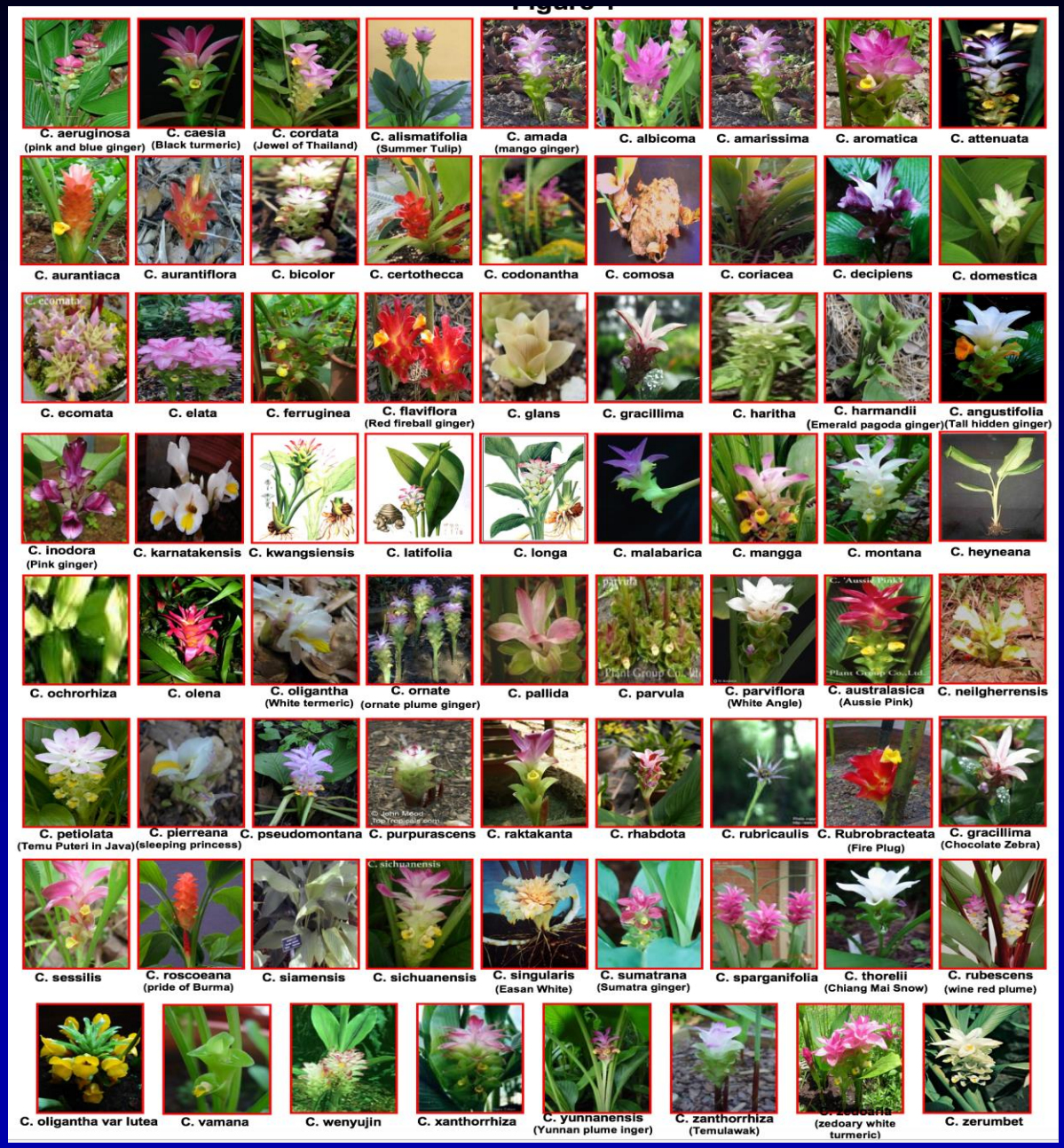

Trends in Pharmacological Sciences
Trends Pharmacol. Sci. February 2006 Vol. 30 No. 2, pp. 55–104 ISSN 0165-6147
Pharmacology of curcumin
IL-17 in human disease
Discovering GAPCs
Plasticity of adult hippocampal progenitors
Cell Press

Pharmacological basis for the role of curcumin in chronic diseases: an age-old spice with modern targets.

Aggarwal BB, Sung B.

Trends Pharmacological Sciences. 2009 Feb;30(2):85-94.

Curcuma Family

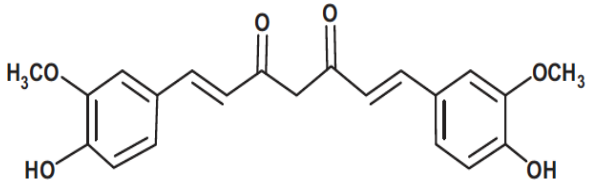


Vogel (1842):
Isolated curcumin

Milobedzka (1910):
Identified structure of curcumin

Lampe (1913):
Synthesized curcumin

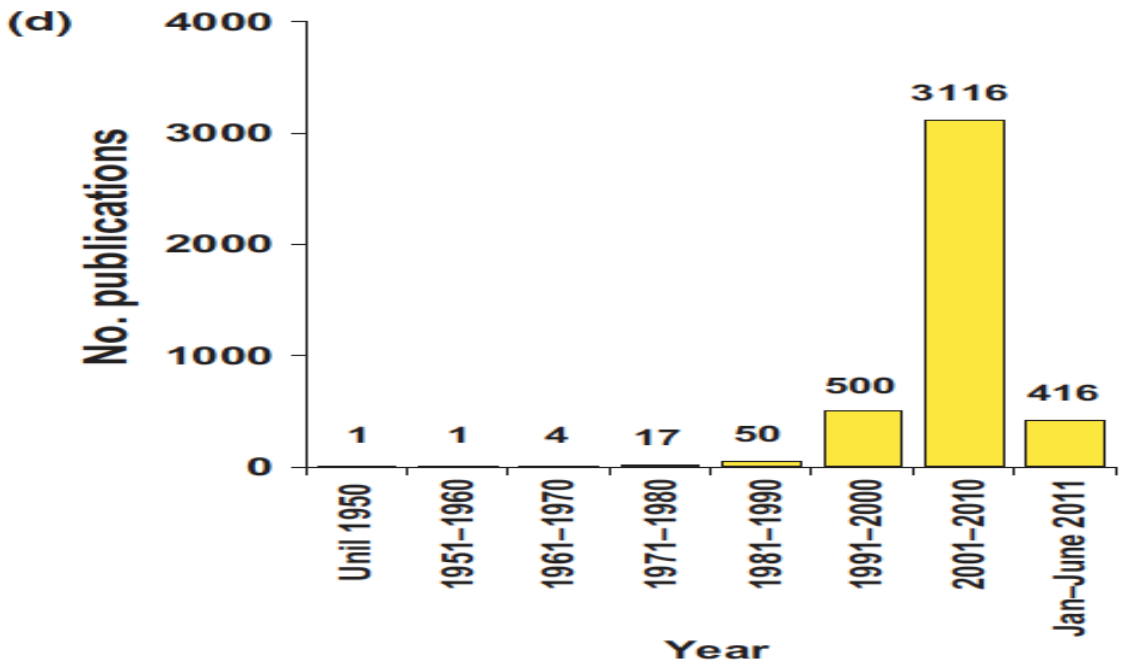
Srinivasan (1953):
Discovered that curcumin is a mixture



Curcumin

(c) **Antibacterial Action of Curcumin and Related Compounds**

INVESTIGATIONS by A. R. Todd[1], H. Rinderknecht[2] W. B. Geiger[3] and others have shown that many unsaturated ketones with the grouping —C=C—CO— also present in a number of naturally occurring antibiotics, possess antibacterial action. In our studies on unsaturated ketones, we found that chalkone flavanone, flavone and some of their derivatives for example, buteine (2,4,3′,4′-tetrahydroxychalkone) a substance of vegetable origin, showed a marked



Discovery of curcumin, a component of golden spice, and its miraculous biological activities.
Gupta SC, Patchva S, Koh W, Aggarwal BB.
Clinical and Experimental Pharmacology and Physiology. 2012 Mar;39(3):283-99.

Curcumin From turmeric

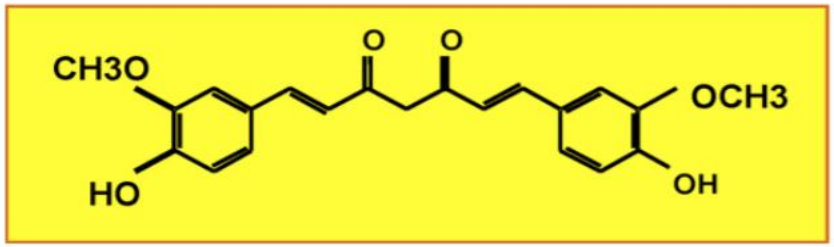
Curcuma longa

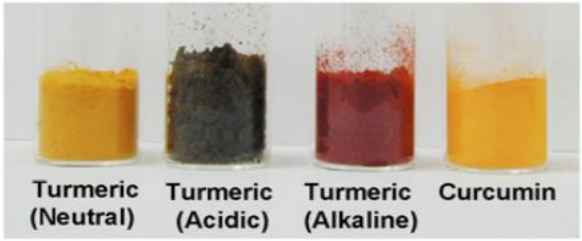
Rhizome

Dried rhizome

Blend (Turmeric)

Extract in 95% ethanol for 24 h, filter and dry





Tetrahydrocurcumin (THC)

Curcumin based products

Antibacterial action of curcumin and related compounds.

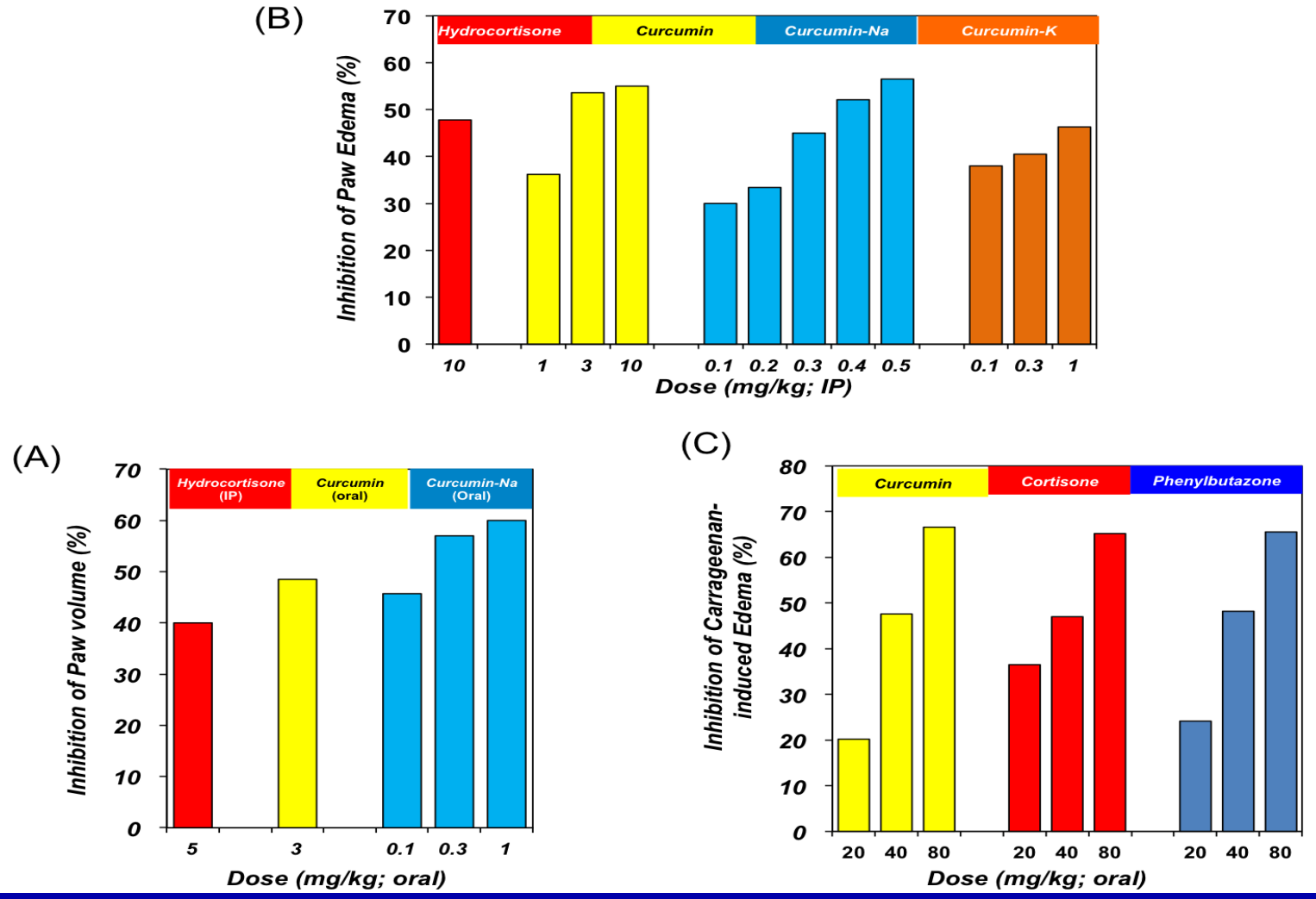
SCHRAUFSTATTER E, BERNT H.

Nature.

1949 Sep 10;164(4167):456.

Curcumin is as potent as hydrocortisone and phenylbutazone

Fig. 1

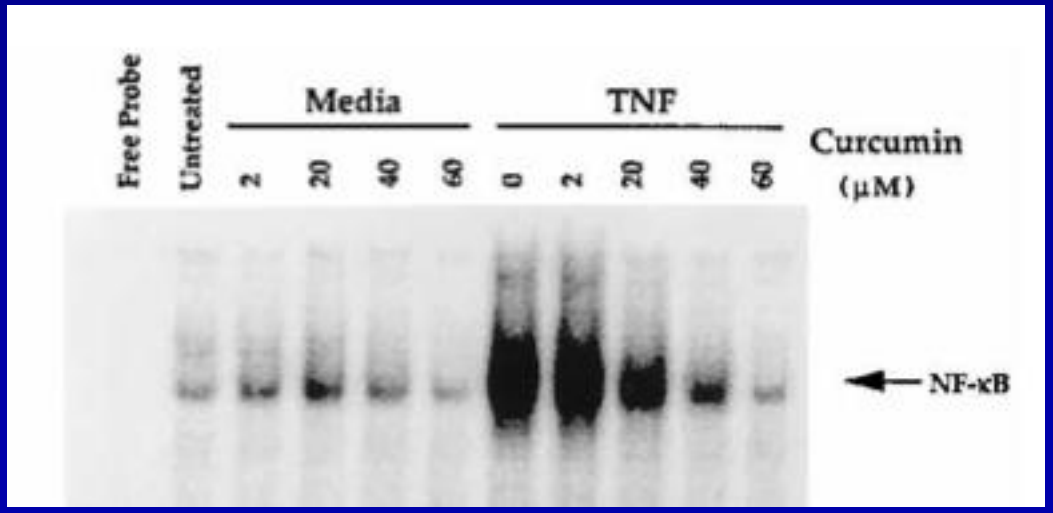


Anti-inflammatory and irritant activities of curcumin analogues in rats. Mukhopadhyay A et al Agents Actions. 1982

Activation of transcription factor Nuclear Factor-kappa B is suppressed by curcumin

Singh S, and Aggarwal BB.

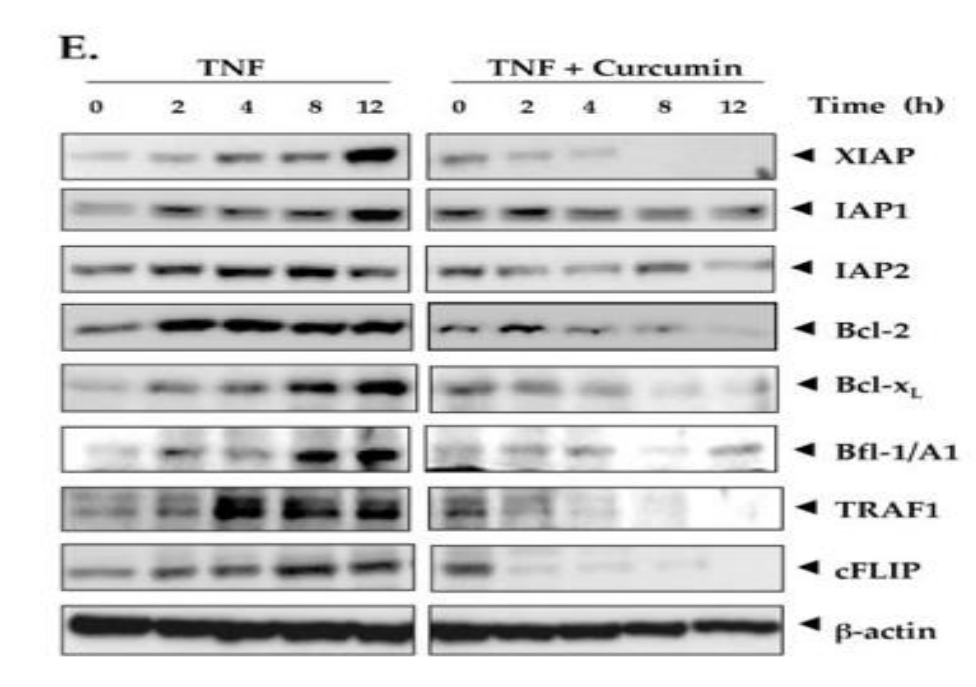
J Biol Chem. 1995 Oct 20;270 (42):24995-5000.

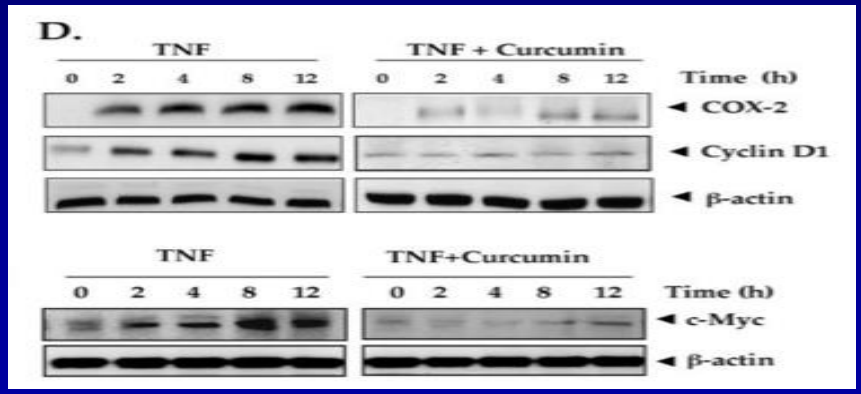


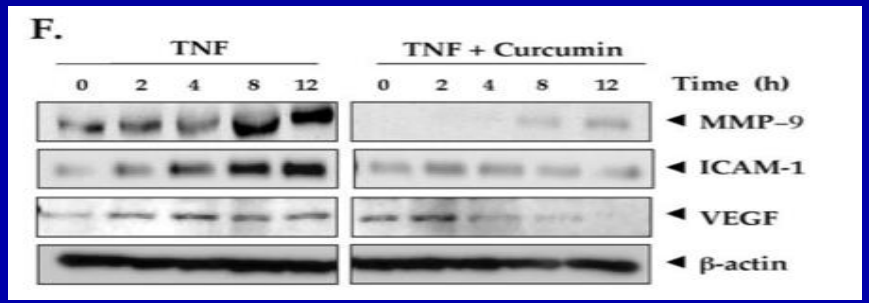
Curcumin Downregulates Expression of Cell Proliferation, Antiapoptotic and Metastatic Gene Products Through Suppression of IκBα Kinase and AKT Activation

Aggarwal S, Ichikawa H, Takada Y, Sandur SK, Shishodia S, Aggarwal BB.

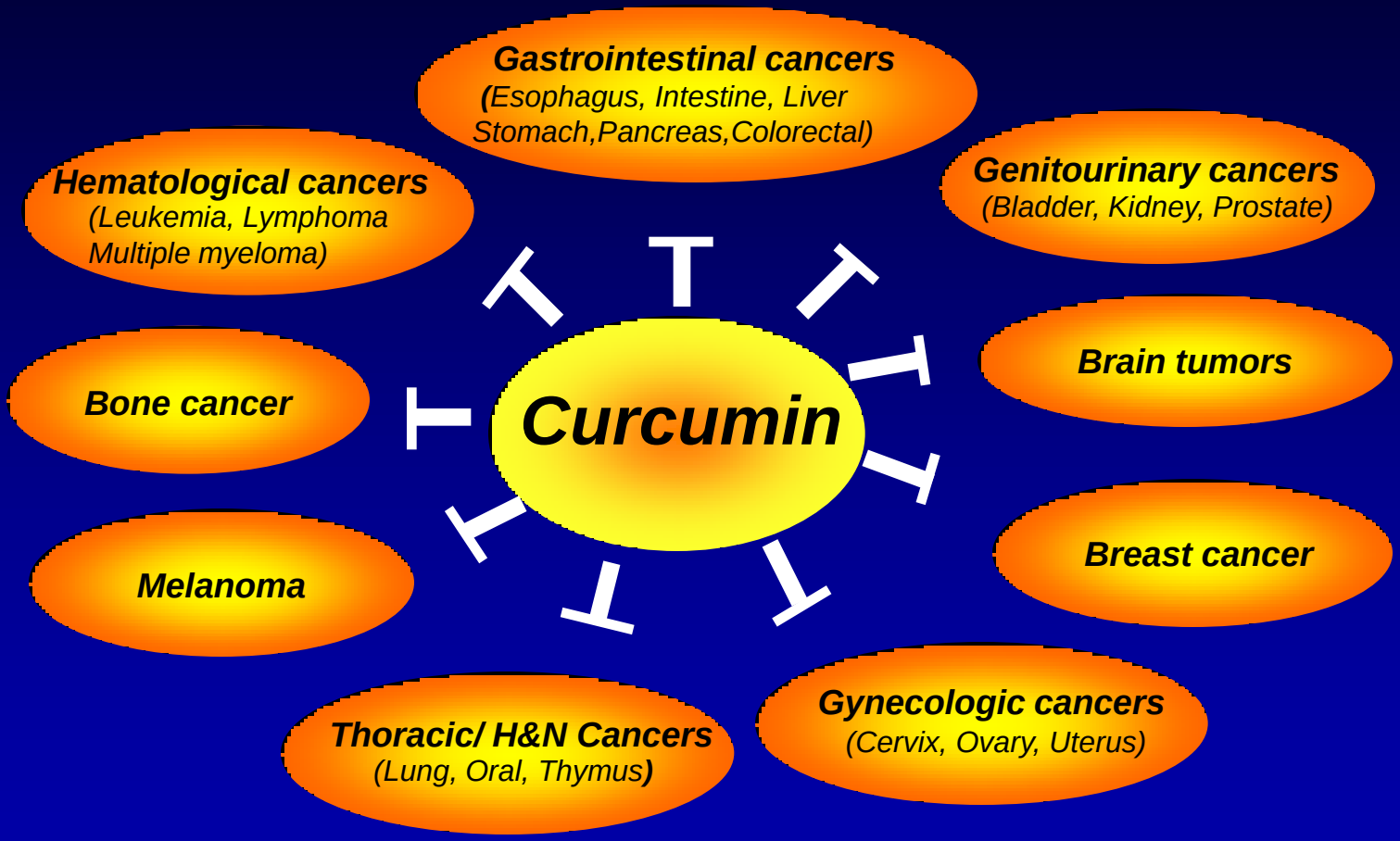
Molecular Pharmacology
[2006 Jan;69(1):195-206]







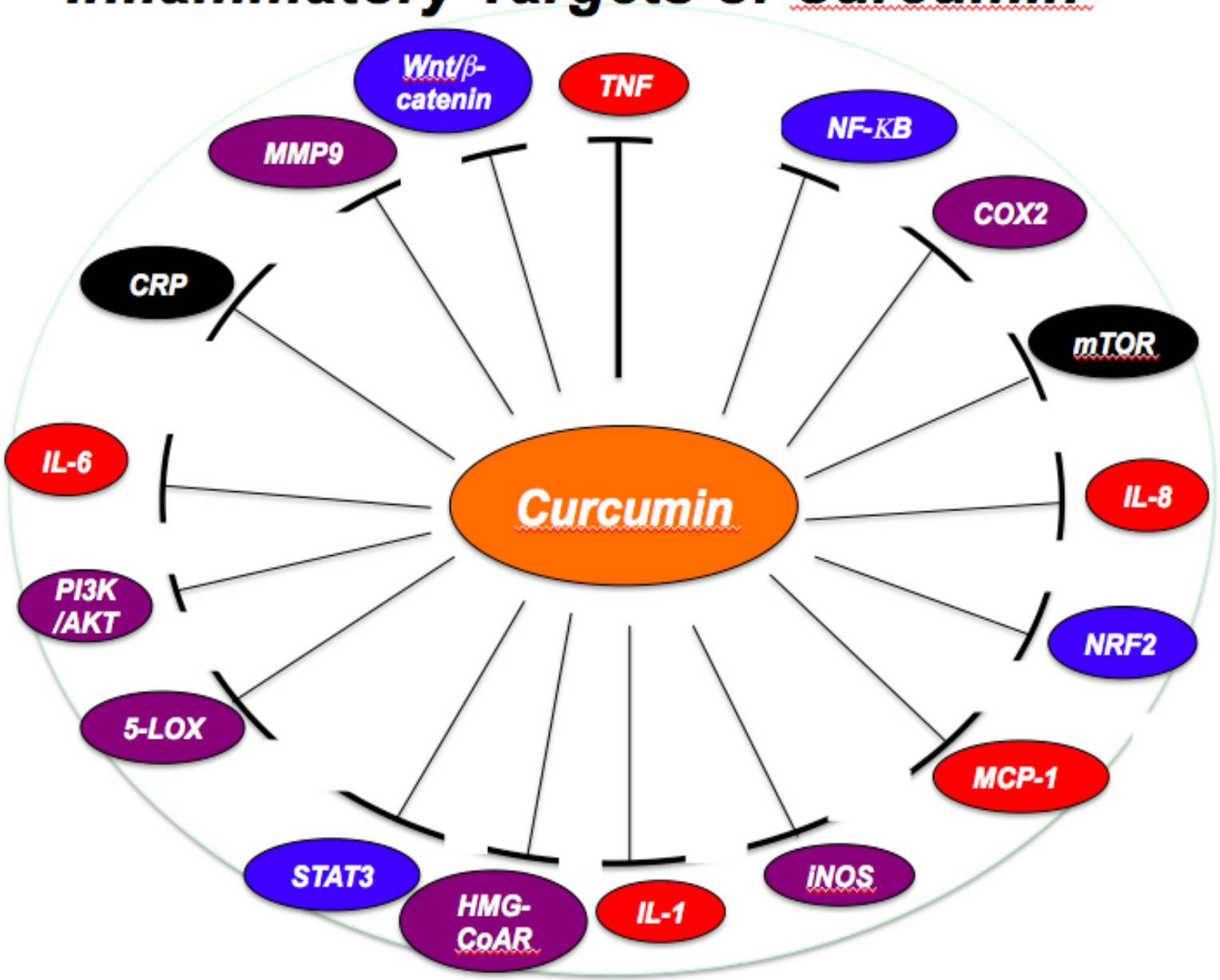
Preclinical data with curcumin against various cancers



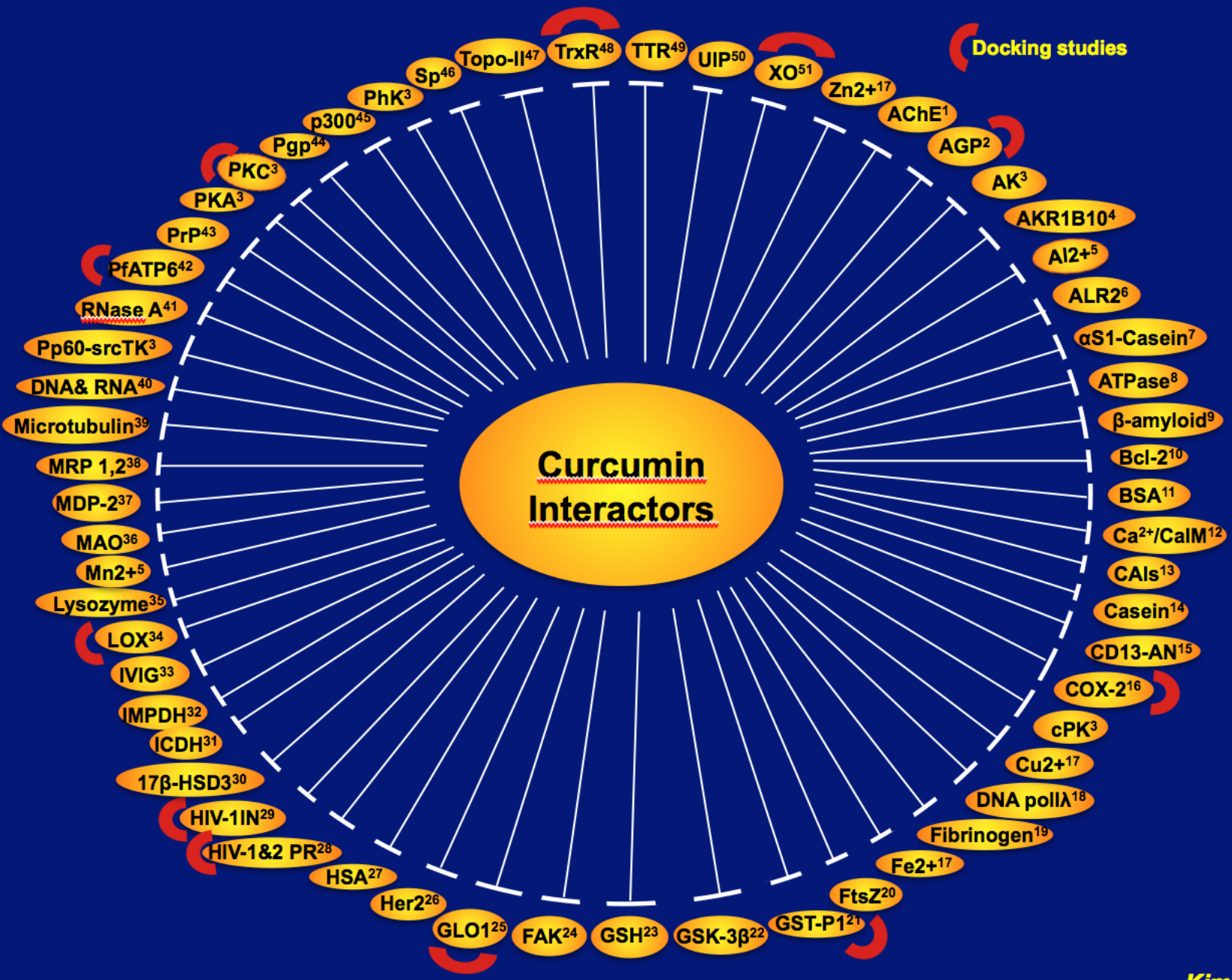
Curcumin and cancer: an "old-age" disease with an "age-old" solution.

Anand P, Sundaram C, Jhurani S, Kunnumakkara AB, Aggarwal BB. Cancer Lett. 2008;267:133-64.

Inflammatory Targets of Curcumin



Curcumin binders



[1]Ahmed T, 2009
[2]Zsila F, 2004
[3]Reddy S, 1994
[4]Matsunaga T, 2009
[5]Lin R, 2008
[6]Muthenna P, 2009
[7]Sneharani AH, 2009
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[33]Liu Y, 2008
[34]Jankun J, 2006
[35]Wang SS, 2009
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[41]Sahoo BK, 2009
[42]Ji HF, 2009
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[44]Chearwae W, 2004
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[47]Martin-Cordero C, 2003
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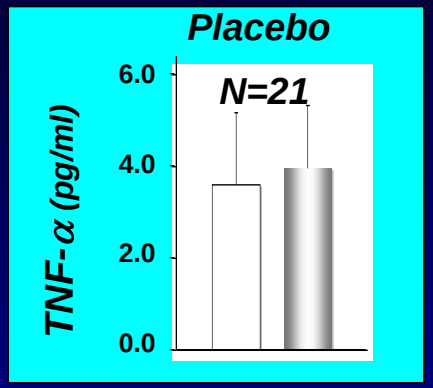
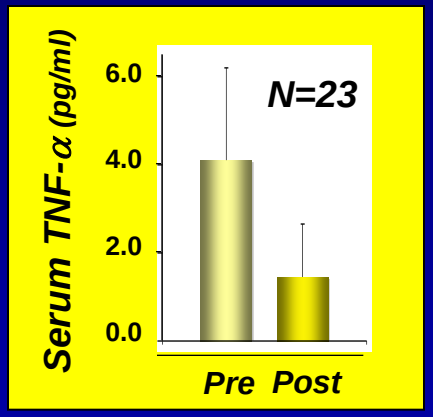
[49]Pullakhandam R, 2009
[50]Mullally JE, 2002
[51]Shen L, 2009

Kim 11-03-2010

Evidence that curcumin is an orally bioavailable TNF-a blocker in human





Curcumin
(150 mgx2 daily)

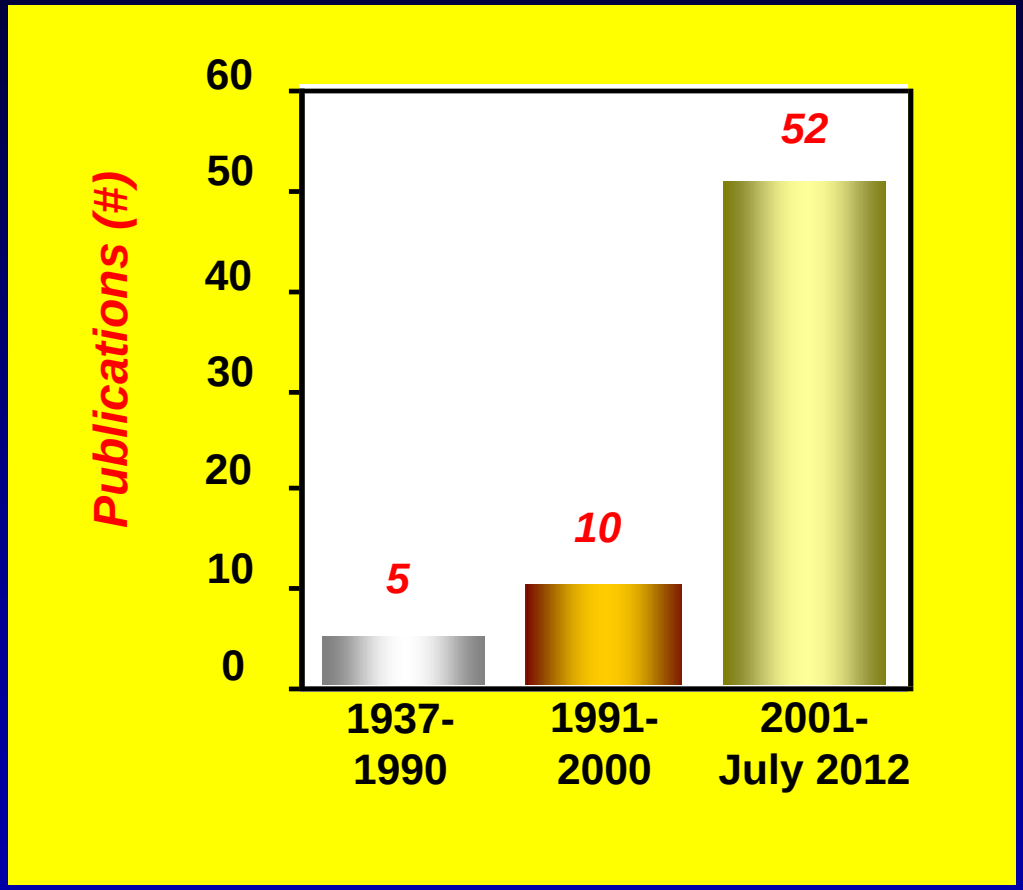
8 wks

Usharani, 2008

To date, more than 65 human clinical trials of curcumin, which included more than 1000 patients, have been completed, and as many as 35 clinical trials are underway!

Therapeutic Role of Curcumin:

Lessons Learned from Clinical trials



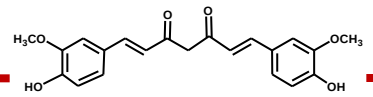
Gupta, Patchva and Aggarwal:

AAPS J. (in press)

Curcumin Clinical Trials?

Cancer
- Colorectal cancer
- Pancreatic cancer
- Breast cancer
- Prostate cancer
- Multiple myeloma
- Lung cancer
- Cancer lesions
- Head and neck cancer

Inflammatory diseases
- Crohn disease
- Ulcerative proctitis
- Ulcerative colitis
- Inflammatory bowel disease
- Irritable bowel syndrome
- Rheumatoid arthritis
- Osteoarthritis
- Chronic anterior uveitis
- Recurrent anterior uveitis
- Post operative Inflammation
- Gastric ulcer
- Peptic ulcer
- H. pylori infection
- Idiopathic orbital inflammatory Pseudotumor



Curcumin

Skin diseases
- Vitiligo
- Psoriasis

Neurodegenerative diseases
- Dejerine-Sottas disease
- Alzheimer's disease

Cardiovascular diseases
- Acute coronary syndrome
- Atherosclerosis

Metabolic diseases
- Diabetes
- Diabetic nephropathy
- Diabetic microangiopathy
- Lupus nephritis

Renal diseases
- Renal transplantation

Viral diseases
- Acquired immunodeficiency syndrome

OTHERS
- β-Thalassemia
- Biliary dyskinesia
- Gallbladder contraction
- Recurrent respiratory tract infections
- Cholecystitis
- Hepatoprotection
- Chronic arsenic exposure
- Alcohol intoxication
- Chronic bacterial prostatitis

Gupta, Patchva and Aggarwal:, AAPS J. (in press)

Curcumin Clinical Trials (120)

- Panahi, 2015
- Panahi, 2014
- Lopresti, 2014
- Nakayama, 2014
- Henrotin, 2014
- Panahi, 2014
- Ganjali, 2014
- Abidi, 2014
- Kuptniratsaikul, 2014
- Soare, 2014

- Panahi, 2014
- Klickovic, 2014
- Takahashi, 2014
- Jager, 2014
- Singla, 2014
- Sanmukhani, 2014
- Belcaro, 2014
- Cheungsamarn, 2014
- Basu, 2013
- Hejazi, 2013

- Morimoto, 2013
- Marciani, 2013
- Moreillon, 2013
- Ryan, 2013
- Elad, 2013

- Bergman, 2013
- ~~Peek, 2013~~
- Kanai, 2013
- Muglikar, 2013
- Mohammadi, 2013

- Suskind, 2013
- Sahebkar, 2013
- Na, 2013
- Vaolak, 2013
- Irving, 2013
- Ledda, 2012
- Steigerwalt, 2012
- Akazawa, 2012
- Panahi, 2012
- Kudva, 2012

- DiSilvestro, 2012
- Cheungsamarn, 2012
- He, 2012
- Wongharoen, 2012
- Golombick, 2012
- Sugawara, 2012
- Chandran, 2012
- Vitaglione, 2012
- Chainani-Wu, 2012
- Kusuhara, 2012

- Araujo, 2012
- Pinsornsak, 2012
- Wolff, 2012
- Panahi, 2012
- Chainani-Wu, 2012
- Khajehdehi, 2012
- Kanai, 2012
- Appendino, 2011
- Mishra, 2011
- Pungcharoenkul, 2011

- Agarwal, 2011
- Khajehdehi, 2011
- Sasaki, 2011
- Cuomo, 2011
- Carroll, 2011
- Aggarwal, 2011
- Kanai, 2011
- He, 2011
- Belcaro, 2010
- Asawanonda, 2010

- Ide, 2010
- Sannia, 2010
- Koosirirat, 2010
- Dominiak, 2010

- Biswas, 2010
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- Di Mario, 2007
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- Plummer, 2001
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- Sharma, 2001
- Heng, 2000

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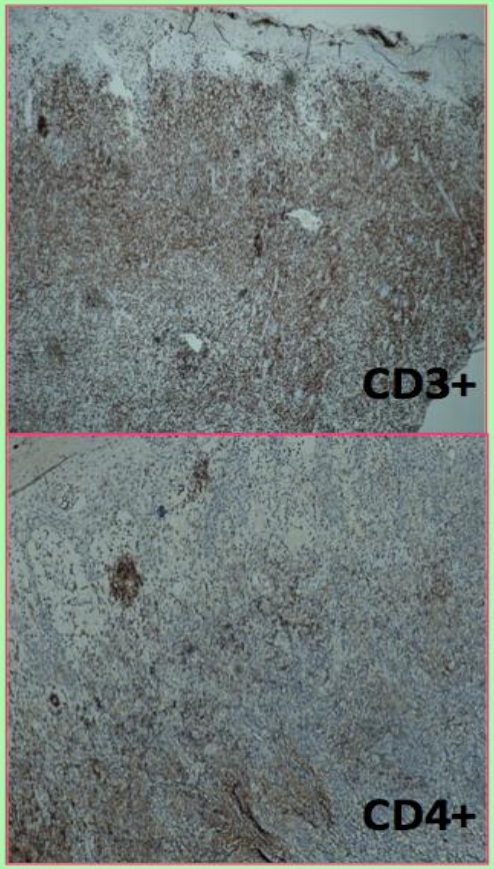
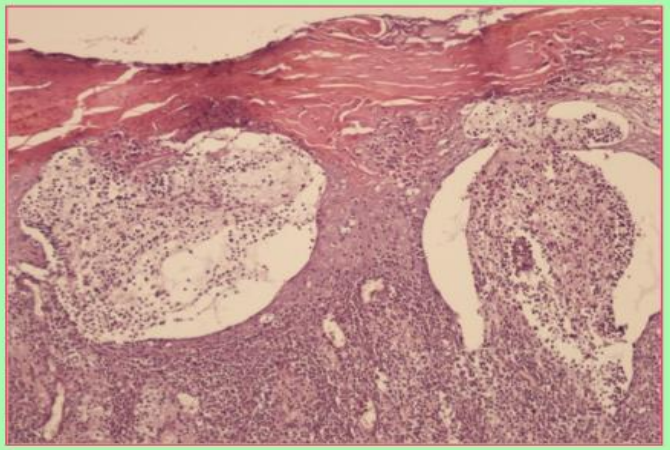
- Niederau, 1999
- Lal, 1999
- Rasyid, 1999
- Shoba, 1998
- James, 1996
- Satoskar, 1986
- Deodhar, 1980
- Pilz, 1975



Curcumin as local application on the lesion of a Bulgarian tumor stage CTCL patient



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Curcumin & Psoriasis Clinical Trials

Treatment of psoriasis with Psoria-Gold

Before

11-07-2003

After

4 weeks

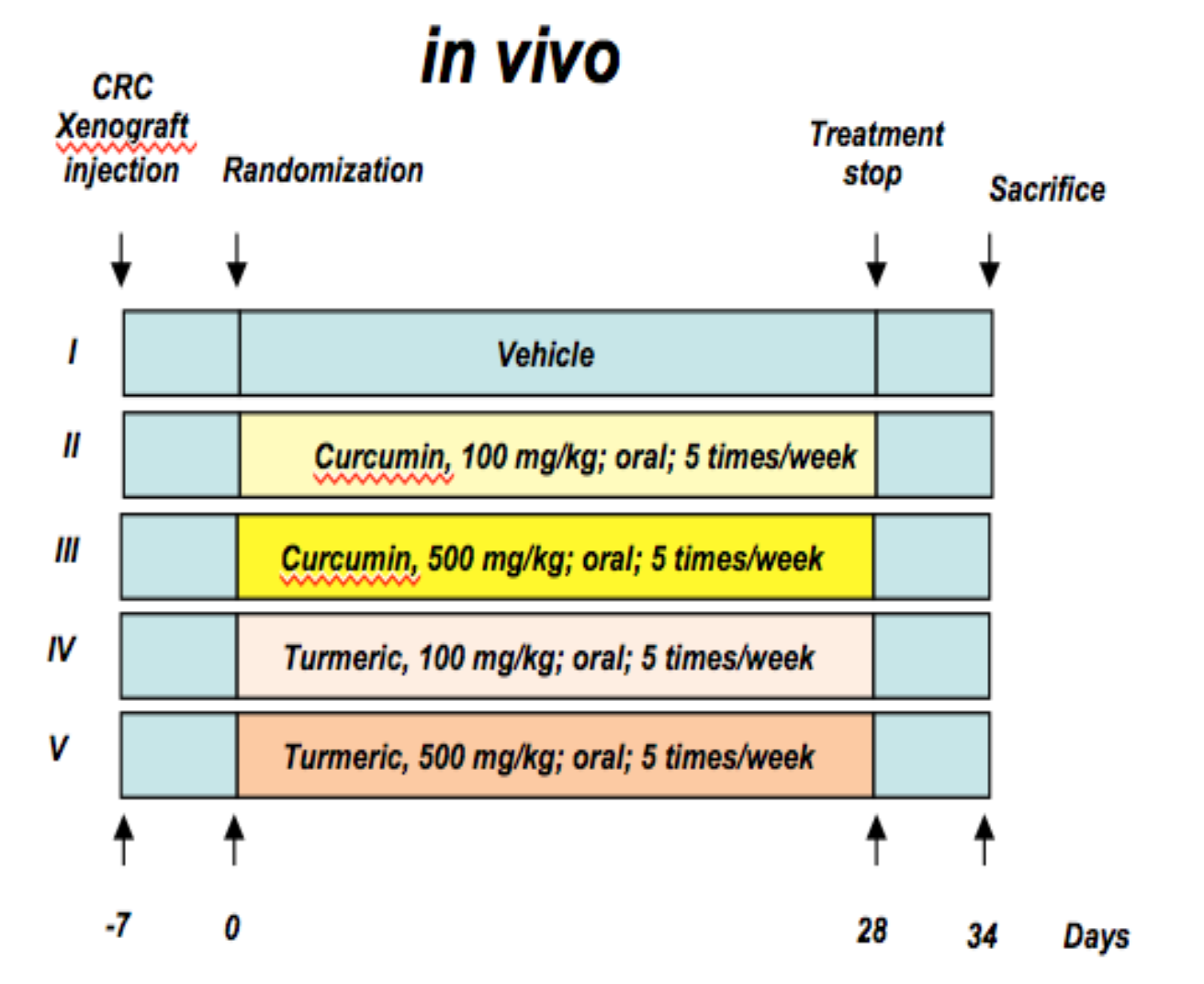
12-05-2003

MCY Heng, MK Song, J. Harker and MK Heng, Br. J. Dermatology, 143, 2000, 937-949

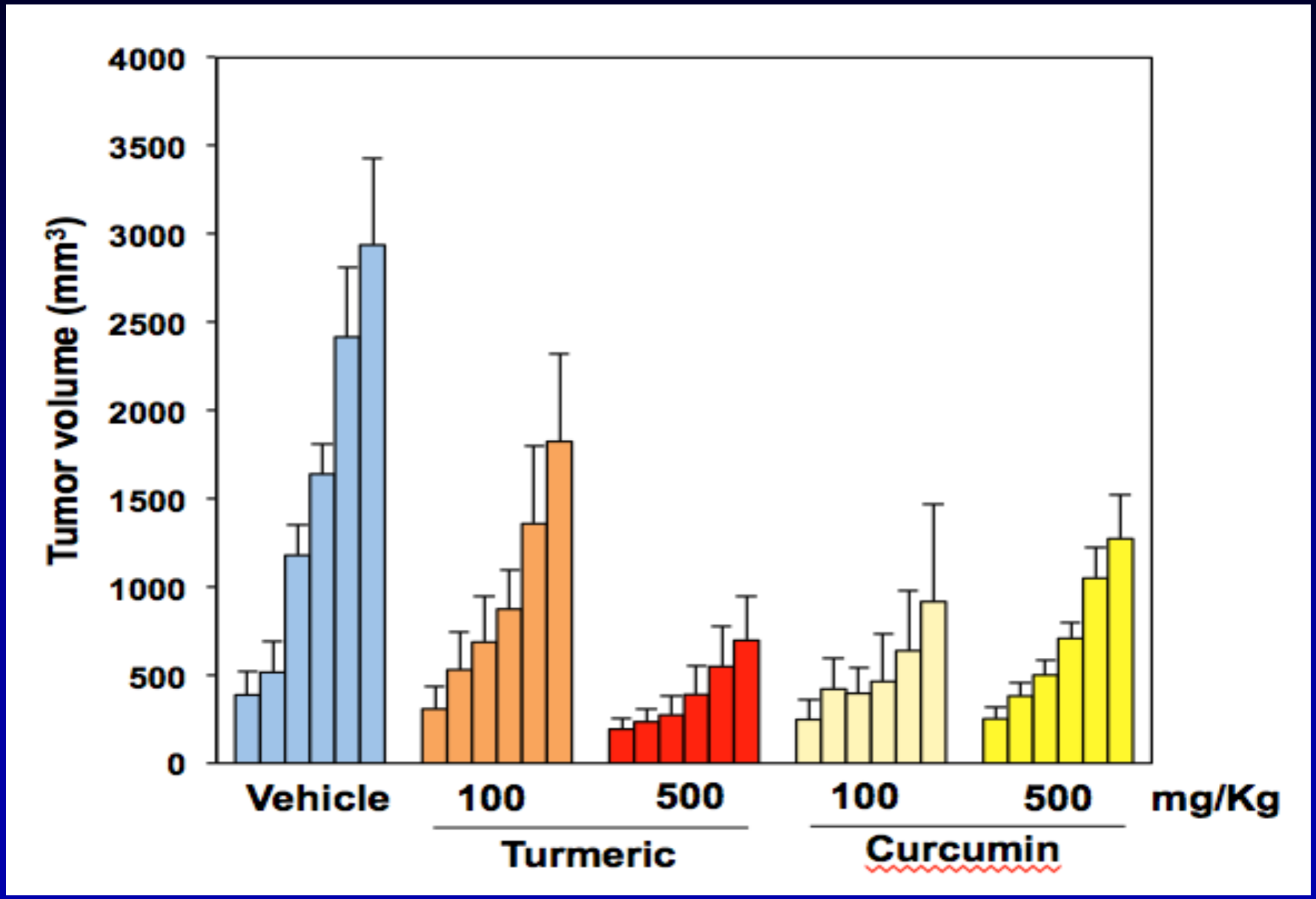
Courtesy of Dr. Madeline Heng from UCLA
http://www.psoria-gold.com/RESEARCH.html

Turmeric is at least as effective as curcumin for anticancer potential in mice

Turmeric vs curcumin for anticancer potential in mice



Turmeric is at least as active as curcumin for anticancer potential in mice against colorectal cancer



Cancer incidence is less in spice consuming countries

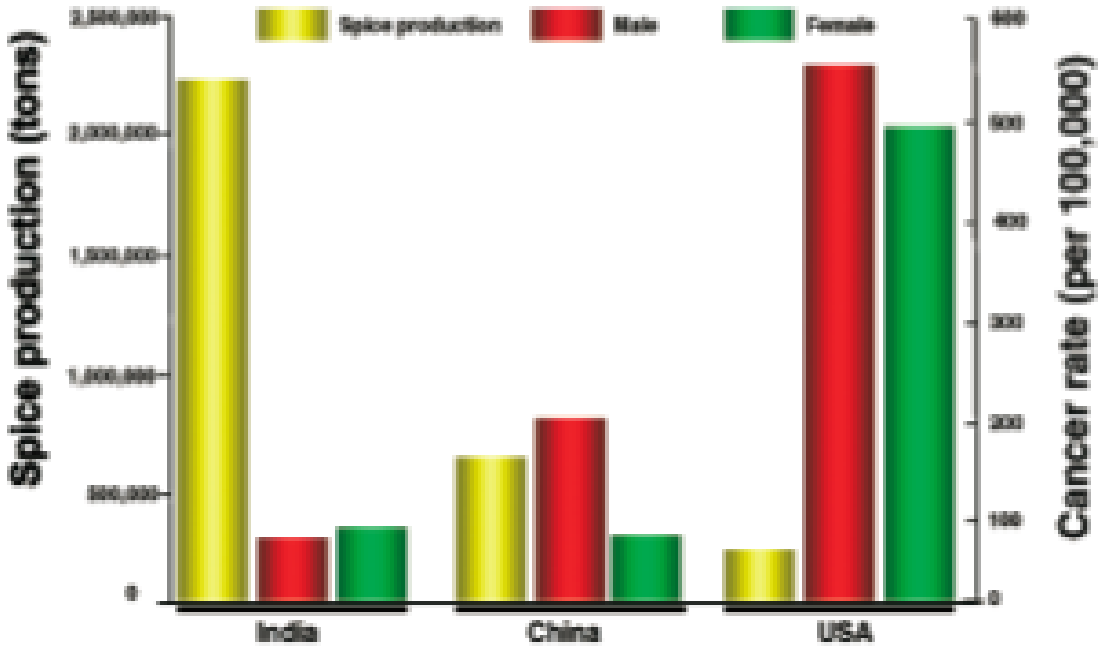


Figure 1. Relationship between production of spices and cancer incidence. Data is modified from 2000 faostat.fao.org (http://www.foodmarketexchange.com/datacenter/product/herb/herb/detail/dc_pi_hs_herb0406.htm) and cancer data from the World Health Organization GLOBOCAN 2002. A color version of the figure is available in the online journal.

Comparison of Cancer Incidence in USA and India

Cancer	USA		India	
	Cases	Deaths	Cases	Deaths
Breast	660	160	79	41
Prostate	690	130	20	9
Colon/Rectum	530	220	30	18
Lung	660	580	3 8	37
Head & Neck SCC	140	44	153	103
Liver	41	44	12	13
Pancreas	108	103	8	8
Stomach	81	50	33	30
Melanoma	145	27	1.8	1
Testis	21	1	3	1
Bladder	202	43	15	11
Kidney	115	44	6	4
Brain, Nervous system	65	47	19	14
Thyroid	55	5	12	3
Endometrial Cancers	163	41	132	72
Ovary	76	50	20	12
Multiple myeloma	50	40	6	5
Leukemia	100	70	19	17
Non-Hodgkin lymphoma	180	90	17	15
Hodgkin's disease	20	5	7	4

Showing cases per 1 million persons calculated on the basis of current consensus: Endometrial cancers include Cervix uteri and Corpus uteri.

GLOBOCAN 2000: Cancer Incidence, Mortality and Prevalence Worldwide, Version 1.0. IARC Cancer Base No. 5. Lyon, IARC Press, 2001.

Spicy approach to cancer treatment.

Nath S.

Journal of National Cancer Institute

2011 Dec 21;103(24):1817-8.

Curry compound fights cancer in the clinic

Carter A.

Journal of National Cancer Institute

2008 May 7;100(9):616-7.

SCIENTIFIC AMERICAN™

Spice Healer [Preview]

An ingredient in curry shows promise for treating Alzheimer's, cancer and other diseases

By Gary Stix

Searching for new drugs by milling through ancient folk pharmacopoeia or by just picking a plant while walking in the woods has a decidedly checkered history. Many well-established therapeutic compounds originated in trees, shrubs, mollusks, even dirt. Aspirin came from willow bark, cholesterol-lowering statins from a mold, and the antimalarial artemisinin from a shrub used in traditional Chinese medicine.

Is it a coincidence or luck?

Add spice to your life!

Aggarwal Talks and interviews

http://www.curcuminresearch.org/

Radio Interview http://www.youtube.com/watch?v=Zht2Q5D0RdY

McGill University http://www.youtube.com/watch?v=XT7vXV7MCmE

www.survivingterminalcancer.com

https://www.youtube.com/watch?v=OI5Z6tA4o1Q

Curcumin and Epigentics Talk in Paris http://www.youtube.com/watch?v=Bnnm15CHRi8

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http://www.healthyindiandiet.com/blog/interview-with-dr-bharat-aggarwal-pioneer-of-turmeric-research

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http://onlinelibrary.wiley.com/doi/10.1111/eci.12171/abstract;jsessionid=6DBDDC04ADBFD3BDEF7DABC238D3B807.f03t04

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KTRK Curry to Prevent Cancer.mpg.
https://www.dropbox.com/s/8duxs2r8e1w6qwo/KTRK%20-%20Curry%20to%20Prevent%20Cancer.mpg

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Postdoctoral Fellows and Visiting Professors

Thank you,

Gracias!

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Obrigado!

Merci!

Gamsa hamnida!

Kiitos!

Shalom!

Shei-shei!

Do Jeh!

Danke!