



Nutrition & MPN

Horizons 7th
International MPN
Advocates Network
Conference

Israel 18-20 Nov 2022

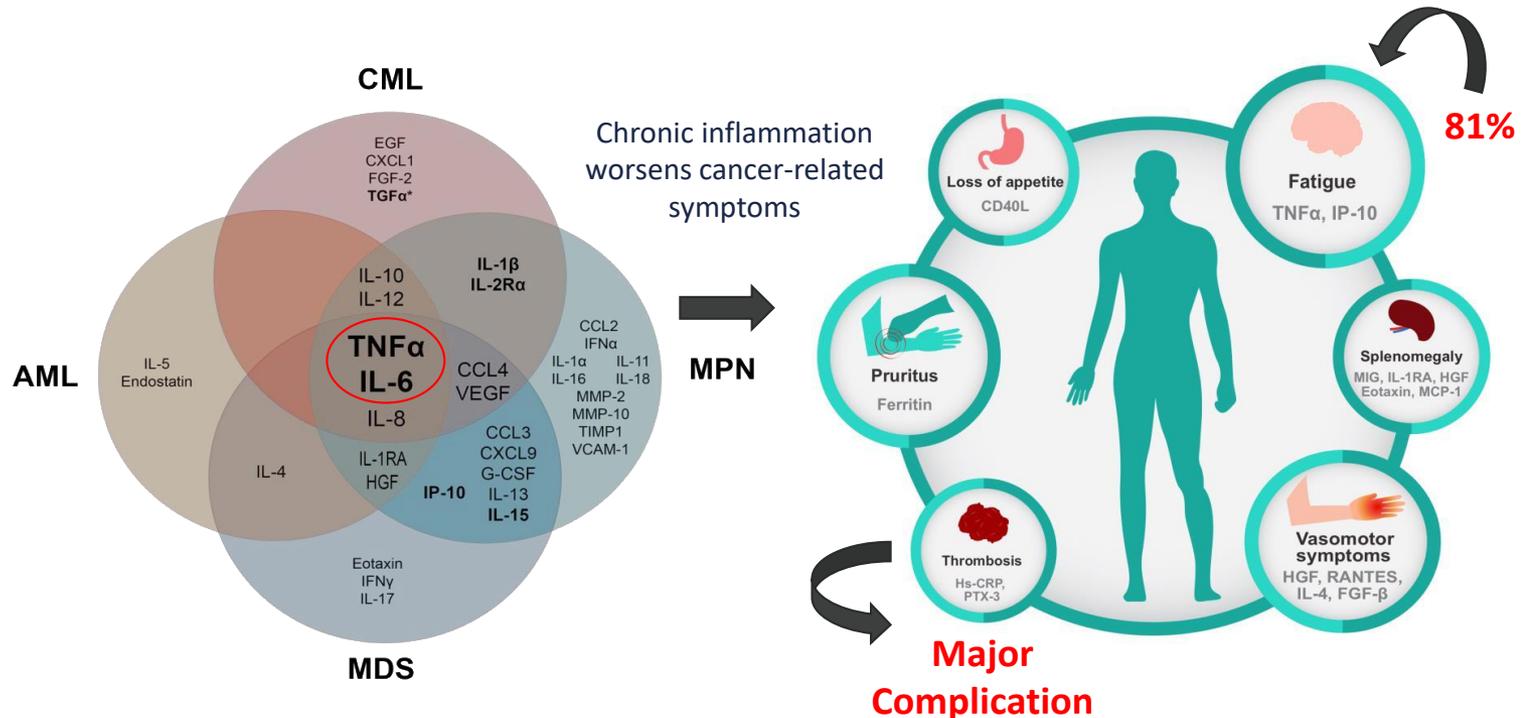
Nathalie Cook OAM

Accredited Practising Dietitian (APD)
BAppSc, MNutrDiet, CertPaedNutrDiet

Nutrition & MPN

- MPN symptoms & progression - associated with inflammation
- Mediterranean or plant-rich diet reduces inflammatory markers & improves health outcomes.
- Nutrients TRIAL – New data suggests Mediterranean style diet improves MPN symptoms & is achievable
- Diet, the gut microbiome & systemic inflammation.
- Frailty & fatigue in MPN & importance of adequate protein
- Mushrooms: Vit D & fibre
- Prunes: anti-inflammatory & bone protective properties
- Caution with vitamin supps: Risk of Vitamin B6 toxicity & neuropathy
- Practical anti-inflammatory eating tips

Inflammatory cytokines correlate with symptom burden and a worse prognosis

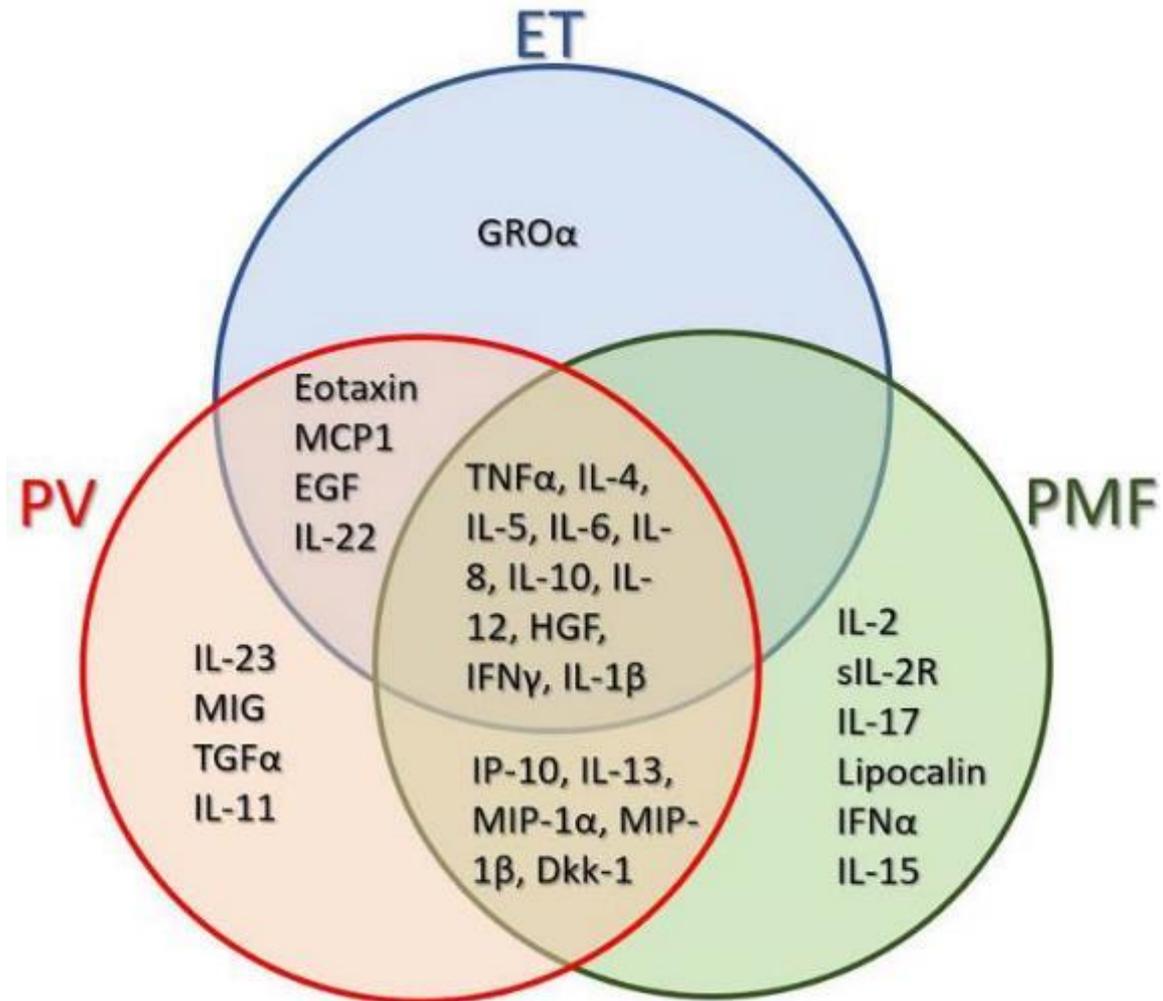


Adapted from Craver et al, 2018

- Ramanathan G, Fleischman AG. The Microenvironment in Myeloproliferative Neoplasms. *Hematol Oncol Clin North Am.* 2021;35(2):205-216. doi:10.1016/j.hoc.2020.11.003

SOURCE: Fleischman, AG, University of California, Irvine- Nutrition and MPN

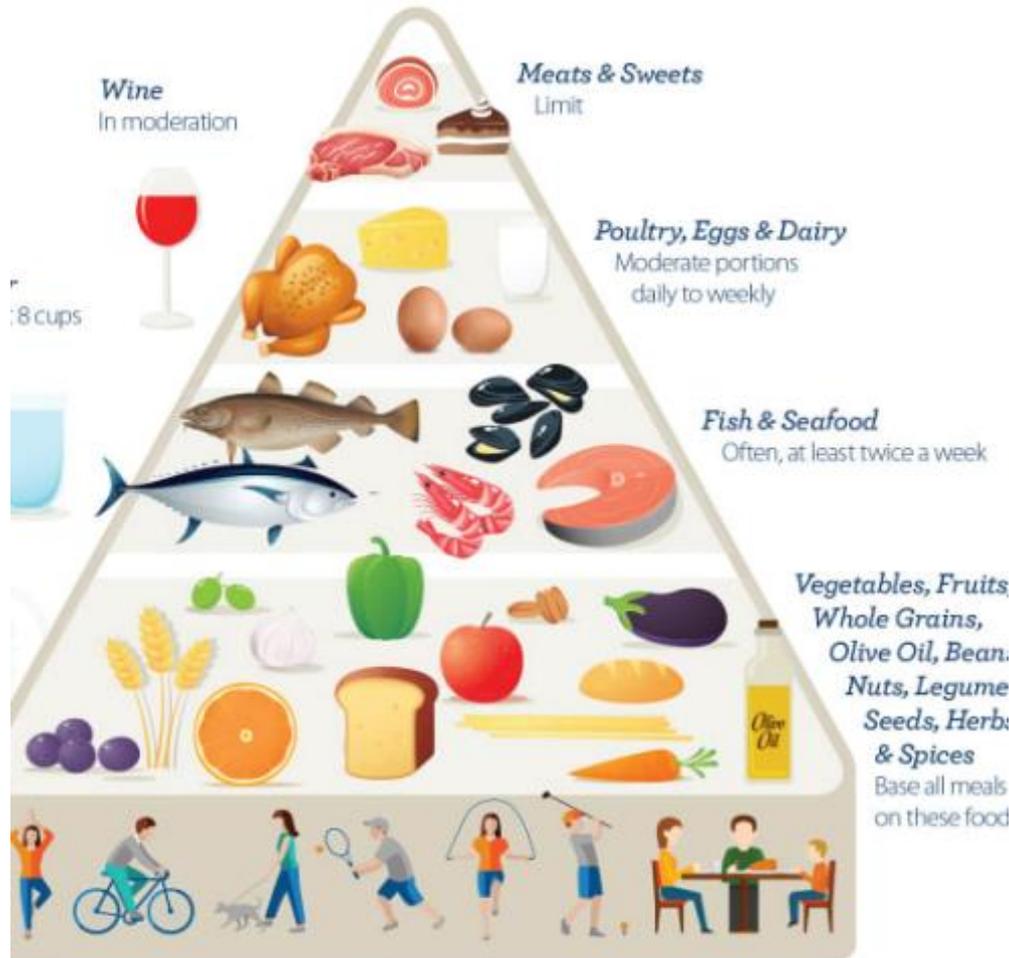
All 3 MPNs are assoc. with chronic inflammation & elevated pro-inflammatory cytokines (cellular messengers)



Ramanathan G, Fleischman AG. The Microenvironment in Myeloproliferative Neoplasms. *Hematol Oncol Clin North Am.* 2021;35(2):205-216. doi:10.1016/j.hoc.2020.11.003

Mediterranean style diet reduces inflammatory markers

THE MEDITERRANEAN DIET



Adherence to a Mediterranean style diet:
(N=3,042):

- **Lower Inflammatory markers (cytokines):**
 - 20% lower **CRP** ($p = 0.015$)
 - 17% lower **IL-6 levels** ($p = 0.025$).
- **Lower coagulation markers**
 - 15% lower **homocysteine** levels ($p = 0.031$)
 - 14% lower **white blood cell counts** ($p = 0.001$)
 - 6% lower **fibrinogen levels** ($p = 0.025$).
- Lower **all cause mortality**.
- **Med. diet reduces inflam. cytokines found in MPN - $TNF\alpha$, IL6, CRP**

Mitrou et. al. Arch Intern Med. 2007;167(22):2461-2468.

Chrysohoou et. al. J Am Coll Cardiol. Jul 7 2004;44(1):152-158. (Adapted from: R. Scherber, MD Mays Cancer Center)

Dietary Inflammatory Index (DII)

- Estimates **inflammatory potential** of an individual's overall diet to modulate systemic inflammation in the body.
 - Measures effects of individual foods, nutrients & flavonoids (plant anti-oxidants) on inflammatory cytokines
- **↑**DII score assoc. with:
 - **↑**Inflammatory cytokines, high BP, obesity. (Rulz-Canela et al 2016)
 - Risk of CVD and CVD mortality (Shivappa et al, 2018)
- **↓**DII score assoc. with:
 - High plant food diets (Turner-McGrievy et al, 2015)
 - Healthier eating patterns & **↓**lower cytokine levels (Wirth et al, 2016)
 - Reduced risk of depression (Marx et al, 2020, Kheirouri, 2018)

Diet with Inflammatory Potential Increases Risk of Heart Attack

Avoid Foods that can Cause Inflammation



White bread



Red & Processed meat



Fried food items



Sweetened beverages & Soda



Fruits



Green and leafy vegetables



Nuts



Fish & Olive oil

Consume Foods that do not Cause Inflammation

Dietary Inflammatory Index (DII) Hannah Mayr, PhD, APD

Research fellow, La Trobe University, Research Dietitian: Princess Alexandra Hospital & Lecturer, Assistant. Prof. Bond University.



- Evaluated the anti-inflammatory potential of 2 healthy diets (2018).
 - MedDiet – **very anti-inflammatory cf conventional low-fat diet.**
 - Participants with ↓DII scores had ↓ IL-6 (inflam. marker)
- **WHY? Extra virgin olive oil, colourful veg & fruit, whole grains, nuts, seeds, legumes, oily fish, herbs, spices.**



The Nutrient Trial (NUTRitional Intervention among myEloproliferative Neoplasms): Feasibility Phase, *Blood* (2019)

Laura F. Mendez, Hellen Nguyen, Jenny Nguyen, Alexander Himstead, Melinda R. Lemm, Elena S. Heide, Robyn M. Scherber, MDMPH, Aditi Choudhry, MD, Chelsea O. McKinney, Ruben A. Mesa, MD, Lari Wenzel, Andrew Odegaard, **Angela G. Fleischman, MD PhD**

1st study to investigate impact of a Mediterranean diet on MPN symptoms & inflammation:

- **MPN pts were able to adhere** to a Mediterranean dietary pattern.
- Adherence to a **Mediterranean diet resulted in 42% reduction** in MPN symptoms

NUTRIENT TRIAL (Intervention Phase Jan-Dec 2021– soon to be published)

A Randomized Clinical Trial to Assess the Impact of a Remotely Administered Diet

Intervention to Impact Symptom Burden in MPN Angela G. Fleischman et al, University of California, Irvine

DASH Diet: (Dietary Approached to Stop Hypertension)

- Low sodium.
- Encourages foods from most food groups

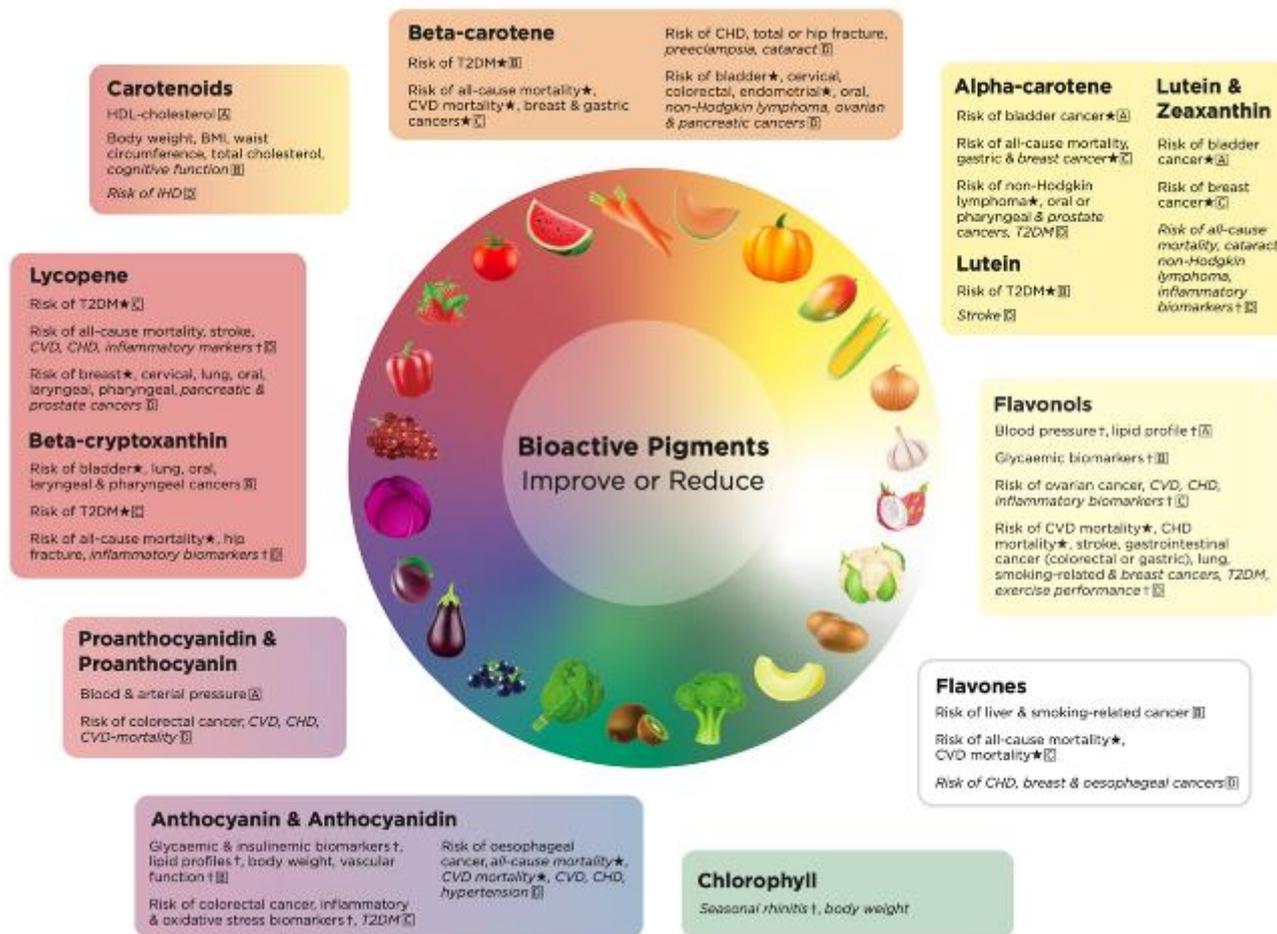
Mediterranean style diet:

- Plant-based, olive oil & seafood.
- Fewer extras (meat, sweets, processed snacks foods, wine etc.)
- **Remote dietitian consults & symptom assessment.**
- **Measured inflammatory biomarkers (cytokines)**
- **Microbiome analyses**

...WATCH THIS SPACE!

DASH		MEDITERRANEAN	
			
FOOD GROUP	DAILY SERVINGS	FOOD GROUP	RECOMMENDATION
Whole grains	7 to 8	Whole grains, vegetables, fruits, seeds, olive oil, beans, nuts, legumes	Base every meal on these foods
Vegetables	4 to 5	Fish, seafood	Eat at least twice a week
Fruits	4 to 5	Poultry, eggs, yogurt, cheese	Eat moderate portions daily to weekly
Dairy, low-fat or nonfat	2 to 3	Meats and sweets	Eat less often than other foods
Lean meats, poultry, fish	2 or fewer	Wine	Drink in moderation
Nuts, seeds, dry beans	4 to 5 per week		
Fats and oils	2 to 3		
Sweets	5 per week		

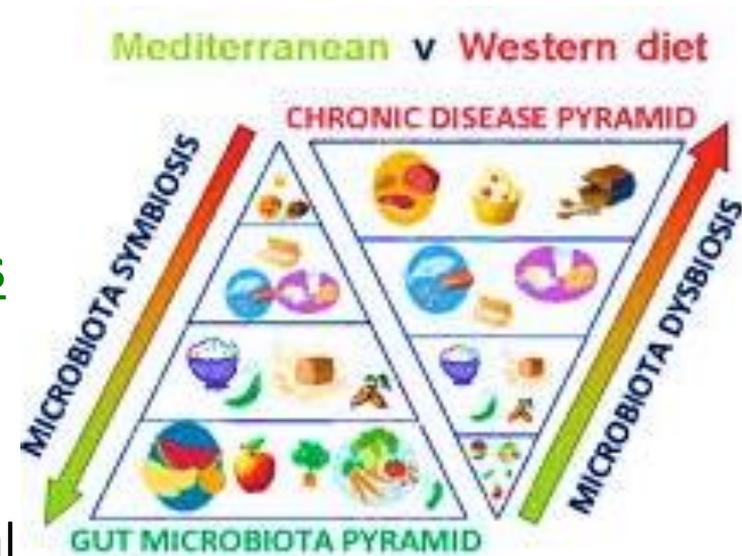
'Eat a Rainbow' – Phytonutrients (flavonoids/bioactive pigments) assoc. with better health outcomes: type 2 diabetes, blood lipids, inflammation, cardiovascular disease, cancer & overall mortality

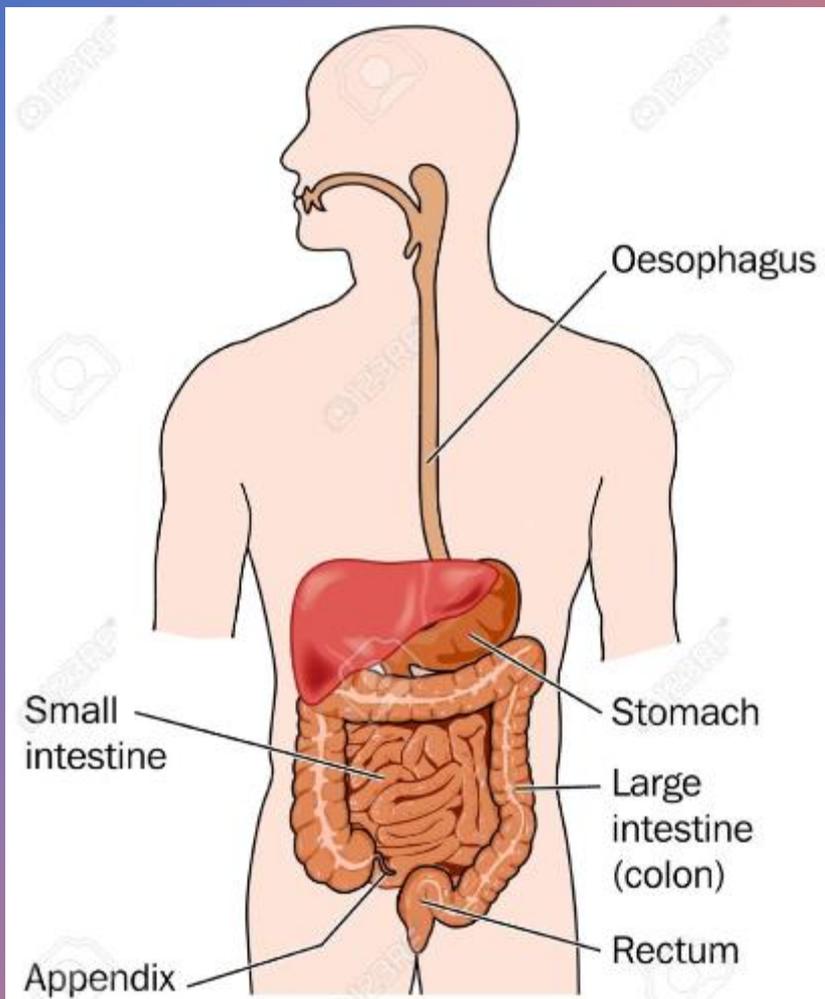


Blumfield, M., Mayr, H., Vlieger, N. D., Abbott, K., Starck, C., Fayet-Moore, F., & Marshall, S. (2022). **Should We 'Eat a Rainbow'? An Umbrella Review of the Health Effects of Colorful Bioactive Pigments in Fruits and Vegetables.** *Molecules*, 27(13), [4061]. <https://doi.org/10.3390/molecules27134061>

What we eat effects our gut microbiota & inflammation throughout the body

- Trillions of micro-organisms live in & on us, **mostly in the GI tract.**
 - Bacteria, fungi, viruses >1000 species.
- By eating colourful, high fibre, minimally processed plant foods...we feed microbes that produce **anti-inflammatory metabolites** - **short chain fatty acids (SCFAs)**
- When we eat **processed foods, high in fat, & sugar & low in fibre**, we starve the beneficial microbes & feed those that produce **pro-inflammatory metabolites**
- So..our food choices **effect the balance & variety** of our gut microbes & **impact our health!**





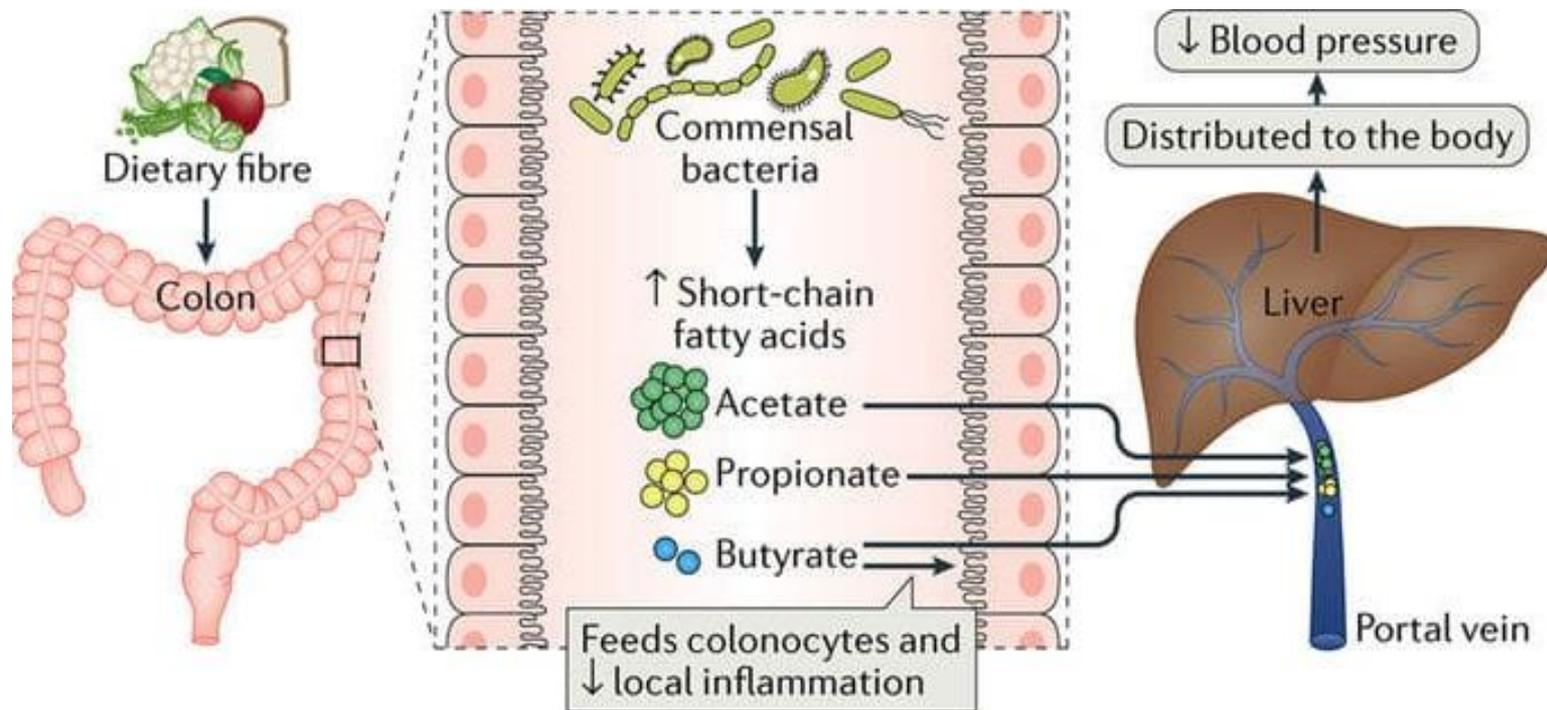
- **Dietary fibre resists digestion in small intestine & reaches the colon**

- Colonic microbes use **fibre** as their energy source & produce protective & anti-inflammatory **short chain fatty acids (SCFAs)**

SCFAs:

- Keep the colon wall healthy
- Protect against colon cancer
- Lower colonic pH & assist Ca absorption
- Are absorbed into the circulation & reduce inflammation throughout the body.

Dietary fibre feeds intestinal bacteria that produce anti-inflammatory short chain fatty acids (SCFAs)



Nature Reviews | Cardiology

- Reference: <https://www.nature.com/articles/nrcardio.2017.120>

Low vs. High Fibre Diet (Aim: 25g w - 30g m/day)

Low fibre diet	Fibre	High fibre diet	Fibre
1 c puffed rice cereal	0.4g	2 WG BF bix or 1/3 c oats	3.3g
2 sls white bread	1.5g	2 sls wg & seed bread	7.5g
1tbsp peanut butter	2.7g	1 tbsp. peanut butter	2.7g
½ c tinned fruit	1.4g	2 pieces of fruit	4.9g
1/2c frozen veg	2.5g	2 c frozen mixed veg	10 g
Mashed potato 120g	1.7g	1 unpeeled potato 100g	2.8g
1 cup white rice	1g	1 c white pasta	2.5g
2 plain dry crackers	.4g	2 whole meal crackers	1.5g
1 slice plain cake 60g	.6g	25 almonds/mixed nuts	3g
1 c fruit juice	0.5g	1 c fruit/veg pieces	2g
5,011KJ	12g	5,000KJ	38g



Dietitian Dr Megan Rossi's research showed eating >30 different plants foods/week = **more diverse microbiome** than eating <10 different plants foods/week.

Each week, try to eat **30 different** plant foods:

VEGETABLES

FRUIT

GRAINS

LEGUMES

NUTS & SEEDS

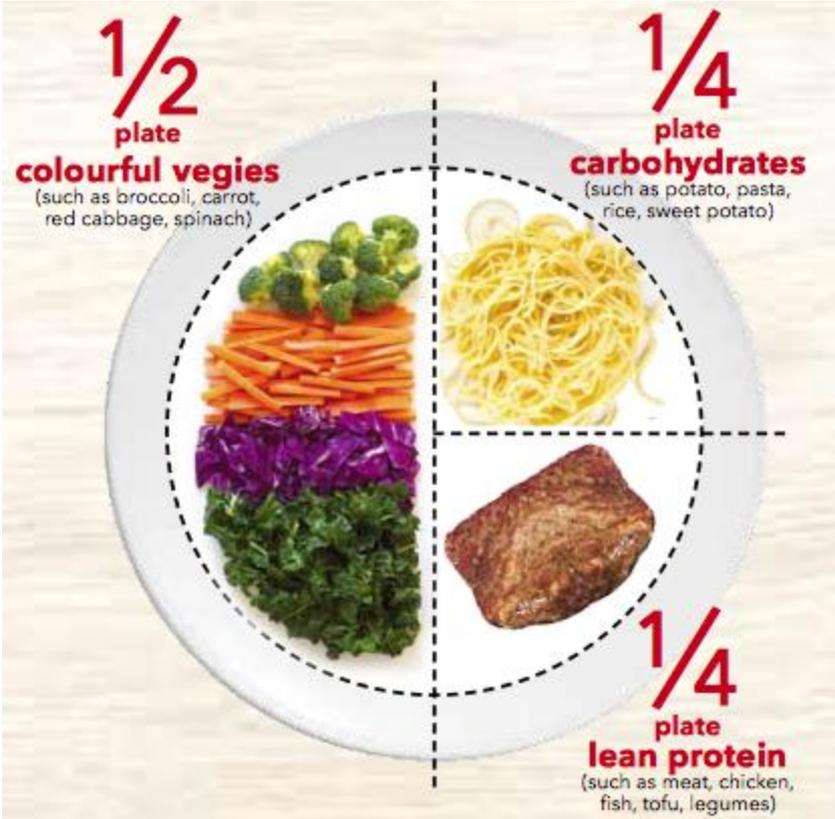
A more diverse & even microbiome is better able to:

- *Train our immune cells
- *Increase resistant to infection
- *Strengthen the gut barrier
- *Communicate with our brain
- *Balance blood sugar, lower blood fats & help prevent many diseases.



Adapted from Dr Megan Rossi: <https://www.theguthealthdoctor.com/>

Healthy dinner portions



Source: www.healthyfoodguide.com.au

Frailty or “sarcopenia” in MPN pts reduces QoL & contributes to MPN fatigue

Sarcopenia (Greek) ‘poverty of flesh’

First proposed (1989) Dr Irwin Rosenberg¹

“No decline with age is more dramatic or potentially more functionally significant than the decline in lean body mass”¹

Normal muscle



Sarcopenic muscle



Progressive loss of **muscle mass & strength**² with age assoc. with:

- Increased falls risk, fatigue, poor QoL, loss of independence
- Increased risk CVD risk, T2DM, mortality.

Sarcopenia assoc. with higher inflam. marker (CRP)³



¹Rosenberg, IH, Summary Comments. *Am J Clin Nutr.* 1989.

²Hughs et al. Longitudinal muscle strength in older adults: influence of muscle mass, physical activity and health. *J Gerontol, A Biol Med Sci,* 2001.

³Bano et al. Inflammation and sarcopenia: A systematic review and meta-analysis, *Epub,* 2016.

Characterizing Frailty in Myeloproliferative Neoplasms: Baseline Results from the Orchid Study (*Blood*, 2020)

Nicholas L Jackson Chornenki, MD, Sarah Karampatos, Darryl Leong, Deborah M Siegal, MD, Christopher M. Hillis, MD
[Blood \(2020\) 136 \(Supplement 1\): 9–10. https://doi.org/10.1182/blood-2020-134557](https://doi.org/10.1182/blood-2020-134557)

- **150 MPN pts** (65 CML, 28 ET, 52 PV, 14 PMF)
- **Assessed frailty indicators:**
 - unintentional weight loss >4kg past yr,
 - Hand grip strength below 20% age/sex,
 - Timed-up-and-go test >13.5 sec. (indicates falls risk)
 - Self-reported exhaustion
 - Low score in Digit Symbol Test (cognitive frailty test)
- **PMF** had higher frailty burden than **ET & PV**
- **Unintentional weight loss** common in MPN pts (34-50%).
- Conclusion: **High rate of baseline frailty among all 4 MPN types.** 20% - PV, ET & CML pts and 42% of PMF pts.





Physiotherapist / Exercise physiologist

Strength training

Progressive resistance training with a high intensity has the most effect on increasing muscle mass and - strength. Take into account the dose - response relationship, recovery period and co - morbidities.

Reference: Peterson et al. 2010



Dietitian

Nutritional intervention

The nutritional intervention is focused on maintaining or increasing muscle protein through adequate consumption of protein, energy, calcium and vitamin D. The dietitian translates the nutritional advice into a diet that is sustainable in the long-term.

Resistance training advice

Exercises

- 8 to 10 different large muscle groups
- Muscle group of arms, legs and trunk

Intensity

- High intensity (BORG scale 7-8/10)
- 80% of one repetition maximum (1RM)

Frequency

- 3 or more times per week

Repetitions

- 8 to 12 repetitions, 1 set

Rest between exercises

- Approximately 2 minutes

Reference: Monteiro-Fernandez et al. 2013

Nutritional advice

Protein

- 1.2 to 1.5 g/kg body weight/day
- Equal distribution over the three main meals
- Aim towards ± 25 g per main meal

Energy

- WHO equation >60 years + 30% activity/stress factor
- Females: at least 1500 kcal/day
- Males: at least 1700 kcal/day

Calcium

- 51-70 years: 1100 mg per day
- >70 years: 1200 mg per day

Vitamin D

- 51-70 years: 10 μ g per day
- >70 years: 15 μ g per day

Reference: Devitz et al. 2014, Paddon-Jones et al. 2009, WHO 2001

Combination of progressive resistance training and adequate protein intake is most efficient to increase muscle mass and muscle strength. Collaboration between physiotherapist/exercise physiologist and dietitian is essential.

Reference: Kim et al. 2012

What is sarcopenia?

Sarcopenia is age - related low muscle mass with accompanied low muscle strength and/or gait speed. Sarcopenia is prevalent in one third of older adults.

Multidisciplinary approach

A multidisciplinary approach is required to prevent, diagnose and treat sarcopenia. The specialist or general practitioner (GP), physiotherapist or exercise physiologist and dietitian should collaborate for the diagnosis and treatment of sarcopenia.

Collaboration triangle:



European consensus definition of sarcopenia



Reference: Cruz-Jentoft et al. 2010

Handgrip strength

Dynamometer

- Males: <30 kg
- Females: <20 kg



Reference: Lavretski et al. 2002

Gait speed

4-meter walktest

- Males and females: ≤ 0.8 m/s



Reference: Lavretski et al. 2002

Muscle mass

Bio-electrical Impedance Analyser

Four-point measurement:
Appendicular lean mass (lean mass of arms and legs) index
Males: ≤ 7.26 kg/m²
Females: ≤ 5.45 kg/m²

Two-point measurement:
Fat free mass index
Males: <16 kg/m²
Females: <15 kg/m²

Reference: Baumgartner et al. 1998

To prevent frailty (sarcopenia), eat protein foods at meals & snacks
Aim for ~25g protein/meal (1.2-1.5g/kg BW/day)

Breakfast:

- ½ c baked beans (7g), 2 eggs (12g*), 1 sl wm toast (3g) white tea (2g) = **24g**
- 1/2c /40g oats (5g), 1c milk (10g*), 1 sl toast (3g), milk coffee (8g*) = **25g**

Lunch:

- 1 x wm sandwich (6g), tuna (15g*), 1 slice cheese (5g*) salad, fruit = **26g**

Dinner:

- Palm size=1/4 plate area meat/chicken/fish (20g*), baked potato w skin, 2 cups veggies, 1 c custard/200g yoghurt (10g*), ½ c fruit = **30g**

Snacks:

Yoghurt*, unsalted nuts, peanut butter, boiled eggs*, fruit bread, fruit, wholegrain crackers, cheese*, milk coffee* or smoothies*.

*** = high biological value protein – meets the body's amino acid needs (protein building blocks)**



Sun exposed MUSHROOMS = Vitamin D enriched MUSHROOMS!!!

Vit D defic. common worldwide - assoc. with *osteoporosis, autoimmune disease, diabetes, worse Covid19 infection.*

Every cell in the body has Vitamin D receptors. Important for immune function.



- 100gm mushrooms in sun for 15-30min = 400IU/10mg Vit. D2 = daily req. (5 button mushrooms/1 large)
- Vit. D2 mushrooms - stable in fridge & cooking.
- Also contain gut-healthy fibre & selenium.

We make Vit. D3 from Ultraviolet B (UVB) in sunshine on our skin (*dehydrocholesterol* to Pre-vitamin D3)

UVB in sunshine converts *ergosterol* in mushrooms to *ergocalciferol* – Pre-Vitamin D2

Pre-Vit D2 & D3 convert to bioactive forms of Vitamin D in the liver, kidneys & macrophages (WBCs).



Safe sun exposure: early morning/late afternoon

(Time needed varies seasonally: 15min-2hrs)²¹

Source: Keegan RJ, Lu Z, Bogusz JM, Williams JE, Holick MF. Photobiology of vitamin D in mushrooms and its bioavailability in humans. *Dermatoendocrinol.* 2013;5(1):165-176. doi:10.4161/derm.23321

6 Prunes/day Reduce Inflammation & Osteoporosis Risk



Bones constantly re-model with a balance of bone-building cells, *osteoclasts* & bone break-down cells, *osteoblasts*

Osteoporosis risk increases with age

Inflammation \uparrow *osteoblasts* & \downarrow *osteoclasts*, increasing osteoporosis risk

Prunes are rich in antioxidants: polyphenols & anthocyanidins

Recent research - 6 prunes/day reduces pro-inflammatory cytokines assoc. with inflammation & osteoporosis (start slowly)

Prunes also contain Vitamin K, magnesium & copper, important for strong bones

Also need- Dietary calcium, protein, Vit. D & weight bearing exercise for osteoporosis prevention

Source: Damani J, Strock N, De Souza MJ, Rogers C. [A randomized controlled trial of dietary supplementation with prunes \(dried plums\) on inflammatory markers in postmenopausal women](#). Presented at: American Physiological Society (APS) annual meeting at **Experimental Biology 2022**; April 2-5, 2022; Philadelphia, PA: poster E346

Caution with Vitamin B6/pyridoxine supplements: Potential for dose-related toxicity - peripheral neuropathy (tingling, burning or numbness in hands & feet)



Vit B6 is found naturally in many foods. Food sources **have not** been reported to cause adverse effects.

Vit B6 toxicity has occurred at a daily dose of >50 mg a day.

- (Rec. Dietary Intake = 1mg/d)

Vit B6 can accumulate from:

- Vit B6 supps (multivitamins, magnesium etc)
- Long-term ingestion of foods or drinks fortified with B6 (Energy drinks, breakfast cereals, meal replacement shakes)

In Australia products with >50mg Vit B6 have a label warning:

'WARNING - Stop taking this medication if you experience tingling, burning or numbness and see your healthcare practitioner as soon as possible. (Contains vitamin B6)' (Currently under TGA review)

Lots of nutrition misinformation online - CHECK SOURCES

- If it sounds *'too good to be true'*, it probably is!!
- Before making major dietary changes or taking a supplement, discussed with your treatment team
- No evidence any particular food is a *'super food'* or supplement is a *'magic bullet'* for cancer prevention or treatment.
- A varied, plant-rich diet is key!
- Check out The Cancer Council:
<https://www.cancer.org.au/iheard>
 - FAQs
 - Submit a question



Heard a claim about cancer?

Does stress increase your cancer risk?
What about underarm deodorants, burnt meat or plastic water bottles?

Heard a story, rumour or fanciful claim about cancer?
Not sure if it's true? Get the facts

[iheard.com.au](https://www.cancer.org.au/iheard)

5 Simple ways to adopt a Mediterranean style / plant-rich diet

1. Include 2-3 pcs of fruit daily



3. Enjoy 2 fish meals/week (fresh or canned)



4. Avoid deep fried & fatty foods.



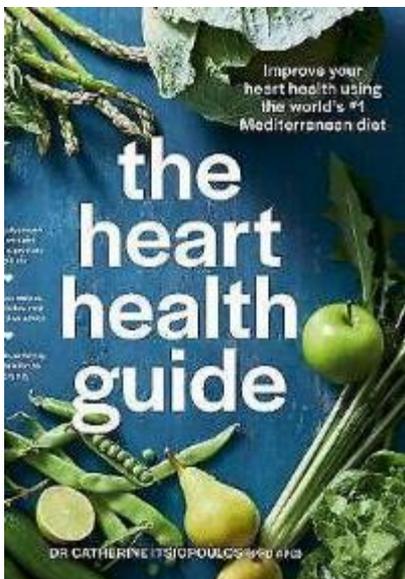
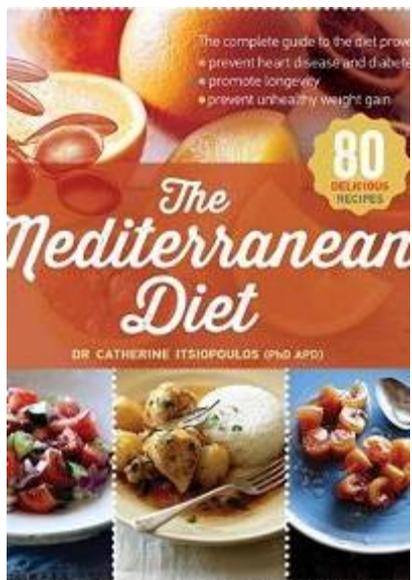
5. Add flavour with fresh herbs, lemon juice and olive oil.



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2. Fill $\frac{1}{2}$ plate with **colourful veg or salad**, $\frac{1}{4}$ plate **carbohydrates** (whole grains & starchy veg), $\frac{1}{4}$ plate **lean protein** (meat, chicken, fish, legumes, eggs, nuts, soy)





Australian dietitian Professor Catherine Itsiopoulos PhD, APD, has 30-years' research on how the Mediterranean Diet reduces risk of cardiovascular disease, improves overall wellbeing and longevity.

<https://www.yourlifechoices.com.au/podcasts/podcast-discussing-heart-health/>

Dr Catherine Itsiopoulos PhD APD is Professor on Nutrition and Dietetics at the University of Melbourne, La Trobe University & Murdoch University

Her beautiful cookbooks are available online

'This is a fascinating book
by a leading researcher'
DR MICHAEL MOSLEY

Brain Changer



How diet can save
your mental health –
cutting-edge science
from the expert

PROFESSOR FELICE JACKA
International authority on diet, mental health and brain health

Professor Felice Jacka
Alfred Deakin Professor Felice
Jacka OAM
Director, **Food & Mood Centre**,
IMPACT, Deakin University,
Australia
President, **International Society
for Nutritional Psychiatry
Research (ISNPR)**

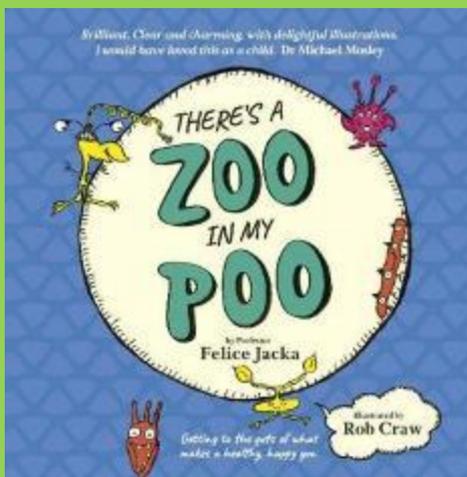


The **Food & Mood Centre** at Deakin University is a world-leading, multi-disciplinary research centre that aims to understand the complex ways in which what we eat influences our brain, mood, and mental health. We are a team of world-class researchers from various backgrounds, studying the food-mood relationship at various levels, from microbiology to public health.

Within the field of Nutritional Psychiatry, our research initiatives aim to identify nutrition-based approaches to preventing and treating mental disorders that may improve brain and mental health both in Australia and globally. Our team works to bring our research from our laboratory to you; we are an evidence-based resource, and aim provide top-quality Nutritional Psychiatry information for all.

<https://foodandmoodcentre.com.au/about/>

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Healthy Eating with MPN



Mediterranean/plant-rich eating pattern



- Eat a '**Rainbow**' to reduce MPN inflammation & symptoms.
 - Start with 1 change/day & gradually increase
- Aim for lots of colourful plant foods daily for phytochemicals/flavonoids & fibre
- Enjoy olive oil for cooking & salads
- Include lean protein at each meal for strong muscles & bones.
- Caution with supplements - to avoid Vitamin B6 toxicity (*Food first approach*)
- Daily physical activity for strong muscles & bones, fatigue reduction, general mental & physical health
- **Healthy eating is empowering & something we can do each day to stay well with MPN**

My workplaces in Melbourne Australia: Banyule Community Health & Victorian Aboriginal Health Service



Questions???



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