# Reduction in cancer risk with Mediterranean diet

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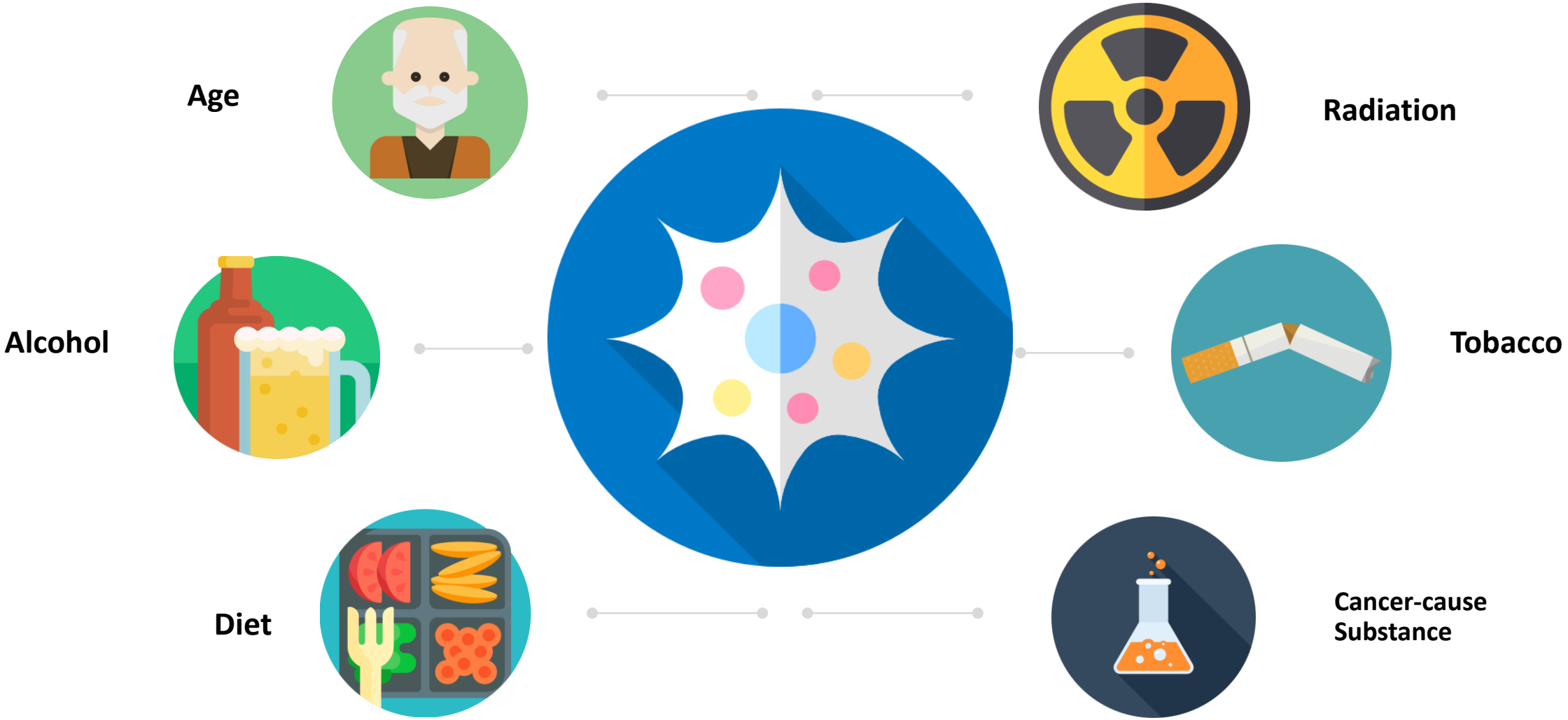
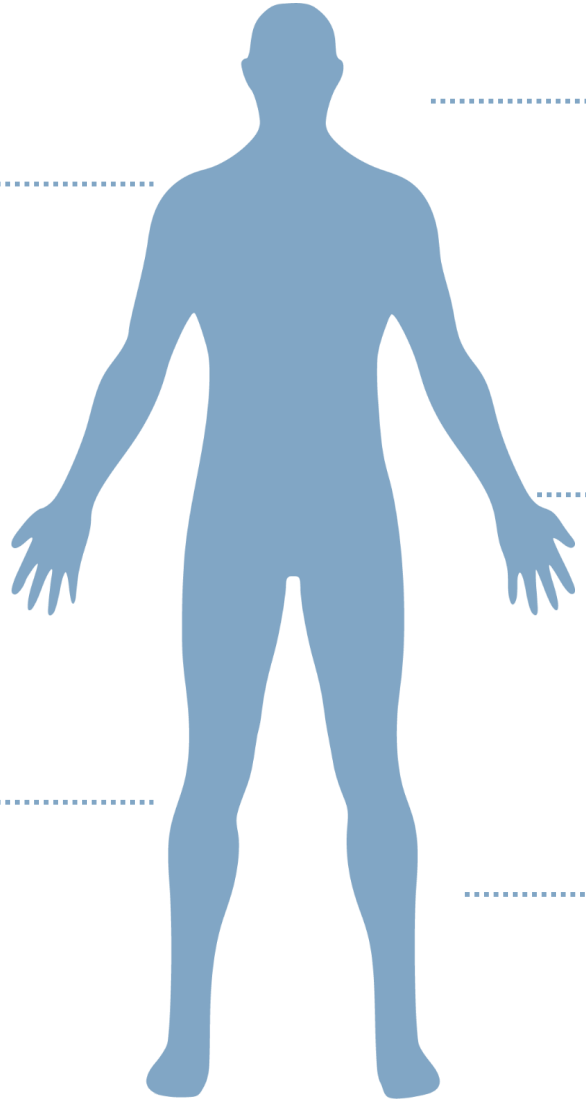
# Cancer-related factors

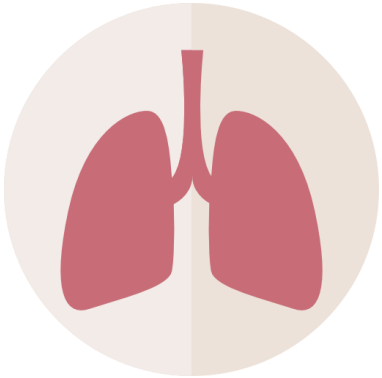


# Which cancers are affected?

Larynx



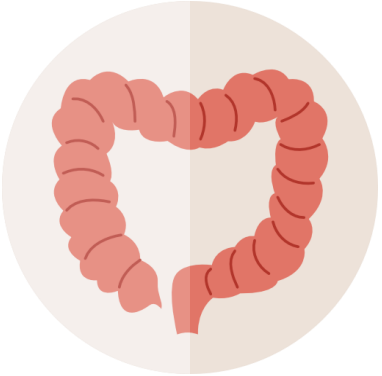
Mouth
& upper throat



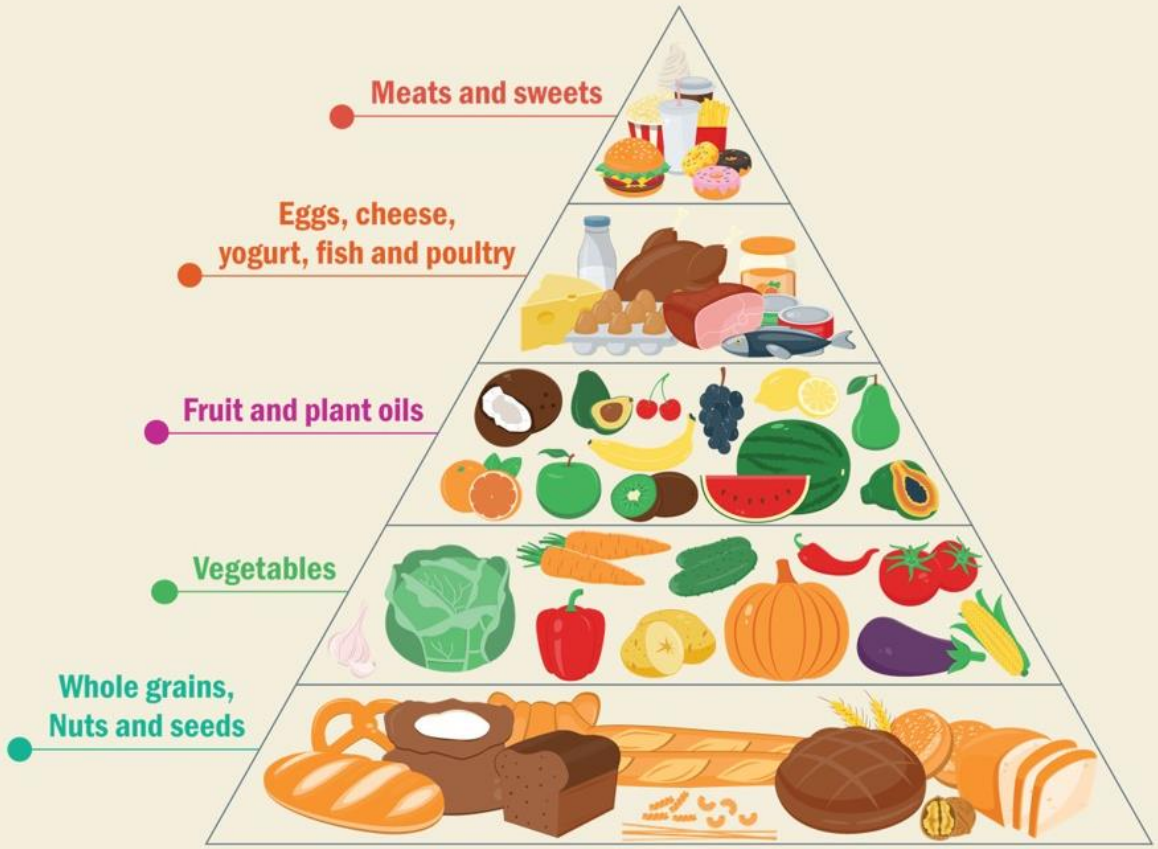
Lung

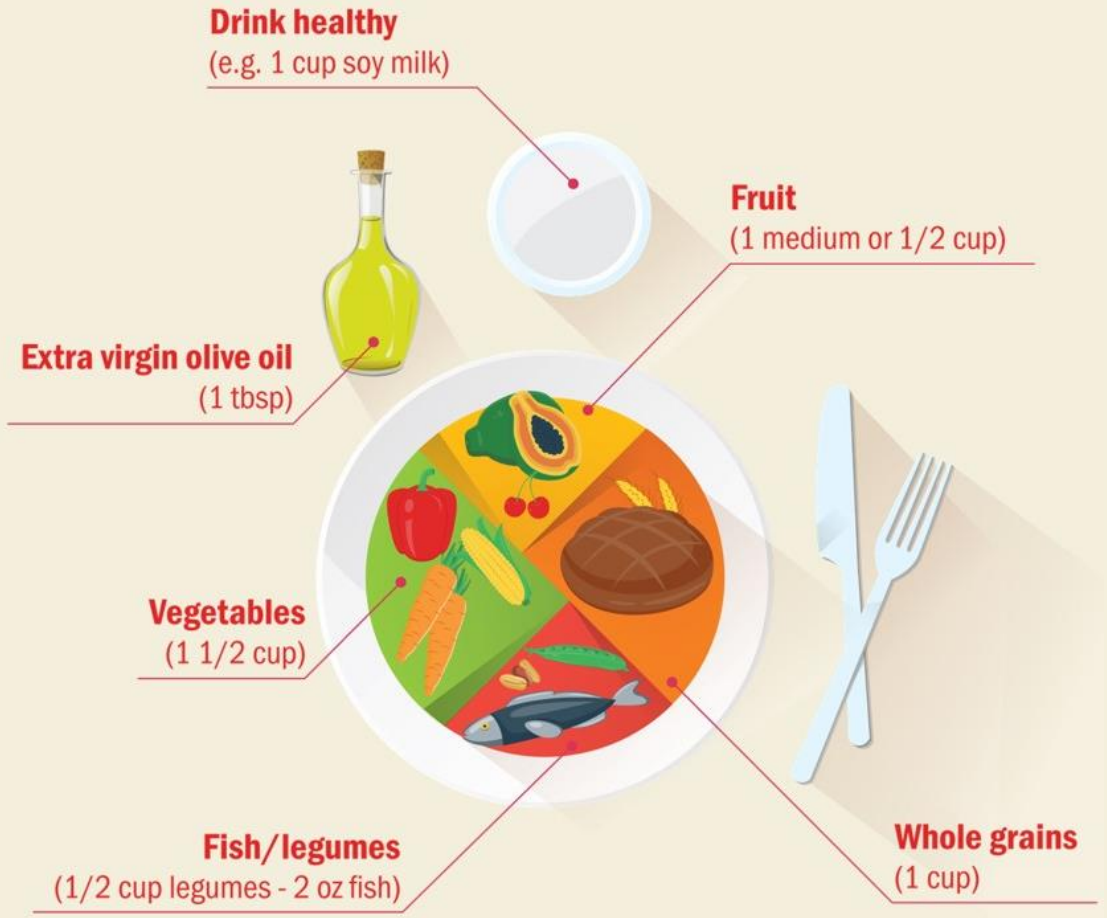
Stomach

Bowel



# Mediterranean diet and its feature



# Mediterranean diet can reduce cancer risk

**Table 4. Results of Statistical Analysis for the Mediterranean Dietary Pattern (aMED) and Cause-Specific Mortality[a]**

| Characteristic | aMED Score, Men (n=214 284) 0-3 | 4-5 | 6-9 | *P* Value for Trend | aMED Score, Women (n=166 012) 0-3 | 4-5 | 6-9 | *P* Value for Trend |
|---|---|---|---|---|---|---|---|---|
| **Cancer** | | | | | | | | |
| Cases, No. | 1608 | 1346 | 763 | | 919 | 921 | 428 | |
| Age-adjusted rates[b] | 409.2 | 284.0 | 234.9 | | 295.5 | 233.6 | 196.3 | |
| Age-adjusted HR | 1 [Reference] | 0.69 (0.65-0.75) | 0.57 (0.53-0.63) | <.001 | 1 [Reference] | | | |
| Multivariate HR[c] | 1 [Reference] | 0.84 (0.78-0.91) | 0.79 (0.73-0.87) | <.001 | 1 [Reference] | | | |
| Multivariate HR[d] | 1 [Reference] | 0.86 (0.80-0.93) | 0.83 (0.76-0.91) | <.001 | 1 [Reference] | | | |
| **Cardiovascular Disease** | | | | | | | | |
| Cases, No. | 1012 | 952 | 461 | | 446 | | | |
| Age-adjusted rates[b] | 257.9 | 201.0 | 142.3 | | 144.5 | | | |
| Age-adjusted HR | 1 [Reference] | 0.78 (0.71-0.85) | 0.55 (0.49-0.61) | <.001 | 1 [Reference] | | | |
| Multivariate HR[c] | 1 [Reference] | 0.94 (0.86-1.03) | 0.76 (0.68-0.85) | <.001 | 1 [Reference] | | | |
| Multivariate HR[d] | 1 [Reference] | 0.95 (0.86-1.04) | 0.78 (0.69-0.87) | <.001 | 1 [Reference] | | | |
| **Other Causes** | | | | | | | | |
| Cases, No. | 761 | 657 | 329 | | 421 | | | |
| Age-adjusted rates[b] | 193.8 | 138.8 | 101.1 | | 135.9 | | | |
| Age-adjusted HR | 1 [Reference] | 0.72 (0.65-0.80) | 0.52 (0.46-0.60) | <.001 | 1 [Reference] | | | |
| Multivariate HR[c] | 1 [Reference] | 0.88 (0.79-0.98) | 0.74 (0.65-0.85) | <.001 | 1 [Reference] | | | |
| Multivariate HR[d] | 1 [Reference] | 0.90 (0.81-1.00) | 0.77 (0.70-0.88) | <.001 | 1 [Reference] | 0.82 (0.71-0.95) | 0.72 (0.59-0.87) | <.001 |

**Table 4** Hazard ratios[a] for incident cancer (95% confidence intervals) by score in the Mediterranean Diet Scale among 25 623 cohort participants: The Greek EPIC Study.

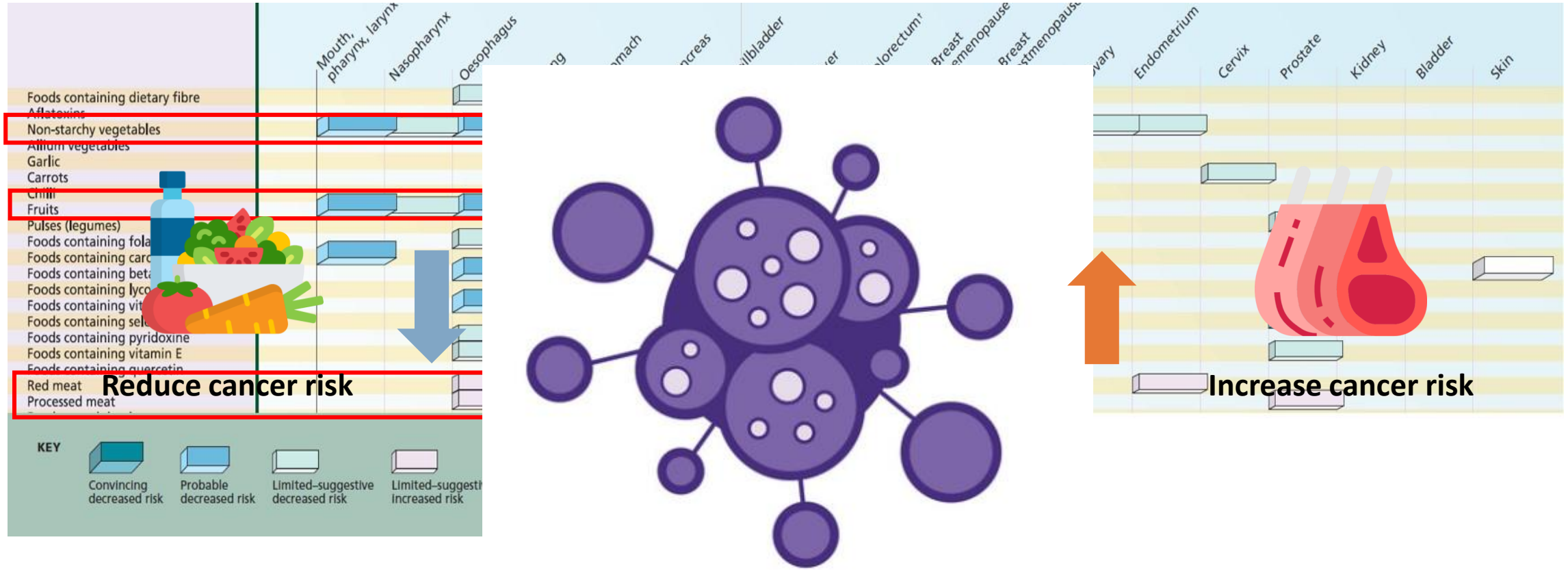
| Hazard ratios | Category of the mediterranean diet score: Score 0–3 | Score 4–5 | Score 6–9 | Per 2-point increment |
|---|---|---|---|---|
| *For any cancer* | Reference | 0.84 (0.72–0.98) | 0.78 (0.64–0.94) | 0.88 (0.80–0.95) |
| Smoking-related cancers[b] | Reference | 0.83 (0.67–1.03) | 0.86 (0.66–1.11) | 0.91 (0.81–1.02) |
| Smoking-unrelated cancers[c] | Reference | 0.86 (0.68–1.08) | 0.70 (0.52–0.93) | 0.84 (0.74–0.95) |
| Excluding first year of follow-up (all cancers) | Reference | 0.85 (0.72–1.00) | 0.76 (0.63–0.93) | 0.88 (0.80–0.96) |
| *By sex (all cancers)* | | | | |
| Men | Reference | 0.96 (0.76–1.20) | 0.83 (0.63–1.09) | 0.91 (0.80–1.02) |
| Women | Reference | 0.74 (0.59–0.92) | 0.73 (0.56–0.96) | 0.84 (0.74–0.95) |

**Results** The Mediterranean diet was associated with reduced all-cause and cause-specific mortality. In men, the multivariate HRs comparing high to low conformity for all-cause, CVD, and cancer mortality were 0.79 (95% CI, 0.76-0.83), 0.78 (95% CI, 0.69-0.87), and 0.83 (95% CI, 0.76-0.91), respectively. In women, an inverse association was seen with high conformity with this pattern: decreased risks that ranged from 12% for cancer mortality to 20% for all-cause mortality ($P = .04$ and $P < .001$, respectively, for the trend). When we restricted our analyses to never smokers, associations were virtually unchanged.

Mitrou, Panagiota N., et al. Archives of Internal Medicine 167.22 (2007): 2461-2468.

Benetou, V., et al. *British Journal of Cancer* 99.1 (2008): 191.

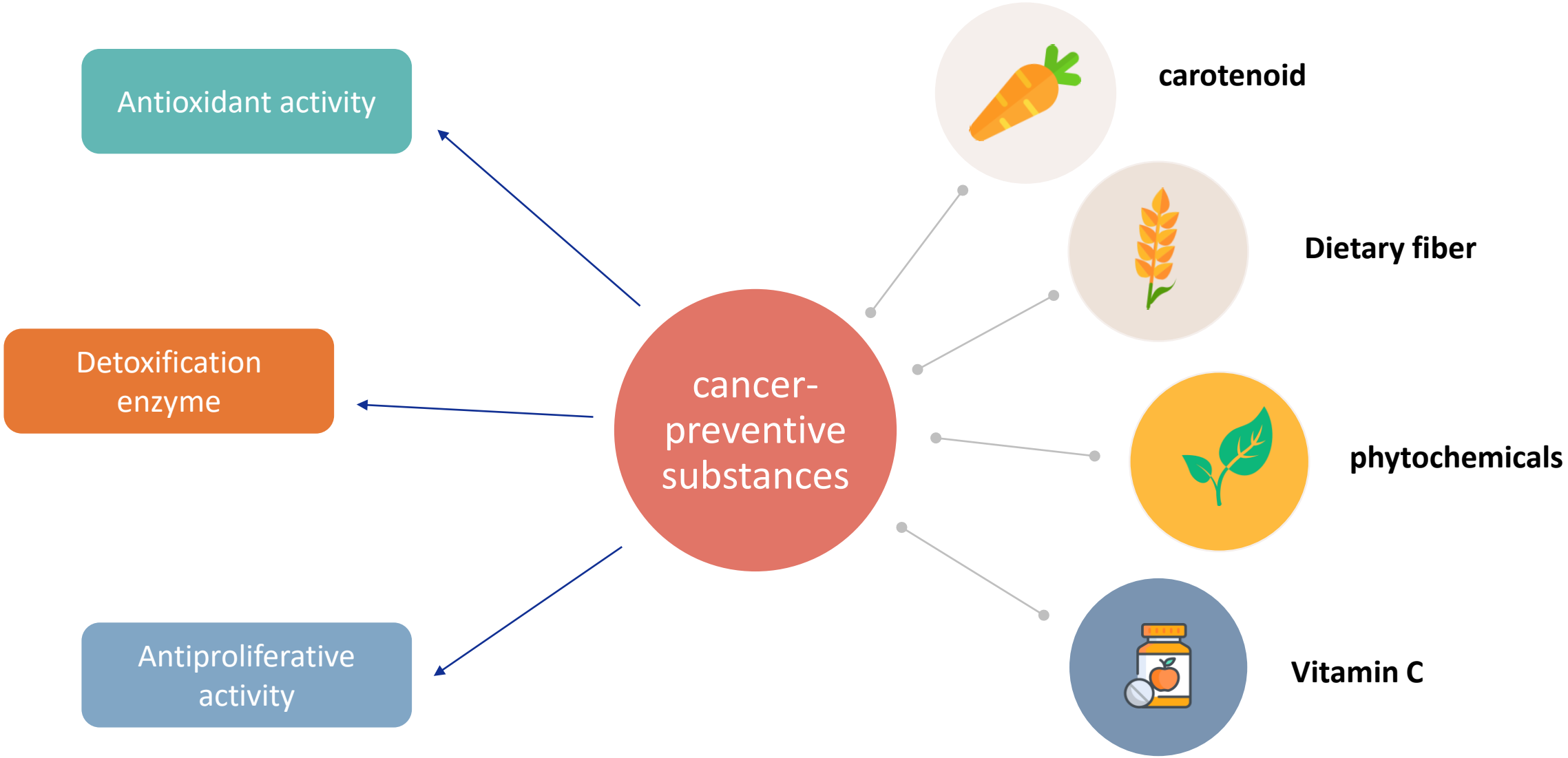
# Diet structure and cancer risk



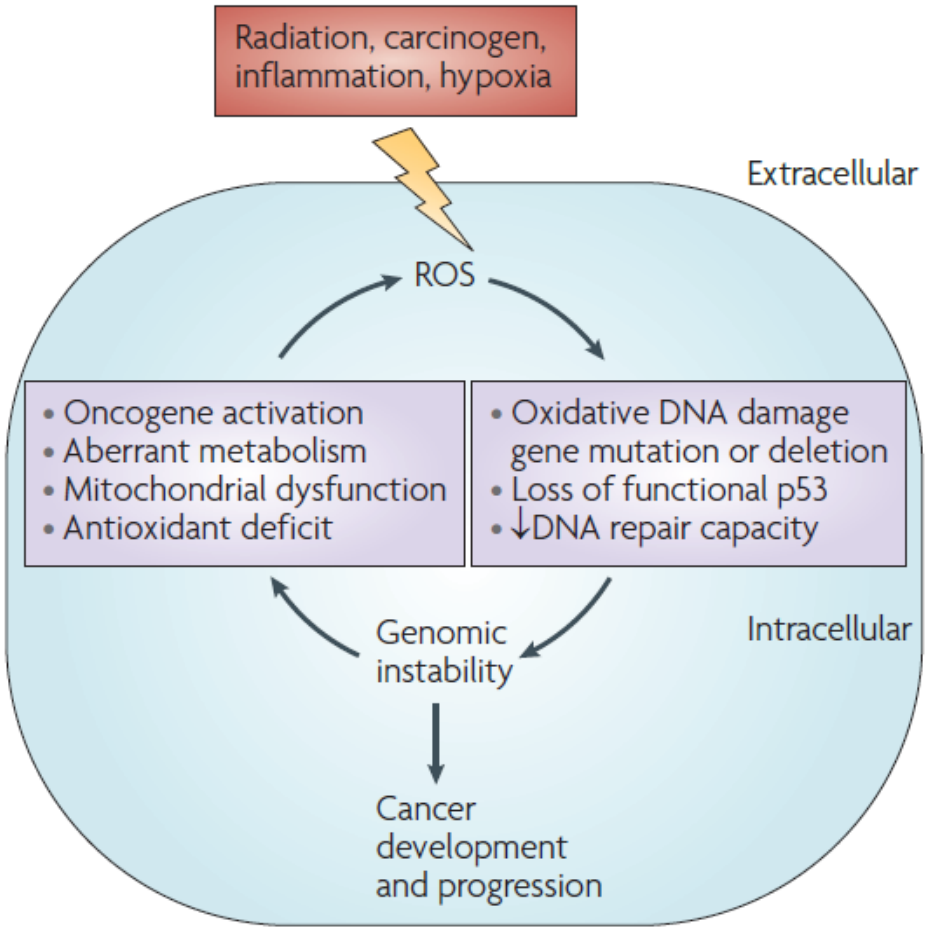

**Relationship between food and the risk of cancer of the sites reviewed**

World Cancer Research Fund / American Institute for Cancer Research.
Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. 2007

# How can fruit and vegetable decrease cancer risk



# Reactive oxygen species (ROS) and cancer




**The vicious cycle of ROS stress in cancer**

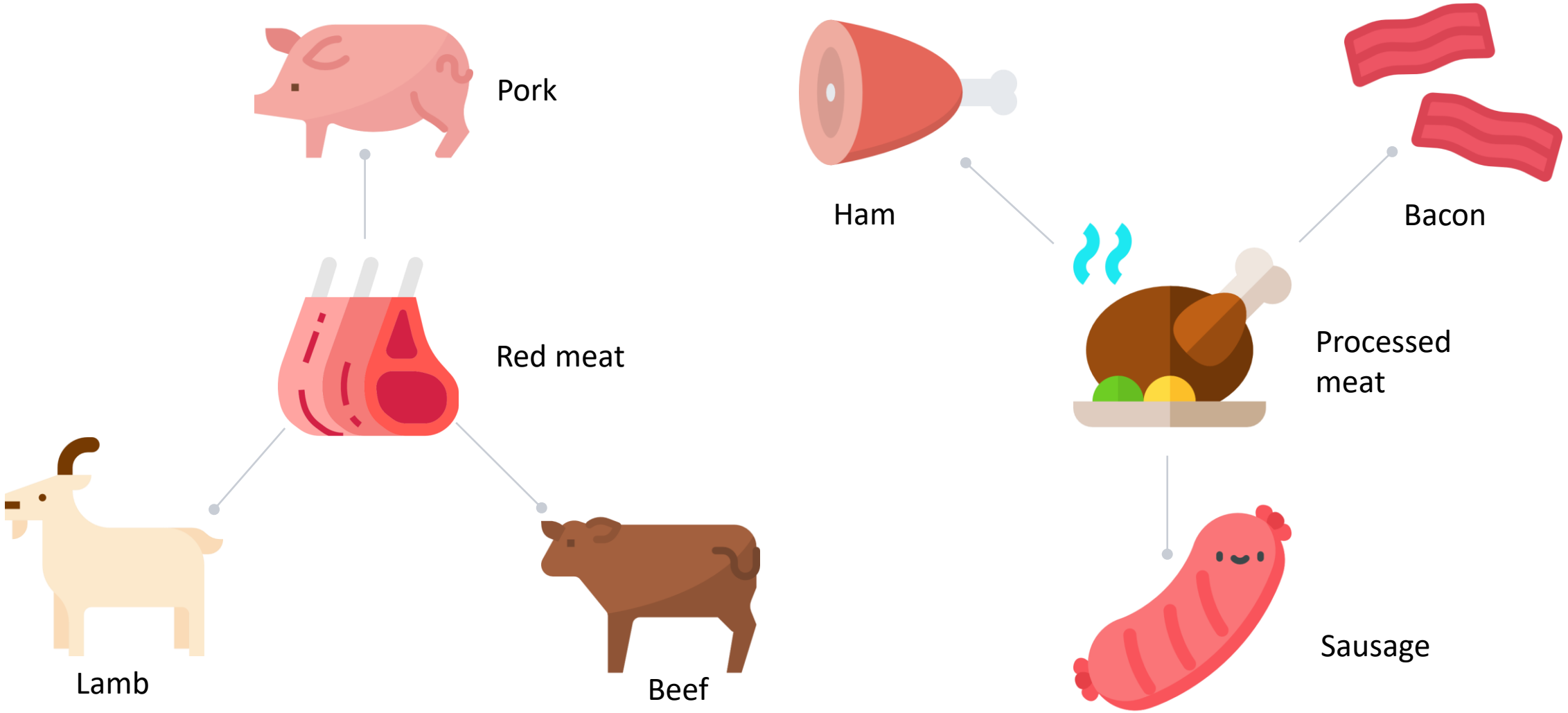
**Alteration of tumor suppressor**

**DNA damage**

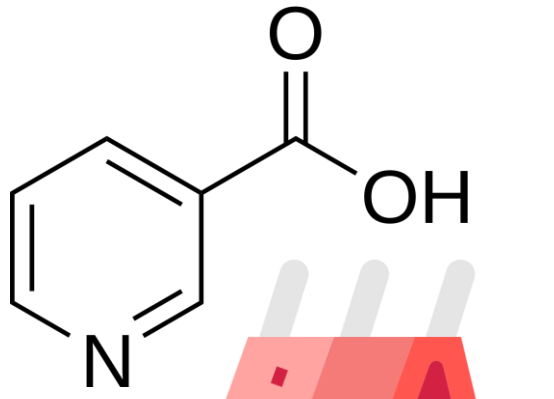
**Decrease of DNA repair ability**

Trachootham, Dunyaporn et al. *Nature Reviews Drug Discovery* 8 (2009): 579-591.

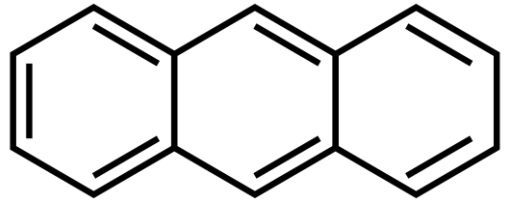
# Red meat and processed meat



# Red meat and processed meat

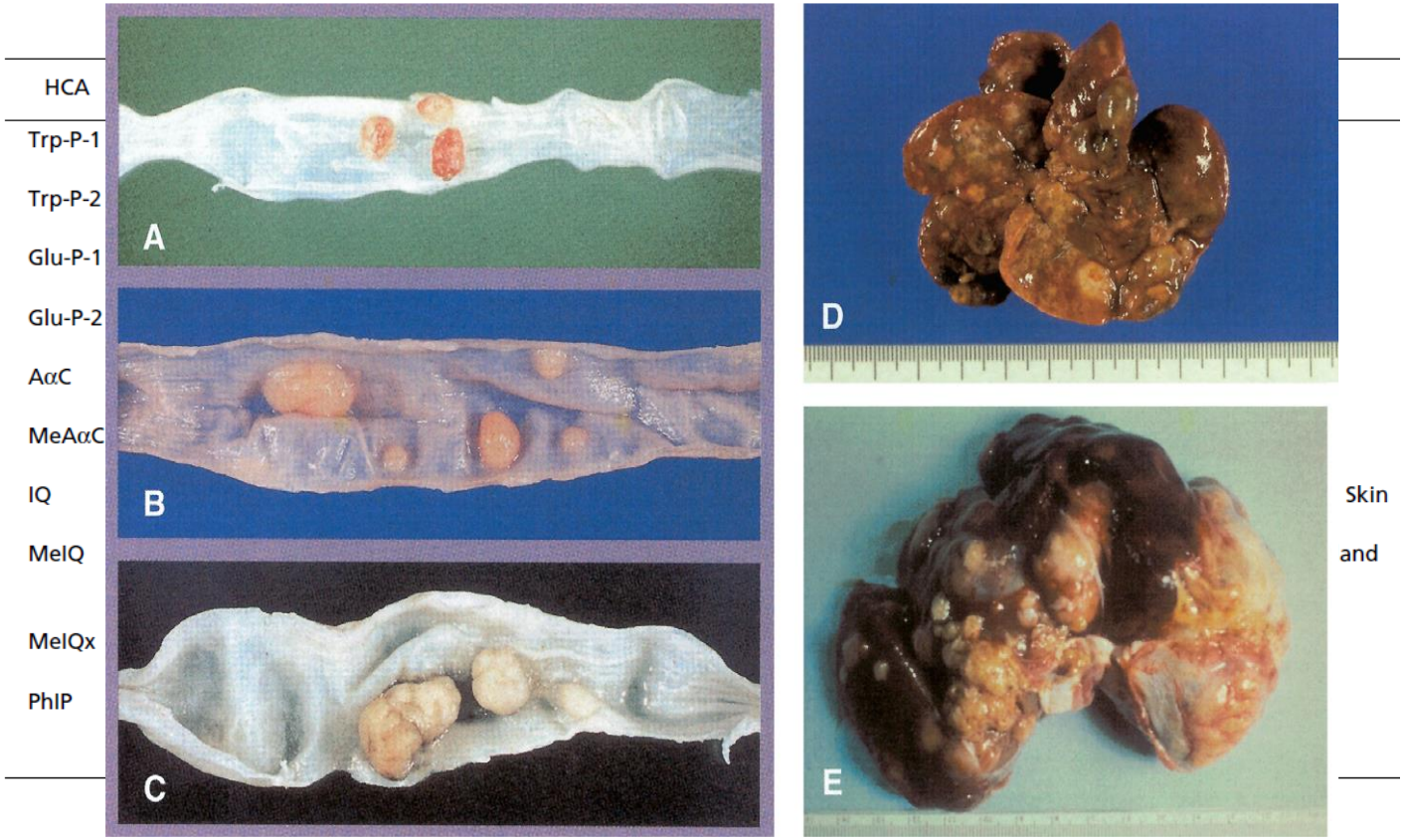



Heterocyclic amines (HCA)



polycyclic aromatic hydrocarbons (PAH)

# Effects of cancer substances




**Carcinogenicity of HCAs in rats and mice**
**Macroscopic features of HCA-induced cancers in experimental animals.**

Sugimura, Takashi, et al. *Cancer Science* 95.4 (2004): 290-299.

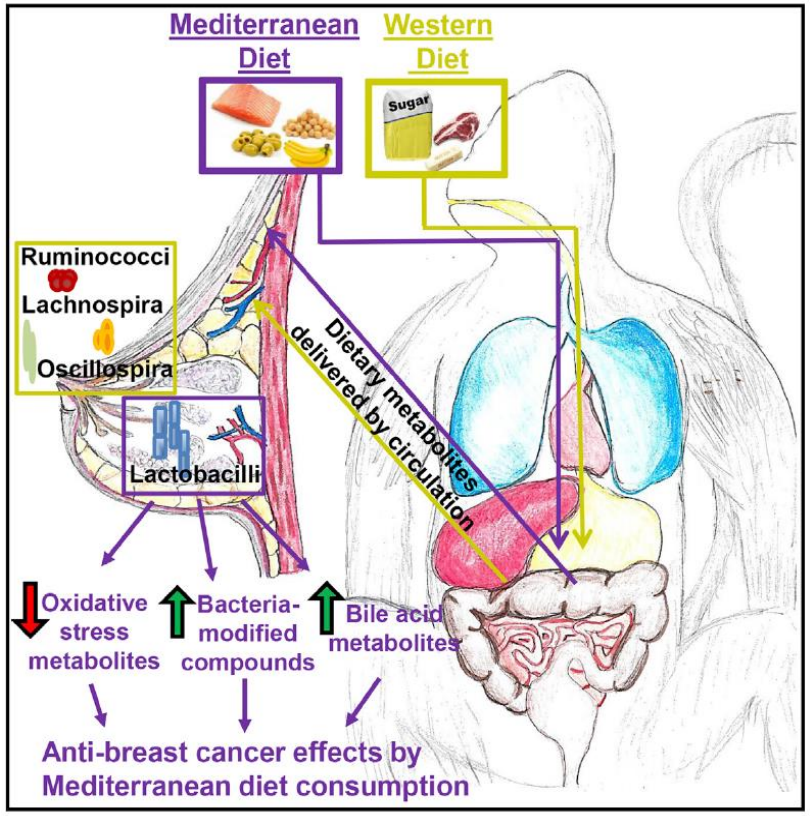
# Mediterranean diet and microbiota

Article

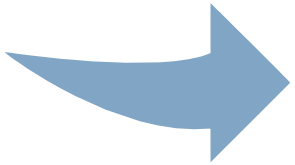
Cell Reports

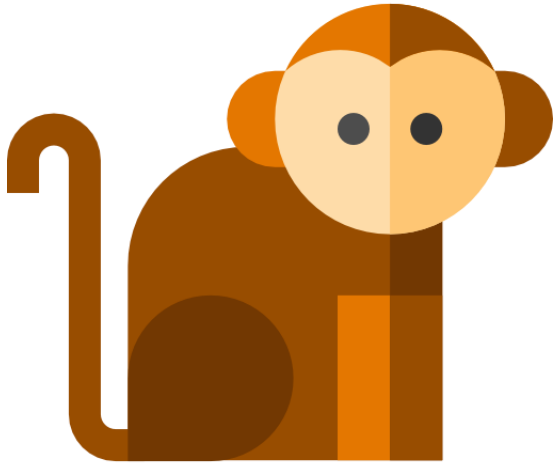
**Consumption of Mediterranean versus Western Diet Leads to Distinct Mammary Gland Microbiome Populations**

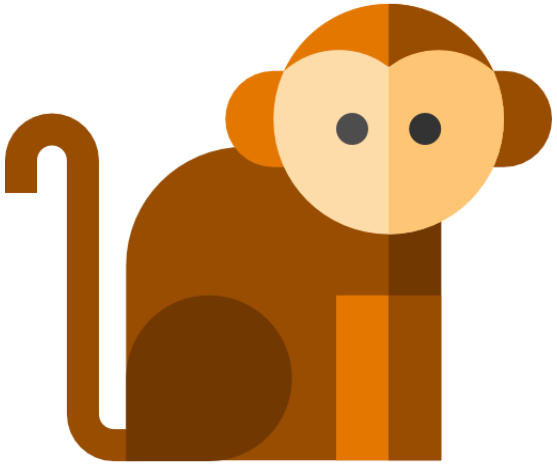
- Diet modulates mammary gland microbiota populations in a non-human primate model
- Consumption of Mediterranean diet elevates mammary gland Lactobacillus abundance
- Mediterranean diet increases breast bile acid and bacterial modified metabolites

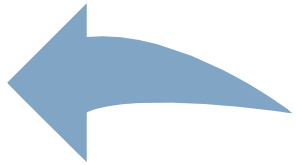


Mediterranean diet



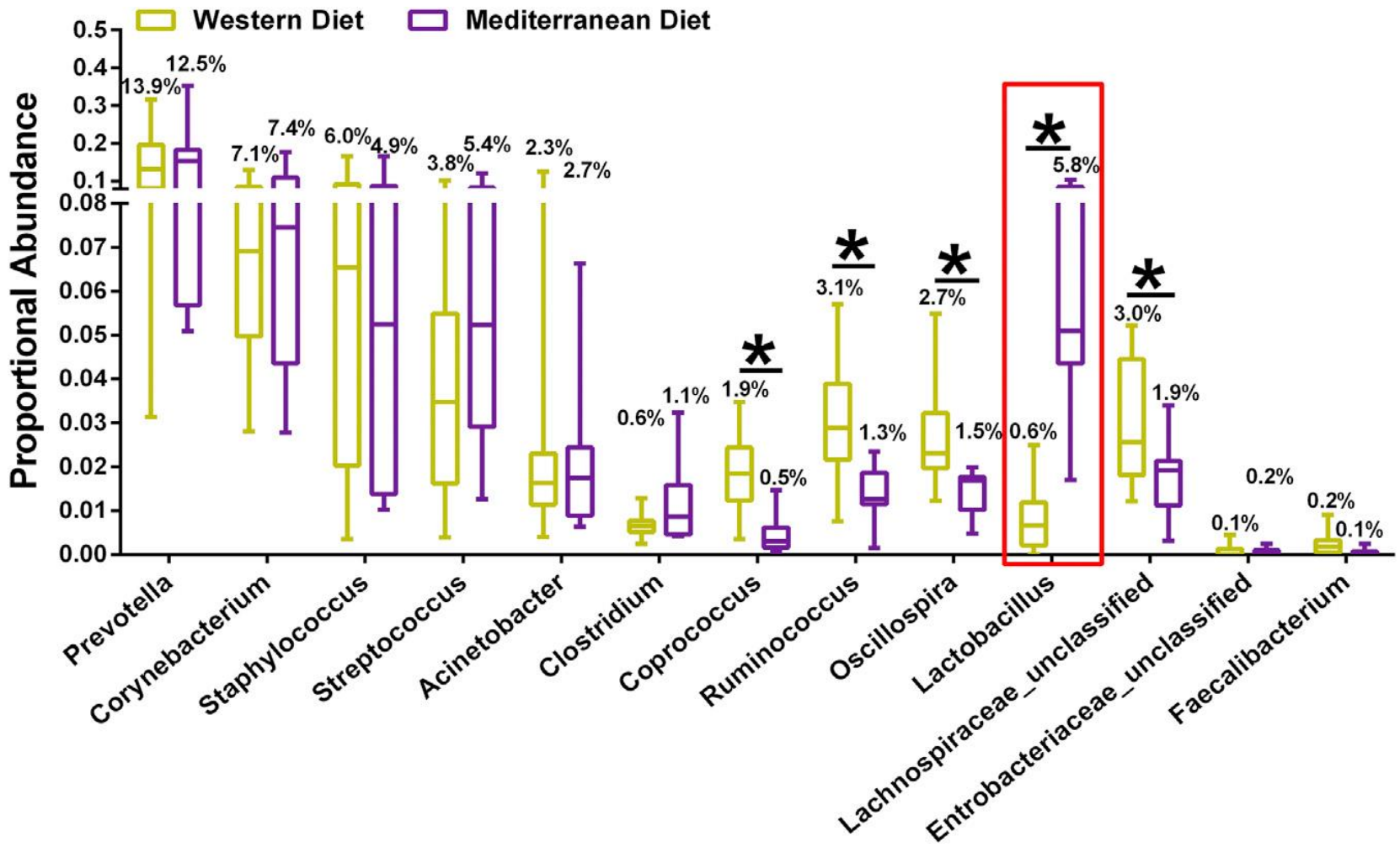






Western diet

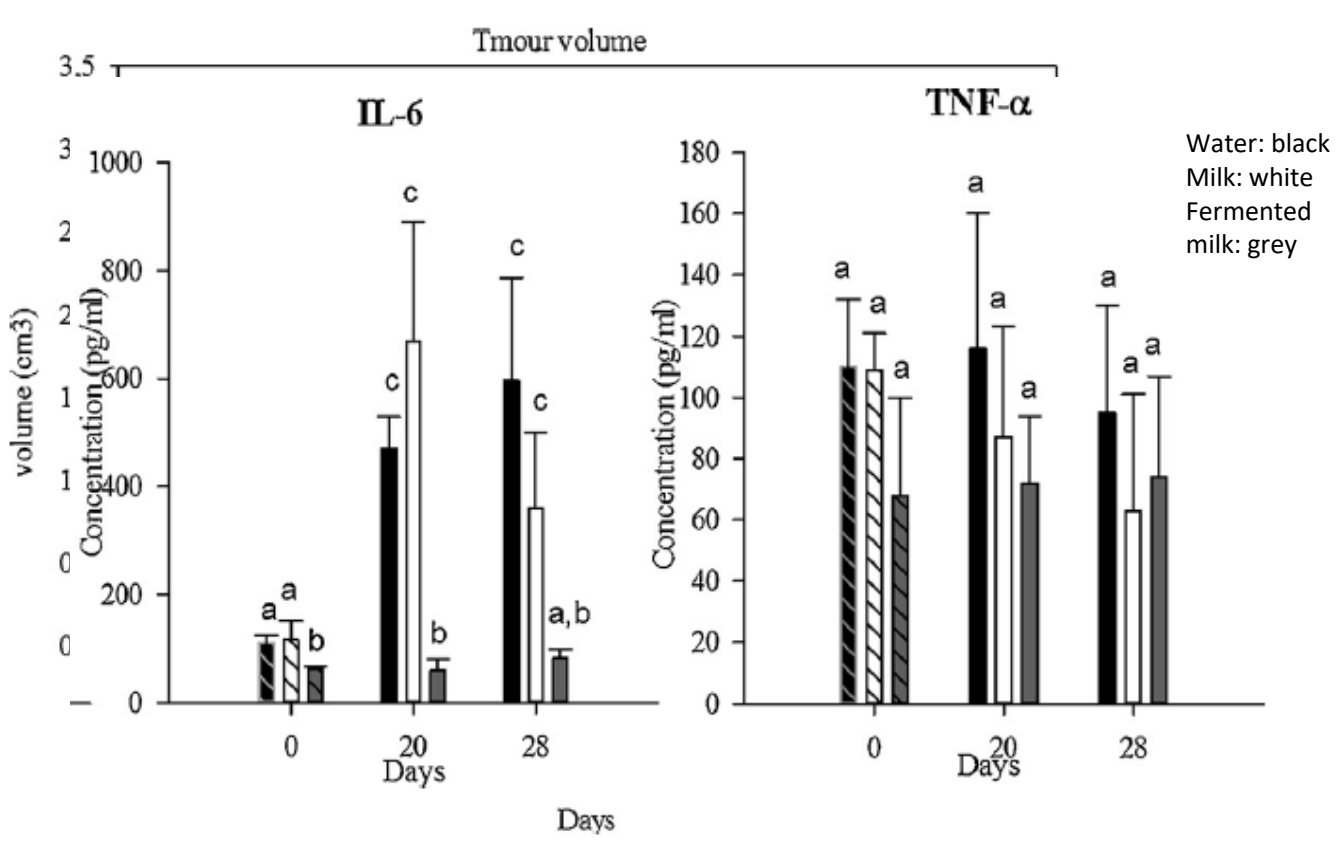
# Breast microbiota abundance alteration



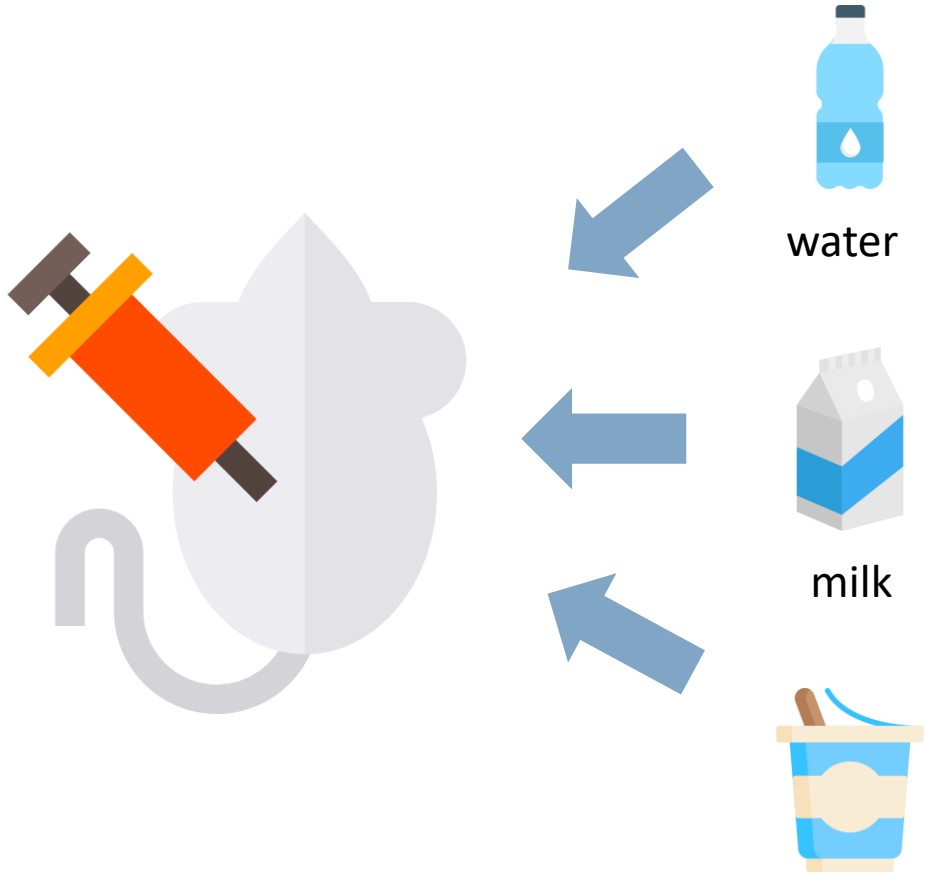

**Differential Taxa between Western Diet-Fed and Mediterranean Diet-Fed Monkey Breast Tissue Microbiota**

Shively, Carol A., et al. *Cell reports* 25.1 (2018): 47-56.

# Lactobacillus can affect breast cancer



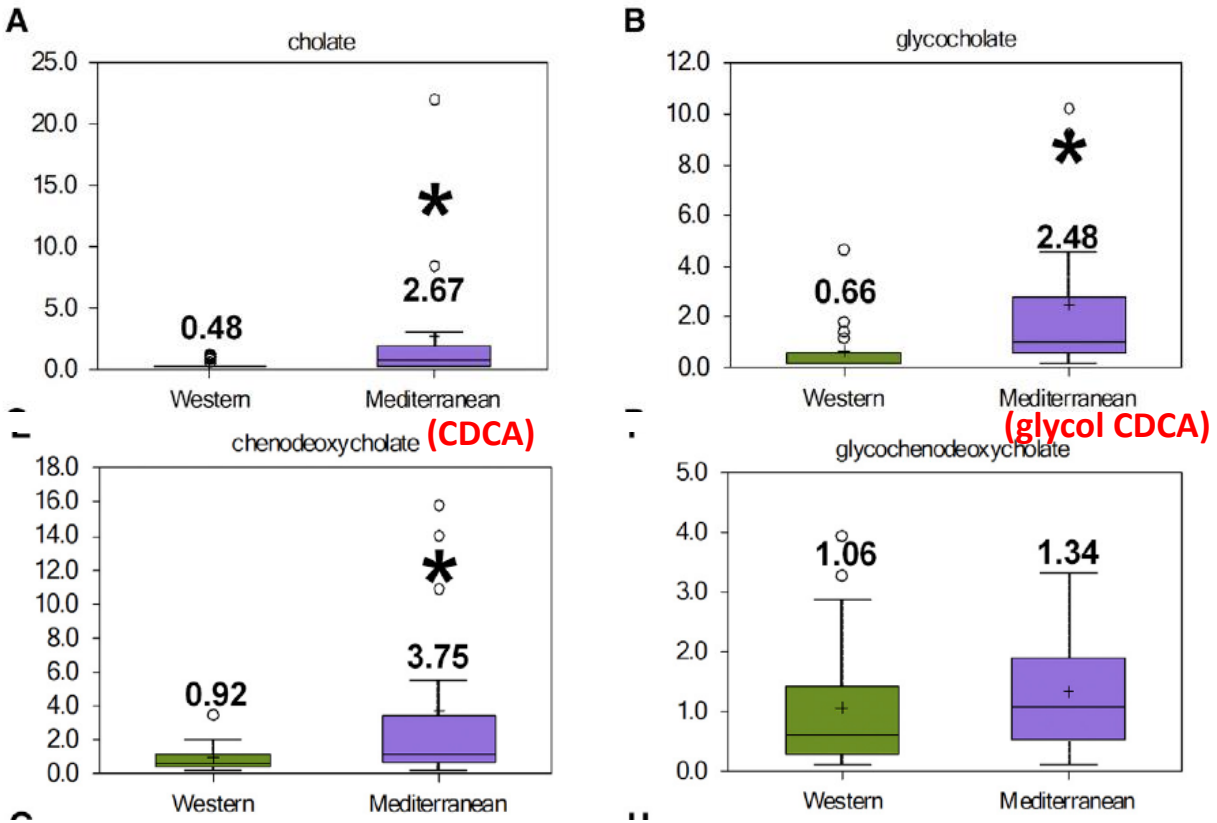

Water: black
Milk: white
Fermented milk: grey



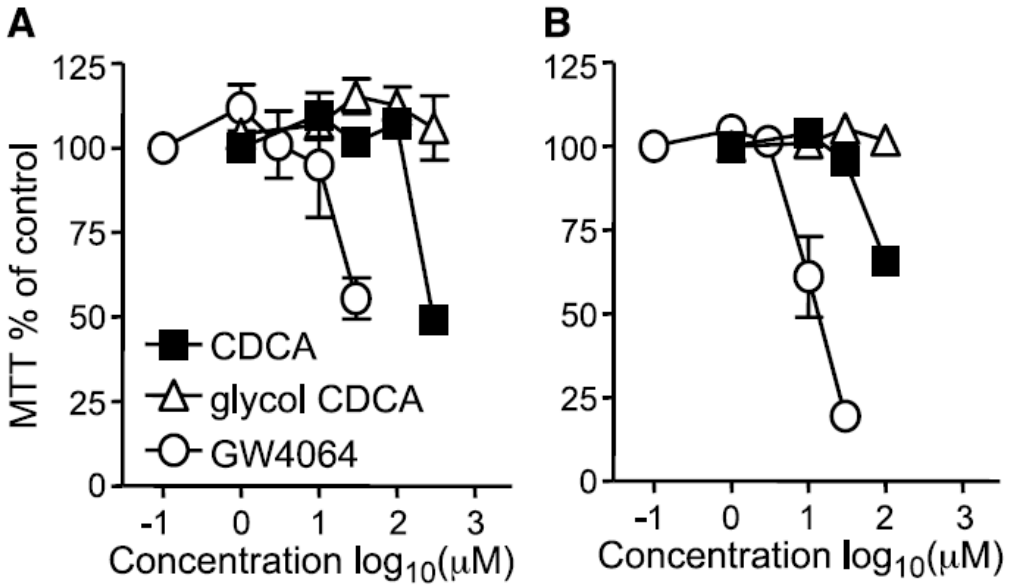

**Effect of tumor injection and EMA administration on the serum cytokines**

Aragón, Félix, et al. *Immunobiology* 219.6 (2014): 457-464.

# Bile acid metabolites elevation




**Diet Differentially Modulates Bile Acid Metabolite Levels in the Mammary Glands**




**Mcf-7 cell line**

**MDA-MB-468 cell line**

**Bile acids induces breast cell lines death**

Shively, Carol A., et al. *Cell reports* 25.1 (2018): 47-56.

Swales, Karen E., et al. *Cancer research* 66.20 (2006): 10120-10126.

# Summary

## *Vegetable*

Antioxidant activity

## *Processed meat*

Cancer-cause substance

## *Lactobacillus*

Mammary gland microbiota

&

metabolites


Thanks for
listening!