Does Everything Really Cause Cancer?

The Truth Behind Cancer Myths

Kelly J Cude, PhD

College of the Canyons

Spring FLEX Week 2020

Which of these could contain the most potent carcinogen ever discovered?

Peanuts (& Soy) are often contaminated with the *Aspergillus* mold. *Aspergillus* secretes A toxin called **aflatoxin B1**. It is the strongest cancer-causing substance ever discovered!

Today's Learning Objectives

1. Define cancer, carcinogens, & genetic mutations

2. Explore research methods used to identify carcinogens

3. Compare and contrast the 5 categories of carcinogens

4. Discuss the importance of exposure & threshold dose

5. Evaluate various risk factors to determine if they are a cancer fact versus a cancer myth

What is Cancer?

- A family of more than 100 different related diseases

- An accumulation of **genetic mutations** that cause the body's **cells to become abnormal** and to **divide out of control.**

- #1 cause of death individuals 45-65, #2 COD overall in the US
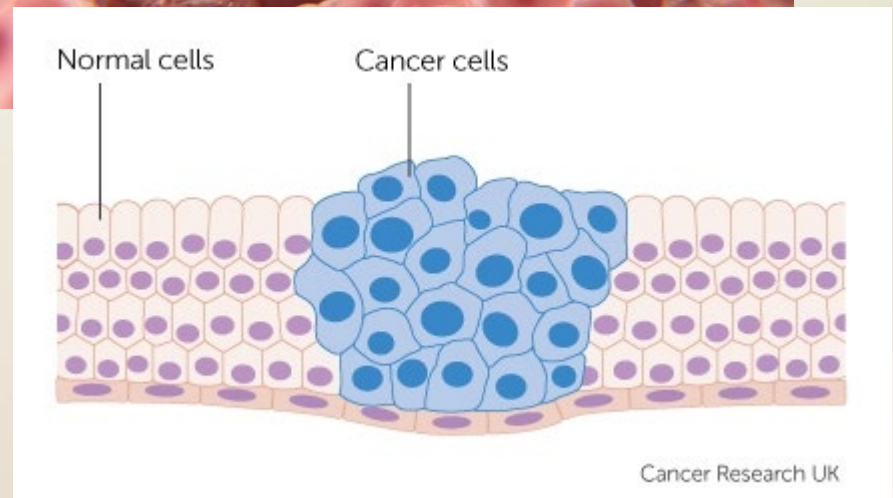
- Lifetime risk 1:2 (men) 1:2.8 women

1991 ⟶ 2015
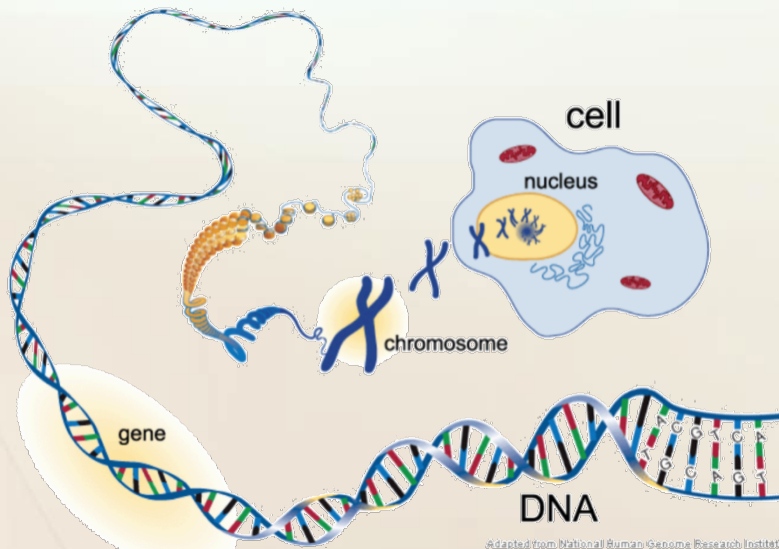THE OVERALL CANCER DEATH RATE IN THE UNITED STATES FELL ↓ 26%

SEER Cancer Statistics Review, 1975–2015
cancer.gov

What is cancer?

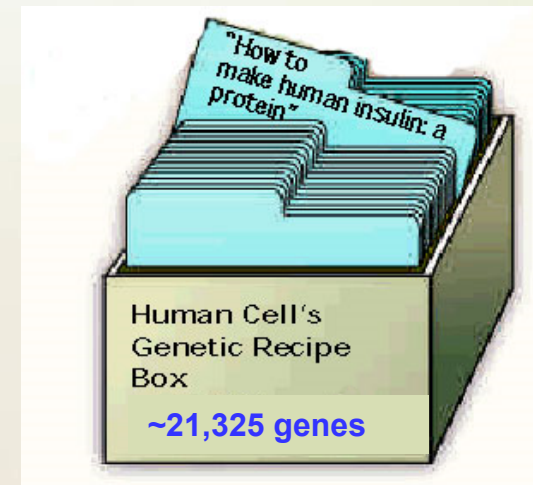Normal cells   Cancer cells

Cancer Research UK

What are Genetic Mutations?

- Damage to DNA, the "blueprint" or "instruction manual" of a cell

- The **root cause of EVERY cancer**

- **Every patient** has a **unique combination of mutations** and thus a UNIQUE disease (over 1000 mutations identified)

Our genetic instructions are stored on long chromosomes that are kept inside the nucleus of each cell

Humans have 21,325 genes
That act as "recipes" for building proteins

cell

nucleus

chromosome

gene

DNA

Adapted from National Human Genome Research Institute

"How to make human insulin: a protein"

Human Cell's Genetic Recipe Box

~21,325 genes

* specifically, initiators

What Causes Cancer?

- **10% of cancer is inherited** (family history): meaning the genetic mutations have been passed down through the bloodline

- **90% of cancer is sporadic** (spontaneous): meaning the genetic mutations occur in that person's lifetime following exposure to various DNA damaging agents (mutagens

Family History

Exposure to Agents
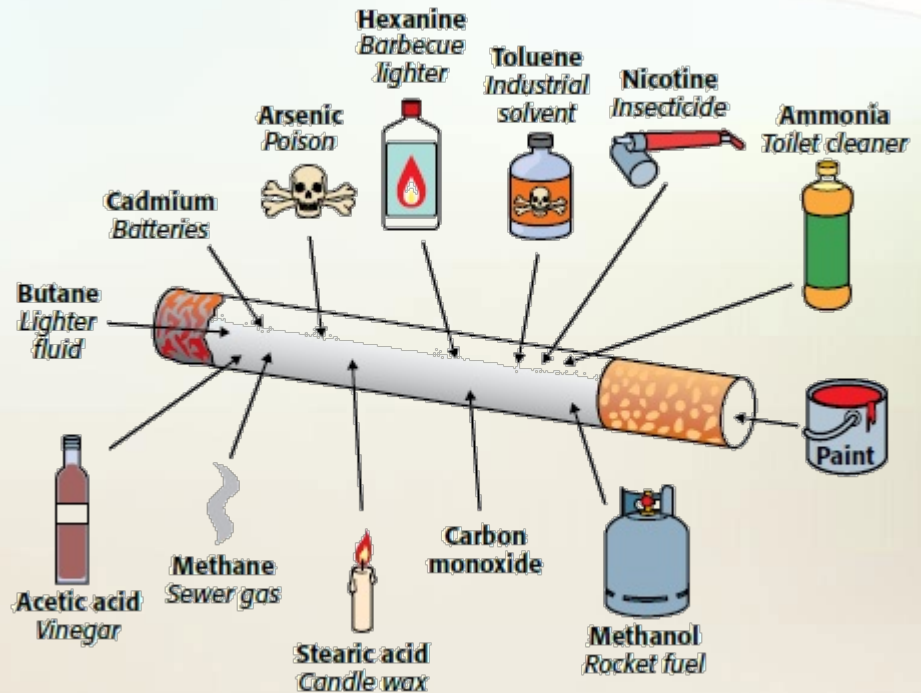
What are Carcinogens?

Carcinogens are any substance or infectious agent that can cause cancer (two categories: initiators and promoters)

- **tumor initiators:** substances that damage DNA and initiate the growth of abnormal cells (majority of carcinogens are in this category)

- **tumor promoters:** substances that promote the growth of abnormal cells (exposure is only dangerous IF exposed to an initiator first!)
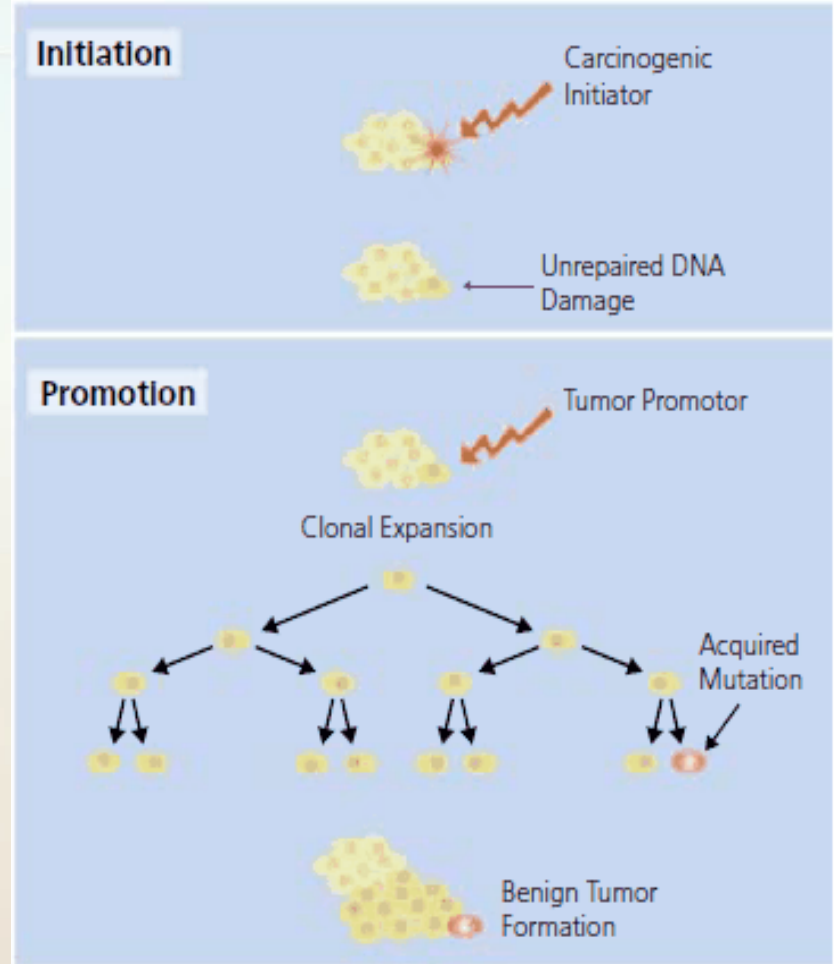
Example Carcinogens Tobacco Contains Tumor Initiators and Tumor Promoters

Tobacco contains 70 confirmed carcinogens including numerous Tumor initiators (arsenic, polonium, benzene, methanol) and Tumor promoters (nicotine, acetic acid).


ESTIMATED NUMBER OF CHEMICAL COMPOUNDS IN CIGARETTE SMOKE

7,357

70

NUMBER OF THESE COMPOUNDS WITH CONFIRMED CARCINOGENIC ACTIVITY

Cadmium *Batteries*

Butane *Lighter fluid*

Acetic acid *Vinegar*

Methane *Sewer gas*

Stearic acid *Candle wax*

Arsenic *Poison*

Hexanine *Barbecue lighter*

Toluene *Industrial solvent*

Nicotine *Insecticide*

Ammonia *Toilet cleaner*

Carbon monoxide

Methanol *Rocket fuel*

Paint

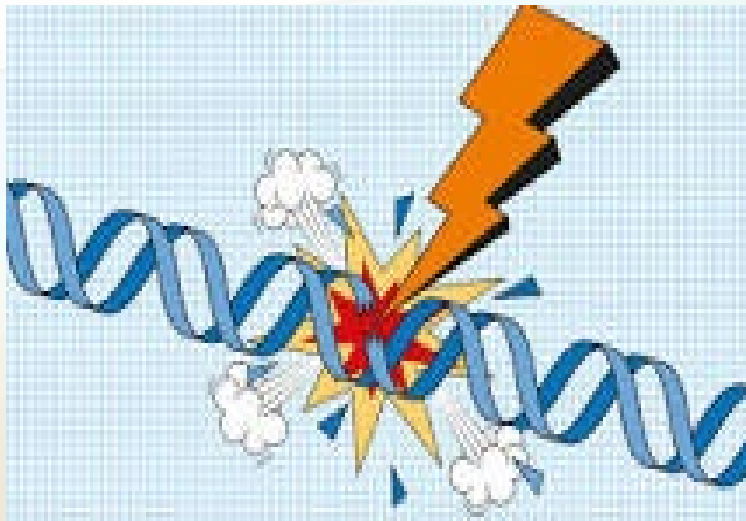Source:http://sciencemags.blogspot.com/2011/01/contents-of-cigarette-smoke.html

What must be TRUE for a Substance to be Classified as a Carcinogen?

Agent must **Damage DNA** or **Promote Cell Division in Damaged Cells**
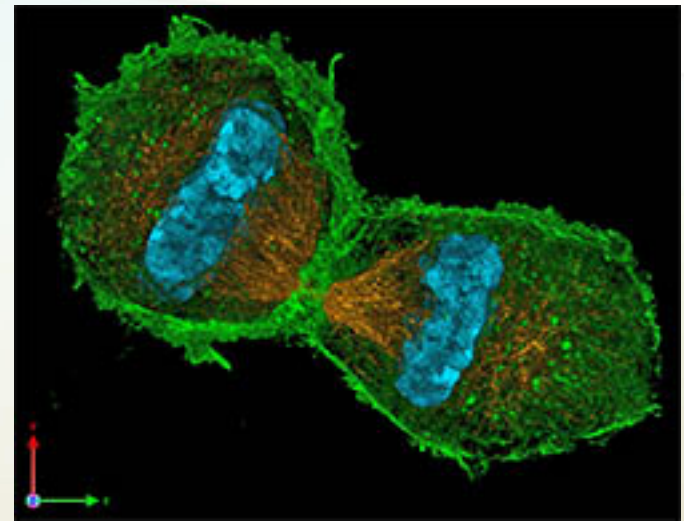
Other important questions to ask
What dose of the agent is necessary to be cancer causing (threshold dose) *almost always requires an occupational exposure*

How do Scientists Identify Carcinogens?

- AMES Test in Bacteria

- COMET Assay in Human Cells

- Tests in Animals (usually rats or mice)

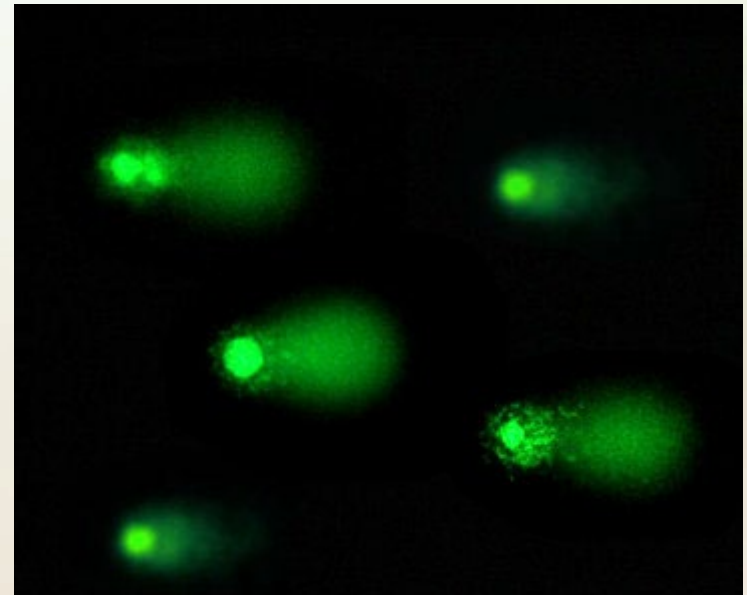- Epidemiology: Patterns in human populations

Eureka!

Experiments Analyzing DNA damage

Advantage: Can test different doses to determine the threshold

AMES test (bacteria): if bacteria grow, test substance can damage DNA

Suspected mutagen

Auxotrophic Bacteria
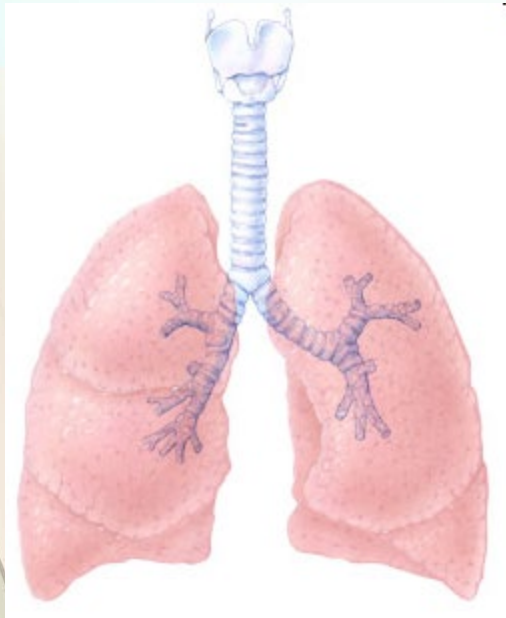
Minimal Media

Incubation
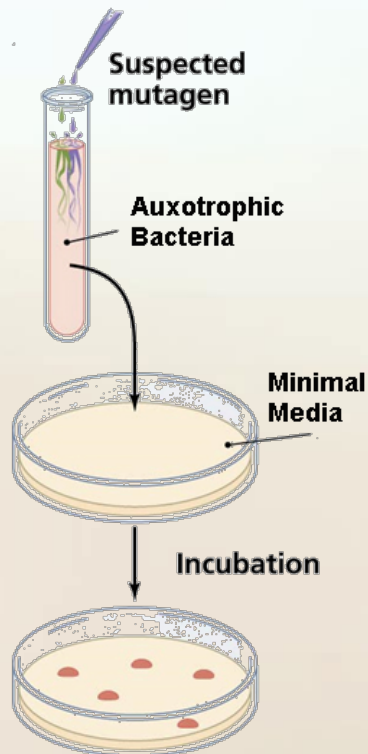
COMET assay (human): if a "comet tail" forms, substance can damage DNA

Studies in Mice/Rats Used to Confirm Carcinogenicity in Animals

Animals models can determine the **timeframe for exposure** (acute vs. chronic doses) and **route of exposure** (inhalation, ingestion, topical)

| Inhalation | Ingestion | Topical |

Epidemiology Studies are used to Confirm Carcinogenicity in Humans

EXTREMEMLY DIFFICULT because people are genetically different from one another, have different eating/lifestyle habits, and work/live in different places.

Epidemiology: surveys to identify potential exposures/habits that people with cancer have in common

Cancer clusters: abundance of a rare cancer, overabundance of a common cancer, or cancer in the wrong population (prostate cancer in children)

Cancer Clusters in Some Regions of the U.S.

1. *Along the Mississippi River (& South in General)*
2. *Kentucky-West Virginia Border*
3. *Alaska*

A Age-standardized mortality rate from neoplasms, both sexes, 2014
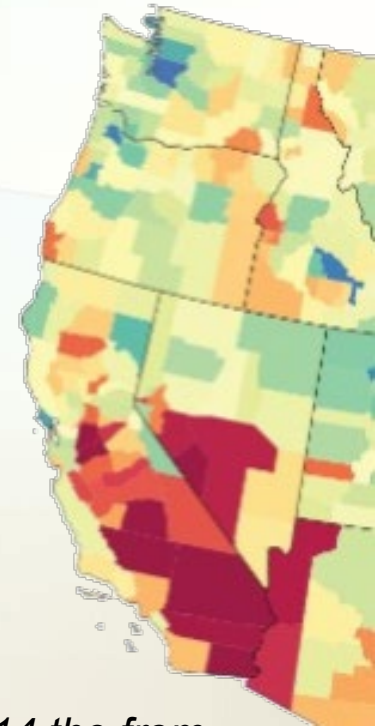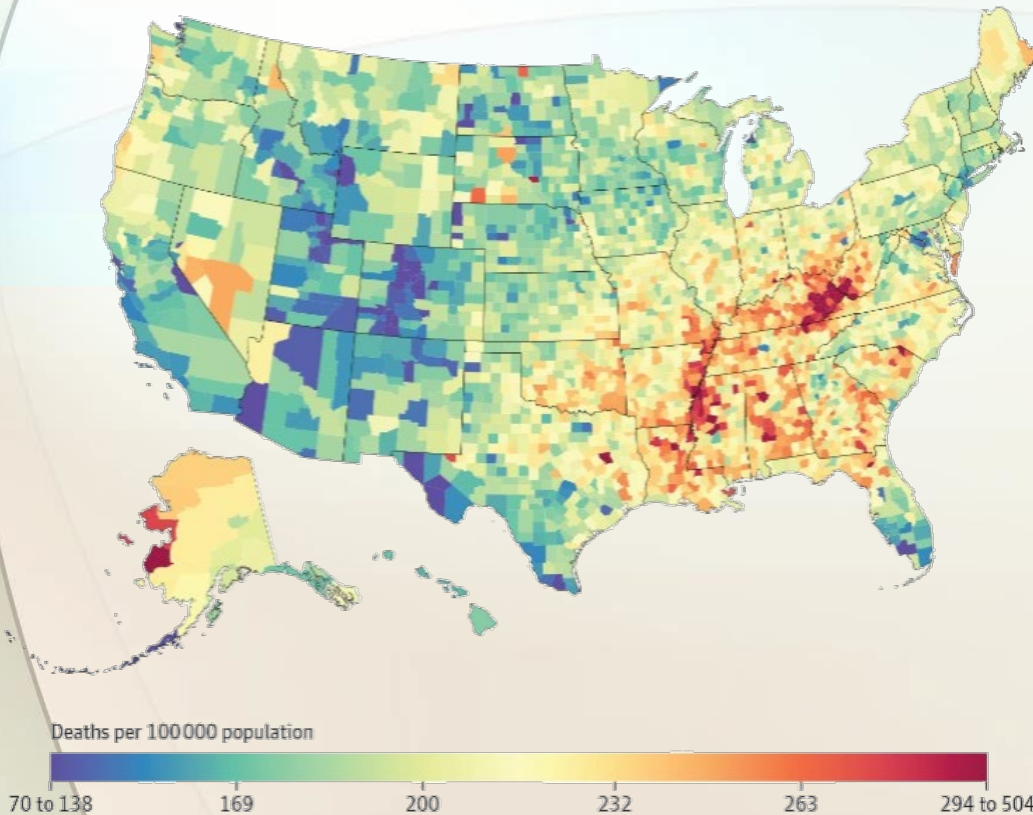
In 2014 the from testicular cancer were highest In California and Nevada

Deaths per 100 000 population

70 to 138   169   200   232   263   294 to 504

Air Pollution to Blame for SoCal City having the Highest Cancer Risk in the Nation

According to a 2009 study by the EPA the SoCal city of Cerritos has the **highest cancer risk in the nation** at 1,200 per million people…. That is **34x the national average!**

4 | Home | News | I-Team | Weather | Entertainment | •••

SoCal City Ranks Worst in Nation for Cancer Risk

Cerritos scores 34 times higher than national average

By Olsen Ebright

Published at 8:31 PM PDT on Jul 16, 2009 | Updated at 2:54 PM PST on Jan 7, 2010

See CSUN

CSUN

TRENDING

1

2

Toxic air levels in Cerritos could lead to cancer, according to a new report.

Residents in Cerritos may want to rethink their current locale.

How many Carcinogens have been Identified thus far?

6 million chemicals → 50,000 in common contact → 1,013* tested → 120 Group 1 carcinogens identified (*Chemicals in workplace exposure and cancer clusters tested first)

6,000,000 Recognized Chemicals

50,000 Chemicals Humans Commonly Contact

1,013

968 Chemicals Tested for Carcinogenicity in Humans

What Are the Different Carcinogen Classifications?

Not all carcinogens are created equal

GROUP	WHAT DOES IT MEAN?	#	Examples
GROUP 1	**CARCINOGENIC TO HUMANS** — Sufficient evidence in humans. Causal relationship established.	120	cigarette smoke, X-rays, HPV, alcohol, smoked/cured meat, sunlight/UV, aflatoxin
GROUP 2A	**PROBABLY CARCINOGENIC TO HUMANS** — Limited evidence in humans. Sufficient evidence in animals.	82	red meat, working night shifts, frying foods/acrylamide, hot beverages, hair dyes
GROUP 2B	**POSSIBLY CARCINOGENIC TO HUMANS** — Limited evidence in humans. Insufficient evidence in animals.	311	aloe, gasoline, pickled vegetables, isoprene (rubber), ginko biloba, nickel
GROUP 3	**CARCINOGENICITY NOT CLASSIFIABLE** — Inadequate evidence in humans. Inadequate evidence in animals.	500	coffee, tea, electromagnetic radiation/powerlines, caffeine, fluorescent lighting
GROUP 4	**PROBABLY NOT CARCINOGENIC** — Evidence suggests no carcinogenicity in humans/animals.	1	caprolactam (synthetic fibers in carpet)

The Importance of Dose!

Just because something can cause cancer, does not mean it will.

Is it possible/likely you will be exposed to the concentration necessary to cause cancer?—most likely if an occupational exposure!

Dose-Response Curve

Dose – Chemical concentration per unit body weight

Increasing effect

no-effect range | range of increasing effect with increasing dose | maximum effect range

threshold

Increasing dose
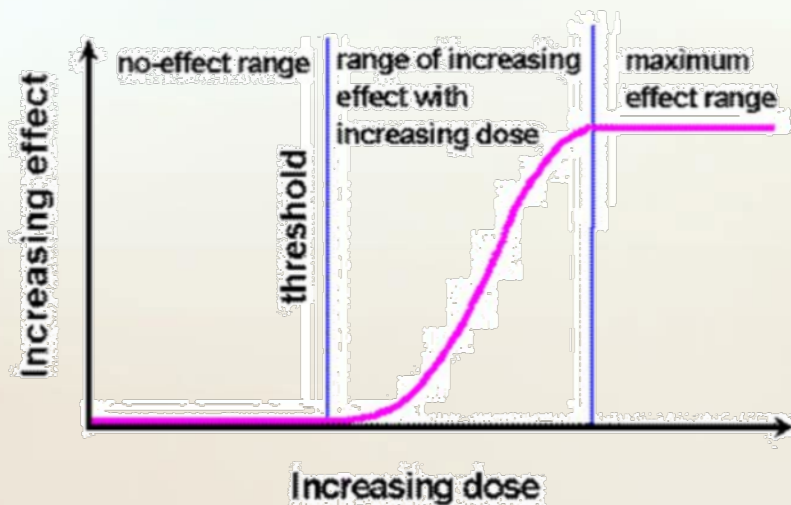
Response – Level of measured adverse effect

Many Chemicals Only Cause Cancer Following Chronic Workplace Exposure

Occupations with High Cancer Risks

Construction/Painters

Types of Cancer:
lung, mesothelioma

Mechanics

Types of Cancer:
leukemia, mesothelioma
hematologic,

Firefighters

Types of Cancer
lung, mesothelioma, oral,
esophageal, stomach,
colon, kidney, & testicular

Hair Stylist/Barber

Types of Cancer:
bladder, larynx, and lungs

Nail Salon Manicurist

Types of Cancer:
lymphoma, multiple
myeloma

Life Guards

Types of Cancer:
Skin cancer, melanoma

Occupations with High Cancer Risks

Plastic Manufacturers

Types of Cancer:
liver, kidney, and larynx

Pilots

Types of Cancer:
malignant melanoma (skin)

Metal Working

Types of Cancer:
kidney, larynx, breast,
pancreas, stomach,
colon, esophagus

Mining

Types of Cancer:
lung, brain, thyroid
mesothelioma, stomach

Rubber Manufacturing

Types of Cancer:
bladder, stomach, lung
leukemia, lymphoma

Agriculture/Farming

Types of Cancer: bladder,
breast stomach, lung leukemia,
skin lymphoma, brain, prostate,
multiple myeloma

Numerous Cancer-Causing Agents are Found in Both Natural and Processed Foods

- Nitrosamines
- Aflatoxins
- Hydrazines
- Allyl Isothiocyanate
- Pyrrolizidine Alkaloids
- Substances in Bracken Fern
- Safrole, Estragole. Beta Asarone, Isosafrole
- Tannins
- Psoralens
- Ethyl Carbamate
- Estrogenic Substances
- Coumarin
- Alcohol
- Diacetyl
- Quercetin, Kaempferol, Rutin

Table 1. Components of food thought to be carcinogenic or mutagenic.

Numerous Anti-Cancer Agents are Found in Both Natural and Processed Foods

Category	Food	Active Principles
Beverages and drinks	Green tea, red wine	Stilbenoids (resveratrol), flavanols (catechins)
Fruits	Strawberries, blackberries, raspberries, blueberries, cranberries, apple, pineapple, cherries, oranges, grapefruit, lemons, red grapes, pomegranate	Carotenoids (lycopene), the most part of flavonoids and in particular glycosides of anthocynidins (anthocyanins), stilbenoids (resveratrol), flavanones (hesperetin),
Vegetables and mushrooms	Soy beans, artichokes, tomatoes, garlic, kale, broccoli, cauliflower, Brussels sprouts, bok choy, lavender, maitake mushrooms, parsley, pumpkin	Flavones (apigenin), isoflavones (genistein), flavonols (quercetin), isothiocyanate (sulfurafane), glycosides of anthocyanidins (anthocyanins)

Carrots (*Daucus carota*) (carotenoids)

Grapes (*Vitis vinifera*) (resveratrol)

Tomato (*L. esculentum*) (lycopene)

Cranberry (*V. oxycoccos*) (myrecitin)

Pomegranate (*Punica granatum*) (Ellagic acid)

Cloves (*S. aromaticum*) (eugenol)

Ginger (*Zingiber officinale*) (gingerol, shogaol)

Garlic (*Allium sativum*) (allicin)

Spinach (*Spinacia oleracea*) (natural antioxidant mixture)

Mustard (*Brassica juncea*) (sulphoraphane)

Rosemary (*R. officinalis*) (carnosol)

Vanilla (*V. planifolia*) (vanillin)

Cabbage (*Brassica oleracea var. Capitata*) (indole-3-carbinol)

Citrus fruits (Vitamin C)

Aloe (*Aloe vera*) (emodin)

Living Downstream

http://www.livingdownstream.com/trailer

Does EVERYTHING Really Cause Cancer?

Separating Myths from Facts
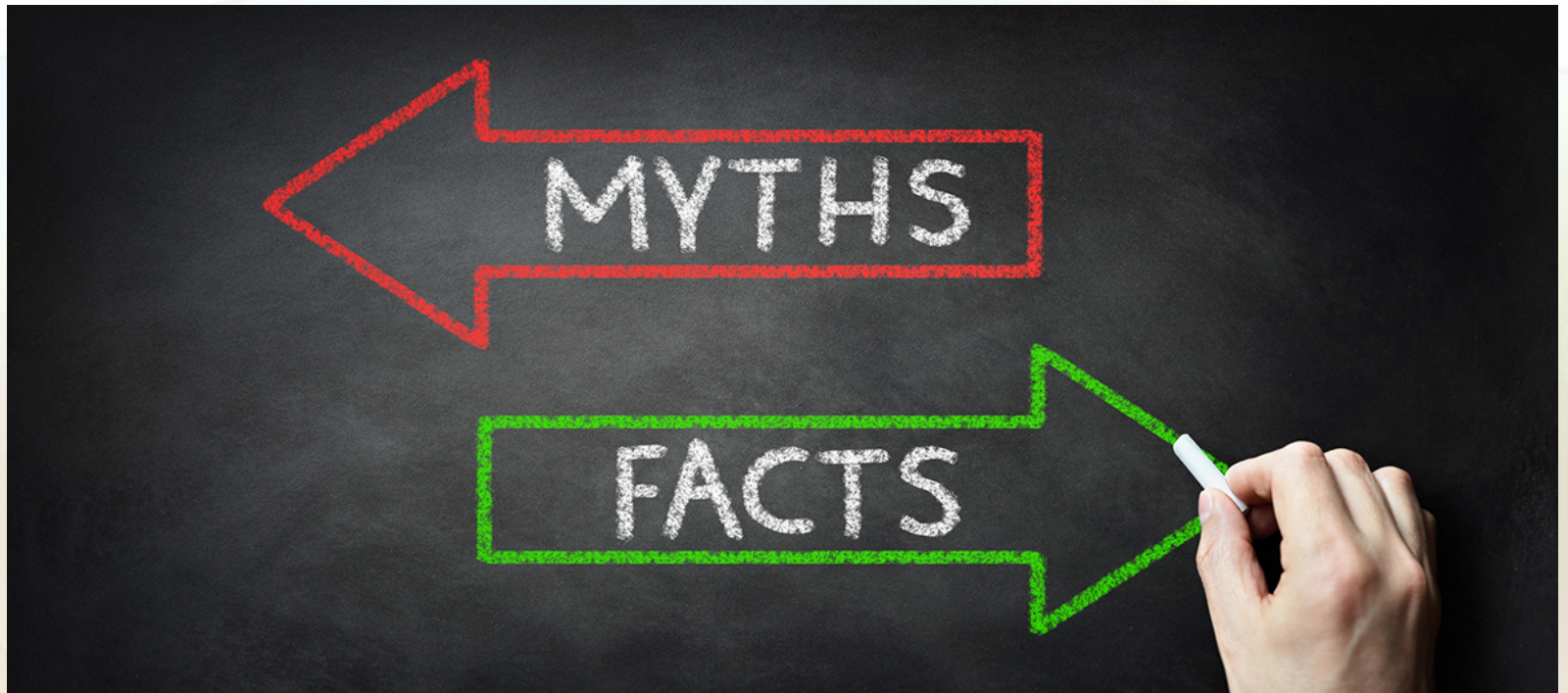
MYTH: EATING SUGAR CAUSES CANCER

While cancer cells do consume sugar to "fuel" their relentless cell division, **ALL cells in the body** rely on glucose (sugar) for energy. There is no Evidence that removing sugar from the diet will help prevent cancer or shrink tumors.

HOWEVER A diet HIGH in sugar can lead to **obesity,** which is a risk factor for cancer!

Cancers Caused by Obesity

Meningioma
Thyroid cancer
Adenocarcinoma subtype of esophageal cancer
Postmenopausal breast cancer
Liver cancer
Gallbladder cancer
Stomach cancer
Pancreatic cancer
Kidney cancer
Prostate cancer
Colorectal cancer
Ovarian cancer
Endometrial cancer
Multiple myeloma
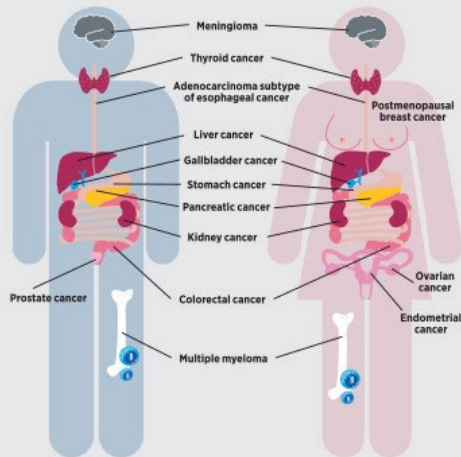
American Association for Cancer Research (AACR) Cancer Progress Report 2017

MYTH: All Dairy Products Causes Cancer

Like many foods, dairy products are a complex mixture of many different agents/chemicals. Some of these have anti-cancer properties, while others have cancer stimulating activity.

🙂

😥

Several studies have linked LOW FAT milk, yogurt, and calcium consumption (500mg to 1000mg/day) with a LOWERED risk of colorectal cancer and fermented milk with a LOWERED risk of bladder cancer.

Consumption of HIGH FAT dairy products (whole milk, butter, cheese) have been associated with an ELEVATED risk of breast, bladder, and prostate cancer.

ANTI-CANCER AGENTS IN DAIRY

- Calcium
- Vitamin D
- Lactic acid bacteria (yogurt)

PRO-CANCER AGENTS IN DAIRY

- Saturated fats
- Insulin-like growth factor
- Estrogen hormones (secreted by pregnant cows)

FACT: UV from Tanning Beds Causes Cancer

There is no such thing as a safe or healthy tan. The ultra violet radiation used in tanning beds damage DNA and increase your risk of skin cancer and melanoma.

INDOOR TANNING DANGERS

75%

increased risk of developing life-threatening melanoma from just one indoor tanning session before age 35.

FACT
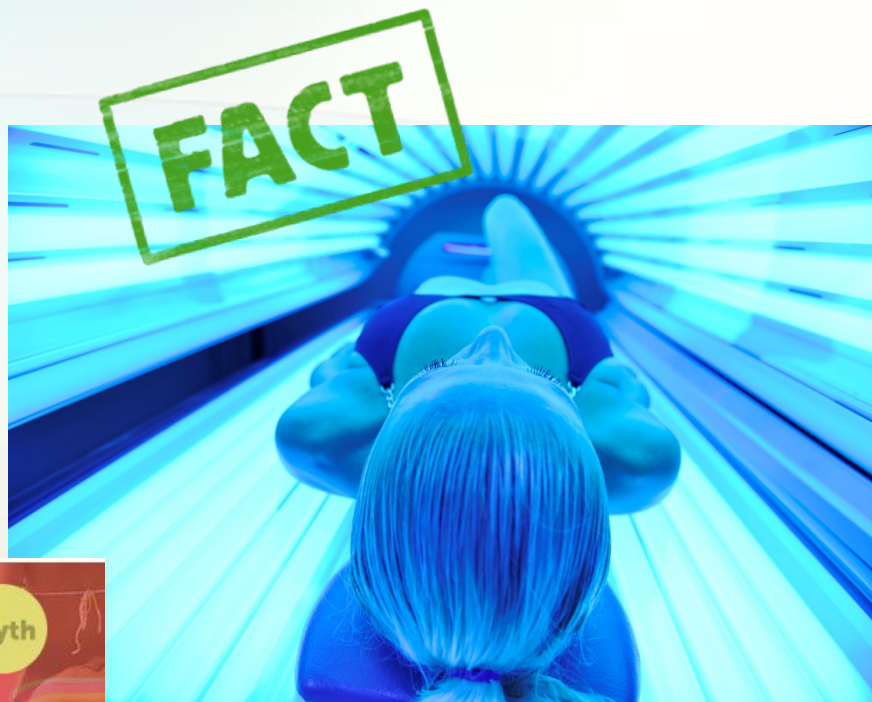
Myth

"HAVING A GOOD 'BASE TAN' WILL PROTECT MY SKIN FROM THE SUN."

Truth

A TAN IS A SIGN OF DAMAGED SKIN.

SOURCES: NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION DIVISION OF CANCER PREVENTION AND CONTROL

LIVESTRONG.COM

MYTH: DIET SODAS CAUSE CANCER

Original studies found that rats fed high levels of either saccharin or aspartame frequently developed cancer. Studies had TWO FLAWS:

DOSE NOT RELEVANT:
Later determined the aspartame dose necessary to cause cancer would be equivalent to 10-2083 cans every day … According to the European Food Safety Agency, an adult weighing 132 lbs would have to drink **36 cans of a diet soft drink** (containing aspartame) every day to reach/exceed the acceptable daily intake (ADI).

MECHANISM UNIQUE TO RATS:
Rats convert saccharin into a carcinogen during digestion, humans do NOT have the same enzyme

"Does Aspartame Cause Cancer?" American Cancer Society, Accessed on 1/8/2020 https://www.cancer.org/cancer/cancer-causes/aspartame.html

TBD: Most Evidence Suggest the Use of Talc Does <u>NOT</u> Causes Ovarian Cancer

"The weight of evidence does not support an association between perineal talc exposure and an increased risk of ovarian cancer."- National Cancer Institute

CONCERN
For decades, many women have applied talc, of baby powder, to the genital area (against instructions on label). In the early 1970s, scientists discovered talc particles in ovarian tumors.

DATA
Prospective study on 61,000 women over 12 years showed NO link between talc use and ovarian cancer risk (2014)

FDA continues to get "adverse event reports" involving talcum powder…more investigations are necessary.

MYTH: Living Under Powerlines Causes Cancer

Power lines emit both electric and magnetic energy.
- The **electric energy** is easily shielded/weakened by walls
- The **magnetic energy** emitted is a low energy form of radiation that <u>does not damage genes.</u>

ELECTROMAGNETIC SPECTRUM

Energy strong enough to penetrate body & damage DNA

Frequency (waves per second)

0   10 10^2 10^3 10^4 10^5 10^6 10^7 10^8 10^9 10^{10} 10^{11} 10^{12} 10^{13} 10^{14} 10^{15} 10^{16} 10^{17} 10^{18} 10^{19} 10^{20} 10^{21}

Hz   kHz   MHz   GHz   EHz

DIRECT CURRENT   EXTREMELY LOW FREQUENCY   LOW FREQUENCY   RADIO WAVES   MICROWAVES   INFRARED RADIATION   ULTRAVIOLET   X-RAYS   GAMMA RAYS

NON-IONIZING RADIATION   IONIZING RADIATION

Computer
60-100 Hz

Power Lines
50-60 Hz

TV Broadcast
54-700 MHz

Radio
AM 520-1610 kHz
FM 87.5-108 MHz

Microwave
3-30 GHz

Mobile Phone
1.9-2.2 GHz

VISIBLE

Diagnostic Radiation
5-50 EHz

Therapeutic
Radiation
500-5,000 EHz

MYTH

Note: preliminary studies suggest children living in homes with extremely high levels of EMF radiation have an increased risk of leukemia. The dose is found in fewer than 1% of households and may be a combination of electronic appliances, WIFI, other EMF sources. Additionally, people who work on powerlines for long periods of time, have an increased cancer risk

MYTH: CELL PHONES CAUSE CANCER

People initially became concerned when male* rats exposed to radio-frequency waves had a higher risk of developing Schwannomas (a rare nerve tumor)

DOSE NOT RELEVANT

Rat Study used 2-3x the cell phone limit of RF energy
Rat Study used 9-19 hours every day
Humans mostly texting or hands-free headsets

MECHANISM NOT VALID

Cancer is caused by genetic mutations, and cell phones emit a type of low-frequency energy that is not strong enough to damage DNA.

*Note: Radiofrequency from cell phones does not damage DNA. However, exposure does cause **heating** to the area of the body where a cell phone or other device is held (ear, head, etc) of unknown significance with respect to tissue damage/cancer risk*

Infamous "popcorn" experiment

FACT: Eating Bacon Increases Cancer Risk

Processed meats are those that are **cured, smoked, or salted** for preservation. Processed meat often contain **nitrosamines,** which mutate DNA**.**

Eating just 50 grams of processed meat each day can **elevate cancer risk by 18%.** (IARC)
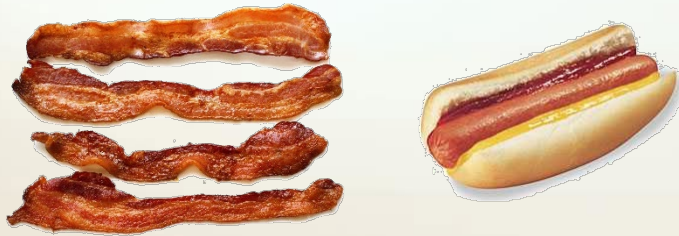
50 g = 4 strips of bacon or 1 hot dog

DANGERS OF PROCESSED MEAT

COLORECTAL CANCER
According to the IARC, each 50g (e.g. one to two slices of ham) portion of processed meat eaten daily increases the risk of colorectal cancer by 18 per cent.

PROSTATE CANCER
Men preferring red meat, fat and processed grains were 2 ½ more likely to die from cancer-related cause.

BREAST CANCER
Researchers at Harvard University analysed data, and scientists estimated that among women who ate the most amount of red meat, there were an extra 6.8 cases of breast cancer for every 1,000 women over 20 years of follow-up.

Source: BCC, CBC NEWS, THE GUARDIAN   ST GRAPHICS

Eating bacon has been linked to pancreatic cancer

More than **34,000 cancer deaths** are caused around the world each year by diets high in **processed meat** (IARC)

MYTH: DEODORANTS CAUSE BREAST CANCER

Originally <u>circulated as a hoax email</u> saying that using deodorants prevented the body from sweating out toxins, which then built up in the lymph nodes of the armpit

➤**Parabens:** preservatives used in cosmetics that have a similar structure to estrogen but; however, parabens have activity level $1/10,000^{th}$ as strong as endogenous estrogen

➤**Aluminum:** Likely the result of confusion over women being told not to wear antiperspirants to a mammogram exam because it interferes with the imaging.

http://www.cancerresearchuk.org/about-cancer/causes-of-cancer/cancer-controversies/cosmetics-and-toiletries#Cosmetics0

FACT: Eating Peanuts* <u>Might</u> Increase Cancer Risk

Aflatoxin*, produced by mold that frequently contaminates peanuts, soybeans, and corn, is the MOST POTENT CARCINOGEN known to man. FDA allows 20 ppb in human food, 300 ppb in animal feed

Aflatoxin contributes to up to 28% of all cases of liver cancer

In the US, the FDA routinely tests peanut butter and corn for the presence of unsafe levels of aflatoxin

Animals that consume aflatoxin-contaminated food can transfer the toxins to meat, milk and eggs resulting in human exposure to a health hazard.

Higher Aflatoxin Risk with Imported Peanuts and Organically Grown Peanuts

% of Crop in Violation of Aflatoxin Safety Standards

Aflatoxins in peanuts

FDA U.S. FOOD & DRUG ADMINISTRATION
CENTER FOR FOOD SAFETY & APPLIED NUTRITION

- import   - domestic

Year	import	domestic
2010	5.63%	0.00%
2011	16.44%	0.00%
2012	16.87%	5.71%
2013	8.47%	1.02%
2014	11.95%	0.00%
5-year	12.66%	1.29%
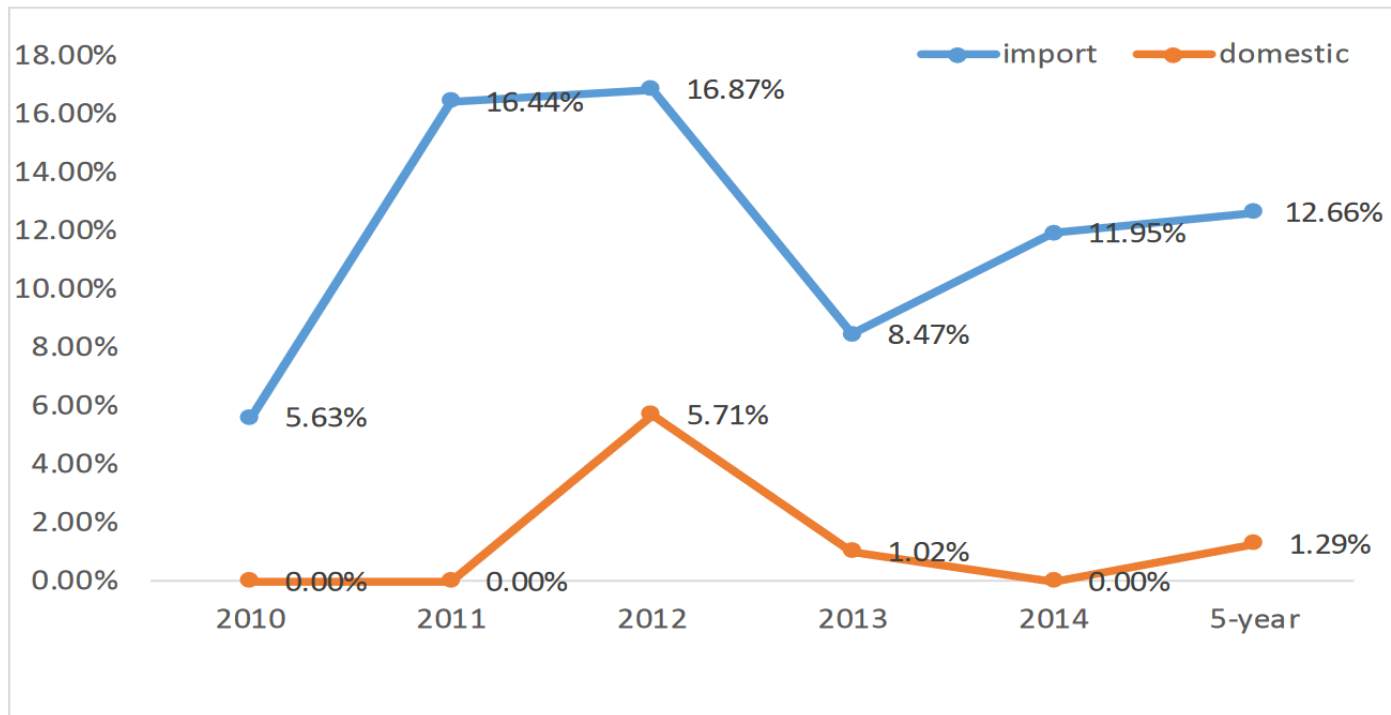
- Violation rate for domestic peanut products is generally lower than import peanut products

Fact: Obesity Increases Cancer Risk

Nearly 1 in 3 cancer diagnoses are linked to obesity. In the US, obesity Levels are on the rise, with nearly 66 % of the population categorized as overweight or obese.

BEING OVERWEIGHT CAN CAUSE 13 TYPES OF CANCER

●●● Larger circles indicate cancers with more UK cases linked to being overweight or obese

○ Number of linked cases are currently being calculated and will be available in 2017

- Meningioma (a type of brain tumour)
- Thyroid
- Oesophagus
- Breast after menopause
- Liver
- Upper stomach
- Gallbladder
- Pancreas
- Kidney
- Bowel
- Ovarian
- Womb
- Myeloma (a type of blood cancer)

LET'S BEAT CANCER SOONER
cruk.org

CANCER RESEARCH UK

FACT

Body Mass Index

| <18,5 UNDERWEIGHT | 18,5-24,9 NORMAL | 25-29,9 OVERWEIGHT | 30-34,9 OBESE | 35< EXTREMLY OBESE |
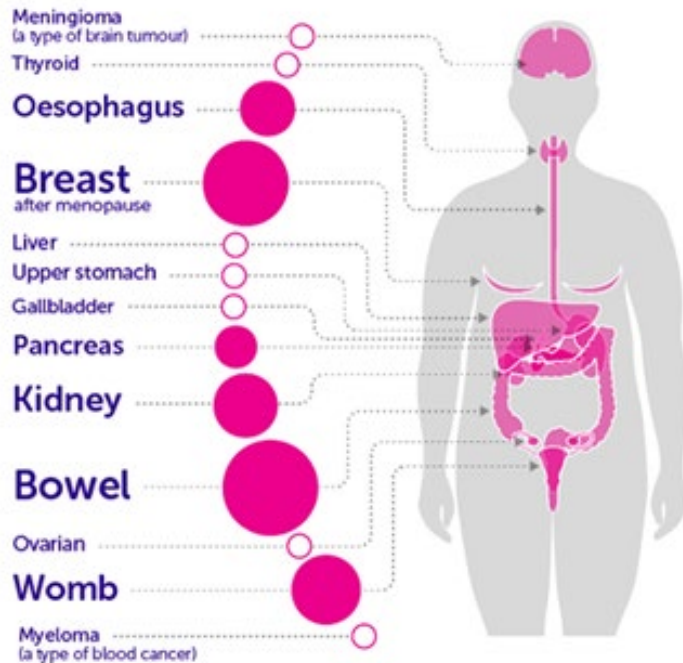
BMI= 703 x weight (lbs) / [height (in)]^2

MYTH: Eating Soy Products Causes Cancer

Soy (or soya) products such as tofu and soy milk are made from soybeans, and contain a group of chemicals called isoflavones.

Isoflavones are plant-based estrogens and elevated human estrogen in a known risk factor for breast cancer.

Isoflavones are **much weaker** than the estrogen produced by our bodies.

People with the **highest intake** of soy (Asians) do NOT have a higher risk of breast cancer (actually lower!)

www.visualphotos.com

MYTH: PLASTIC WATER BOTTLES CAUSE CANCER

There are several unreliable and inaccurate social media posts warning about the alleged dangers of reusing plastic bottles, leaving them in hot cars or freezing water in them.

- **Dioxins:** are not found in plastic used in food/water containers

- **Bisphenol A:** not used in disposable water bottles. A review of hundreds of studies has found although BPA does leach into food/water, it does not cause cancer (TDI $4\mu\gamma$/kg)

MYTH: MICROWAVING PLASTICS CAUSES CANCER

Minute amounts of chemicals (like phthalates) can leach out of plastic when heated → <u>no evidence linking</u> this to cancer *(possible endocrine disruption)*

Safety Tip: Only use cookware that is specially manufactured for use in the microwave oven and are labeled as "microwave safe."

Do not microwave one-time use plastic tubs

FACT: Red Meat Increases Cancer Risk

Red meat includes meat from mammals including beef, pork, lamb, mutton, and goat.

According to the American Institute for Cancer Research a **high intake** of red meat is defined as **more than three servings per week**

Meat consumption correlates with colon cancer risk
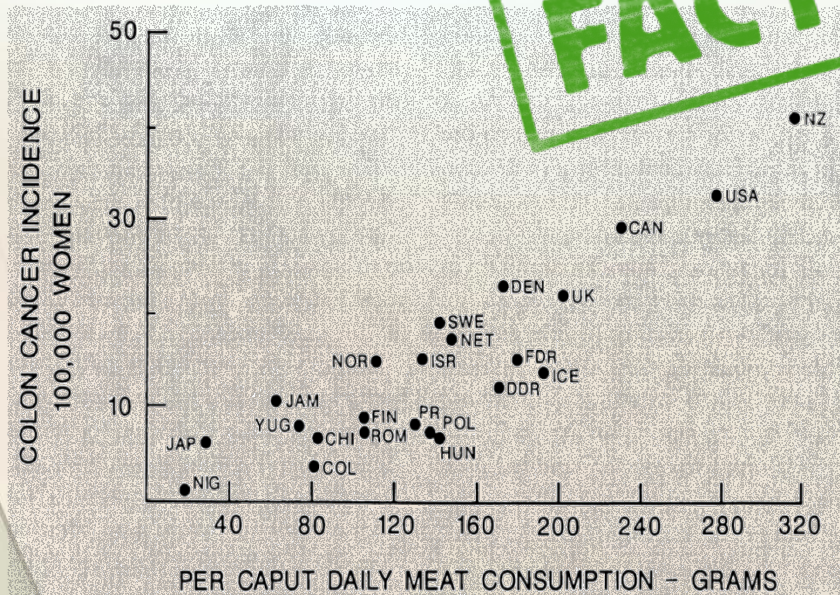
Red meat cooked over an open flame or at high temperatures creates **polycyclic aromatic hydrocarbons (PAH)** and **heterocyclic amines (HCA)**

Examples of Red Meat Target Goals

CANCERS CAUSED BY PROCESSED AND RED MEAT

21%

OF BOWEL CANCERS

NO-ONE ATE ANY PROCESSED OR RED MEAT

8,800 FEWER CASES

Source: cruk.org/cancerstats

HOW MUCH MEAT DO YOU EAT A DAY?

HOW YOUR PROCESSED AND RED MEAT CONSUMPTION CAN ADD UP OVER A DAY...

ENGLISH BREAKFAST | **CUT IT DOWN**

Two sausages...60g | One sausage........30g
Three rashers of bacon............75g | One rasher of bacon.............25g

HAM SANDWICH | **SWAP IT**

Two slices of ham.............. 50g | Substitute ham for chicken or tuna.....................0g

SPAGHETTI BOLOGNESE | **BULK IT OUT**

Minced beef in a regular portion.............100g | Use less meat and add beans or extra veggies...15g

285g TOTAL EATEN

70g RECOMMENDED DAILY LIMIT OF CONSUMPTION

FACT: Alcohol Increases Cancer Risk

Alcohol is a Group 1 carcinogen when consumed in **excess of 1 drink per day** for women (2 drinks a day for men).

7 Cancers Caused by Alcohol

Mouth and upper throat

Larynx

Oesophagus

Breast
in women

Liver

Bowel

Larger circles indicate cancers with more cases linked to alcohol in the UK

Let's beat cancer sooner
cruk.org
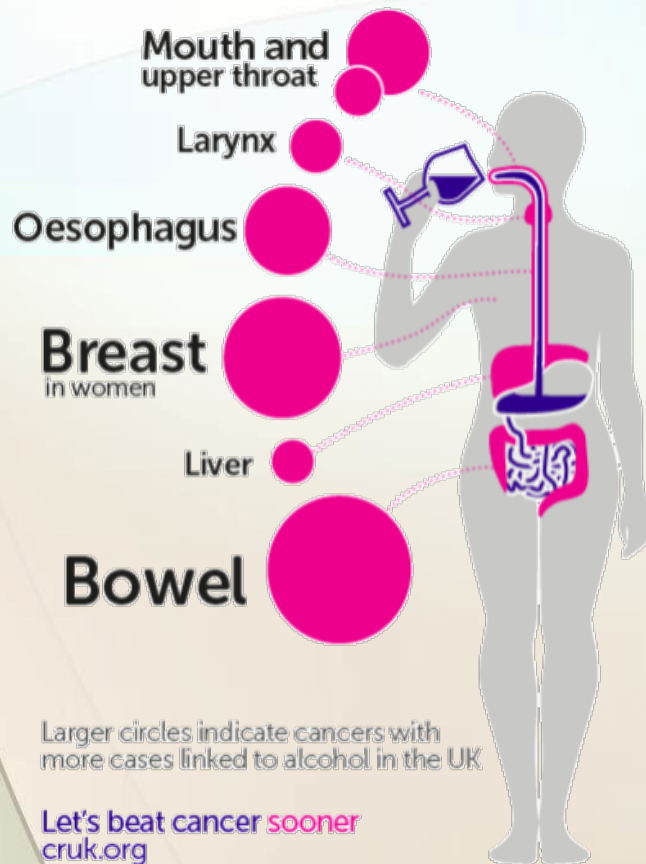
A standard alcoholic drink in the United States contains 14.0 grams (0.6 ounces) of pure alcohol. Generally, this amount of pure alcohol is found in

- 12 ounces of beer
- 8-9 ounces of malt liquor
- 5 ounces of wine
- 1.5 ounces, or a "shot," of 80-proof distilled spirits (liquor)

FACT

Example Benefits of Drinking Red Wine

How do the popular beverages compare in antioxidant activity?

Antioxidant compounds are found in vegetables, fruits and many natural beverages like tea. Balanced diets are naturally-rich in antioxidants. Enjoy the variety, flavours and health potential in every serving!

| **2** cups black tea | = | **1** glass red wine | = | **7** glasses orange juice | = | **20** glasses apple juice |

Source: The Polyphenolic Content of Fruit and Vegetables and their Antioxidant Activities: What Does a Serving Constitute?, Paganga et al., Free Radical Research, Volume 30, February 1999

MYTH: Astroturf Causes Cancer

Initially suspected when a soccer coach in Washington state, noticed a cluster of cancer cases among soccer players (mostly female goalies) who had spent time playing and diving on artificial turf (n = 53)

NOT OBSERVED WITH LARGER SAMPLES

In 10 additional studies, there was no difference in risk observed between those playing on artificial turf vs. grass.

In the initial WA state "cluster" most woman Developed NHL & leukemia. This was no observed among soccer players in other states

TBD: Drinking Hot Coffee/Tea <u>Might</u> Cause Cancer

The World Health Organization, in 2016, said drinking **coffee**, tea and other beverages at temperatures hotter than 149 degrees Fahrenheit "probably causes **cancer**." *especially oral and esophageal cancer*

INITIAL CONCERN

Link between hot beverages and esophageal cancer was observed in individuals drinking mate tea, which is generally served hotter(150°F) than standard coffee/tea (140°C)

OTHER DATA

Drinking alcohol increased the effect: those who reported drinking burning hot tea daily and who also drank more than one alcoholic beverage every day had a **127 percent increased risk of esophageal cancer**

It is hypothesized that drinking scalding beverages may trigger excessive/abnormal wound repair in the throat/esophagus

MYTH: GMOs Cause Cancer

130 research projects with collaboration between 500 independent lab groups have over a period of 25 years have found no risk to human health from GMOs

INITIAL CONCERN
French study found that rats fed a lifetime diet of RoundUp ready corn suffered tumors and organ damage (not reproducible by independent research groups/flawed design)

THE DATA
Countries that have banned GMOs have similar, if not HIGHER, rates of cancer and cancer deaths than the US, where GMOs are prevalent

Studies of Bt toxin at doses 500-2000x higher than in GMO corn showed zero toxicity (no LD 50) in animal studies. In addition, Bt toxin was completed degraded by stomach acid within 5 min @ 37°C

TBD: Most Evidence Suggests Glyphosate does <u>NOT</u> Cause Cancer

Over a Dozen International Agencies Have Concluded that Glyphosate does NOT cause Cancer; however, the IARC recently re-classified it as a Group 2A carcinogen.

Results: Over 35 Ames Tests were ALL negative
Conclusion: Glyphosate does NOT damage DNA

Results: In 20 studies in rats and mice, 18 were negative, 2 were positive with cancer detected in some animals at the highest dose (equivalent dose = 0.5 lbs glyphosate per day).
Conclusion: 90% of animal studies found no effect. 10% of animal studies found a correlation at the highest dose further investigation is required.

EXPOSURE TO GLYPHOSATE INCREASES CANCER RISK
AND SO M
DrJayDa

TBD

Roundup
WEED & GRASS KILLER
SUPER CONCENTRATE

Example: Cancer Rates and GMO Consumption & Production by Country

- The countries in the top ten come from Europe, Oceania and the Americas.

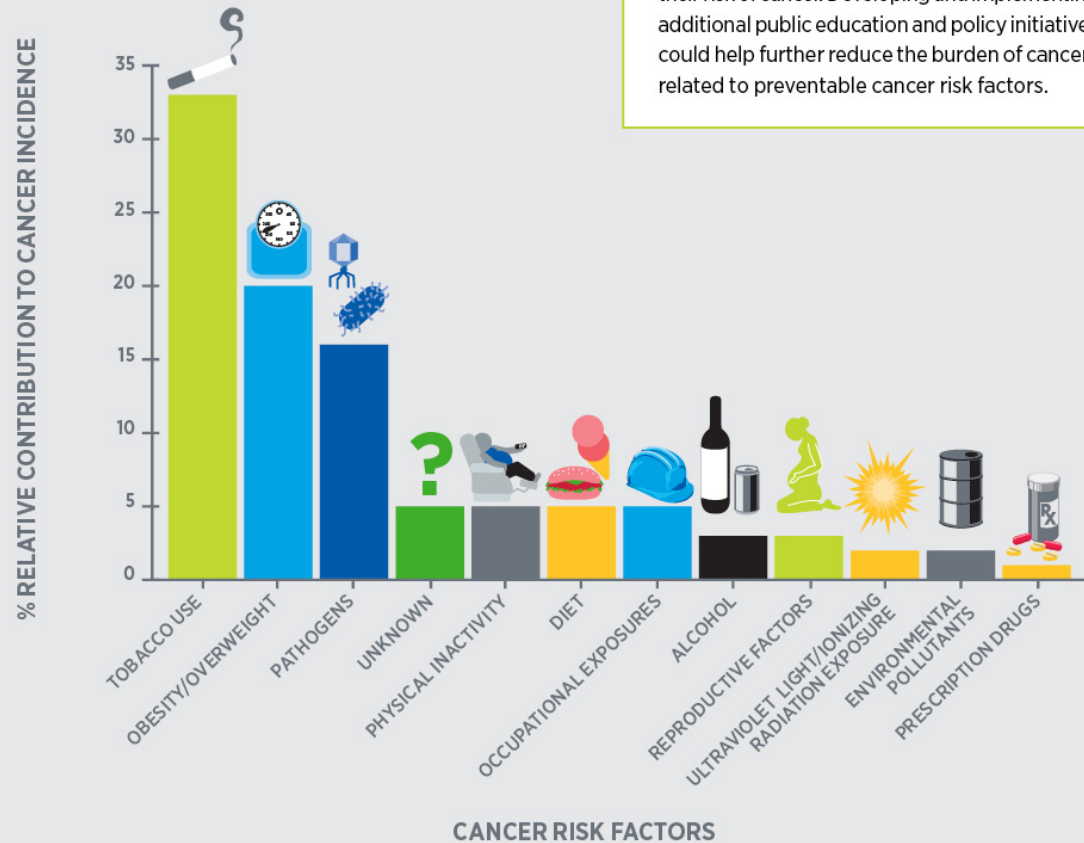| Rank	Country	Age-standardised rate per 100,000	
1	Australia	363.0	#12 GMO use/produce
2	New Zealand	358.3	non-GMO
3	Hungary	330.6	non-GMO
4	Belgium	329.9	non-GMO
5	Canada	329.7	#4 GMO use/produce
6	Denmark	325.5	non-GMO
7	Ireland	322.9	non-GMO
8	US	321.2	#1 GMO use/produce
9	Netherlands	318.9	non-GMO
10	Norway	311.3	non-GMO

Several countries such as France, Germany, Austria, Greece, Hungary, the Netherlands, Latvia, Lithuania, Luxembourg, Bulgaria, Poland, Denmark, Malta, Slovenia, Italy, Croatia, and New Zealand have chosen a total ban [on GMO crops].

Cancer Risk Factors Identified as of 2017

Figure 4

Risky Business

Research has identified numerous factors that increase an individual's risk for developing cancer. By modifying behavior, individuals can eliminate or reduce many of these risks and thereby reduce their risk of cancer. Developing and implementing additional public education and policy initiatives could help further reduce the burden of cancers related to preventable cancer risk factors.

% RELATIVE CONTRIBUTION TO CANCER INCIDENCE

35
30
25
20
15
10
5
0

TOBACCO USE
OBESITY/OVERWEIGHT
PATHOGENS
UNKNOWN
PHYSICAL INACTIVITY
DIET
OCCUPATIONAL EXPOSURES
ALCOHOL
REPRODUCTIVE FACTORS
ULTRAVIOLET LIGHT/IONIZING RADIATION EXPOSURE
ENVIRONMENTAL POLLUTANTS
PRESCRIPTION DRUGS

CANCER RISK FACTORS

American Association for Cancer Research (AACR) Cancer Progress Report 2017
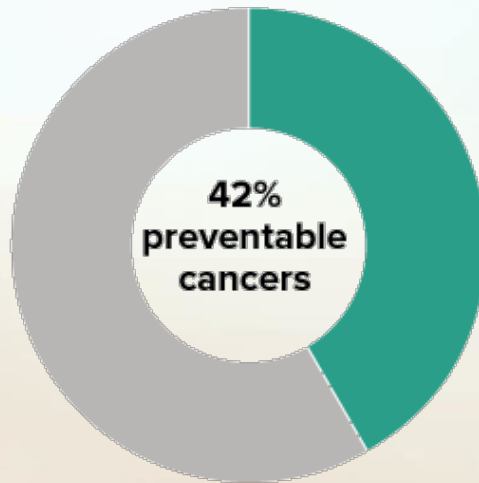
You Can Lower Your Cancer Risk!

It is predicted that 42% of cancers are preventable.

Preventable cancers

More than 40 percent of cancer cases can be prevented, the American Cancer Society finds in a new report. Here is a list of things people can change and their share of cancer cases:

42%
preventable
cancers

CAUSE

Smoking — 19.0%

Obesity — 7.8%

Alcohol — 5.6%

UV radiation — 4.7%

Physical inactivity — 2.9%

Poor diet — 1.9%

Source: American Cancer Society

Parting Thoughts…

❖ To date 120 carcinogens have been identified (but science is built on a continuum and more agents may be discovered with additional research)

❖ Because of chronic misinformation, it is important to get **information from valid sources** (peer-reviewed publications and websites):
- *National Cancer Institute (NCI)*
- *American Institute of Cancer Research (AICR)*
- *American Cancer Society (ACS)*
- *International Association of Cancer Research (IARC)*
- *Cancer Research United Kingdom (CRUK)*
- *Environmental Protection Agency (EPA)*

❖ Remember the **importance of DOSE**, just because something is a carcinogen, doesn't mean it is dangerous to you at the level in your environment

Questions?