Citrus Fruits FOR IMMUNITY

As new infectious challenges emerge and cold and flu viruses continue to circulate widely[1], interest in foods for immunity is strong.

Citrus is commonly believed to support immunity... but is it an evidence-based recommendation?

IMMUNITY RECAP

A healthy immune system is a balance of protective inflammation and anti-inflammatory pathways utilising antioxidants to prevent damage and support microbiomes.

For both acute and chronic illness, this complex balancing act requires nutritional support[2] for optimal barrier, detection, targeting, elimination, and memory function.

CITRUS FRUITS are a unique nutrition package for immune support

VITAMIN C

CITRUS IS NOTABLE FOR VITAMIN C WHICH IS WELL-ESTABLISHED IN SUPPORTING IMMUNITY

Vitamin C is vital to:

- ✚ barrier function & wound healing via collagen promotion[5].
- ✚ chemotaxis to recruit cells to targets[5].
- ✚ function of white blood cells[3,5].
- ✚ antioxidant and anti-inflammatory activity[5].

Vitamin C improves immune outcomes in meta-analyses

31 RCTs*[3]	3 RCTs[4]	24 RCTs[3]	5 RCTs[3]
Reduces duration and severity of common colds.	Reduces risk and duration of pneumonia.	No effect on common cold incidence generally.	Decreased infection in short-term high physical stress.

*randomised controlled trials

BIOACTIVES

EMERGING SCIENCE SHOWS CITRUS BIOACTIVES SUPPORT IMMUNITY

Bioactive citrus flavonoids are in all parts of the fruit[9].

Key citrus flavonones are not commonly found in other fruits[8].

Bioactive citrus flavonoids support immunity in 3 ways

1 Anti-microbial

- Hesperidin and hesperitin: reduce binding and replication of SARS-CoV-2, and free radical damage[14,15].
- Hesperidin, hesperitin and quercetin: prevent influenza replication[5,10].

2 Antioxidant[9,10,12]

- Enhance activity of human antioxidant enzymes, and inhibit pro-oxidant enzymes.
- Absorb and neutralise free-radicals.
- Hesperidin, naringenin and orange juice: reduced reactive oxygen species in RCTs[13].

3 Anti-inflammatory

- Hesperidin and orange juice: reduced inflammatory markers in humans[5,13].
- Naringenin, naringin and narirutin: anti-inflammatory effects (cells & animals)[5].
- Hesperidin and naringin: increased microbiome short chain fatty acids (SCFA) production, particularly immune modulating propionate[14].

Major Citrus Flavonoids[9,10,11]

Hesperidin
Hesperitin
Narirutin
Naringin
Naringenin
Diosmin
Nobiletin
Quercetin

FIBRE

CITRUS FRUITS HAVE A UNIQUE FIBRE PROFILE

MOST FRUITS & VEGETABLES = PREDOMINATELY INSOLUBLE FIBRE

CITRUS FRUITS = A BLEND OF SOLUBLE (PREBIOTIC) & INSOLUBLE[16]

Dietary fibres have direct and indirect impacts on the immune system.

- ✓ Soluble fibres (eg. pectins) abundant in citrus support gastrointestinal barrier function[17] and feed the microbiome to support the gut-immunity axis[18].
- ✓ Citrus peel dietary fibres: contain monosaccharides (arabinose, rhamnose, xylose)[19] that increase anti-inflammatory SCFAs[20].

Vitamin C in citrus fruits; What we need vs what's inside[7]

	ORANGE		LEMON		LIME		GRAPEFRUIT		MANDARIN	
PEELED FRUIT	SDT% >35%	RDI% 173%	SDT% >21%	RDI% 106%	SDT% >21%	RDI% 104%	SDT% >24%	RDI% 120%	SDT% >19%	RDI% >93%
	1 fruit (150g)		2 fruit (100g)		2 fruit (100g)		half fruit (150g)		2 fruit (150g)	
ZEST 1 tablespoon	>5%	27%	>3%	18%	>5%	24%	>3%	16%	>2%	11%
JUICE 125ml	>21%	106%	>23%	115%	>26%	131%	>21%	106%	>13%	67%

Adult Recommended Dietary Intake (RDI) = 45 mg/day. Suggested Dietary Target (SDT) = 220mg/day (men), 190 mg/day (women)[6].

Citrus is simple and impactful

EASY AND PRACTICAL

- ✓ Familiar and easy to use and prepare.
- ✓ Available all year round, and abundant in winter when other local fruits may not be in season.
- ✓ Affordable.
- ✓ Recommending citrus reduces complexity while maintaining specificity – maximising likelihood of behaviour change[21].

ENHANCES MEALS AND ENJOYMENT

- ✓ Versatile across meal occasions.
- ✓ Diverse uses in sweet and savoury dishes.
- ✓ Adds colour variety to meals.
- ✓ Unique sweet-sour combination may improve palatability, particularly when anosmia (loss of smell) impacts flavour perception during illness or aging[22].

WHOLE FOOD

- ✓ More than vitamin C.
- ✓ Unique package of nutrients and bioactives to support immunity.

How to recommend citrus

- **Whole** as a snack
- As **juice**
- **Slices** in water or tea
- **Grilled** added to meals
- **Freeze** juice as ice blocks
- Slice segments into **salads**
- In salad **dressings**
- Use lemon or lime juice & zest to **cure seafood or beef**
- Add lemon juice & zest to your favourite **soups**

Take home message:

While there is no silver bullet for optimal immune function, citrus fruits not only add a variety of colours and zesty flavor to meals, but contain a unique combination of nutrients and bioactives important for immunity:

Citrus = C Vitamin C + Flavonoid bioactives + Fibre

The evidence-base for the benefits of these components include studies of supplements in doses achievable from whole fruit intake.

The whole fruit is a unique package that can be recommended to support immunity.

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SCAN FOR MORE INFO

This brochure is intended for educational purposes only.

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