

(Micro)nutrient intervention to prevent age-related immune decline

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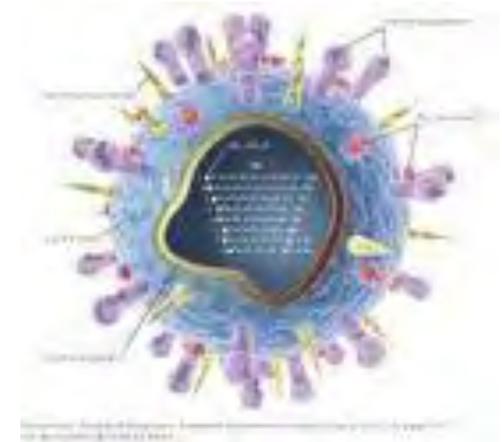
(pcc@soton.ac.uk)

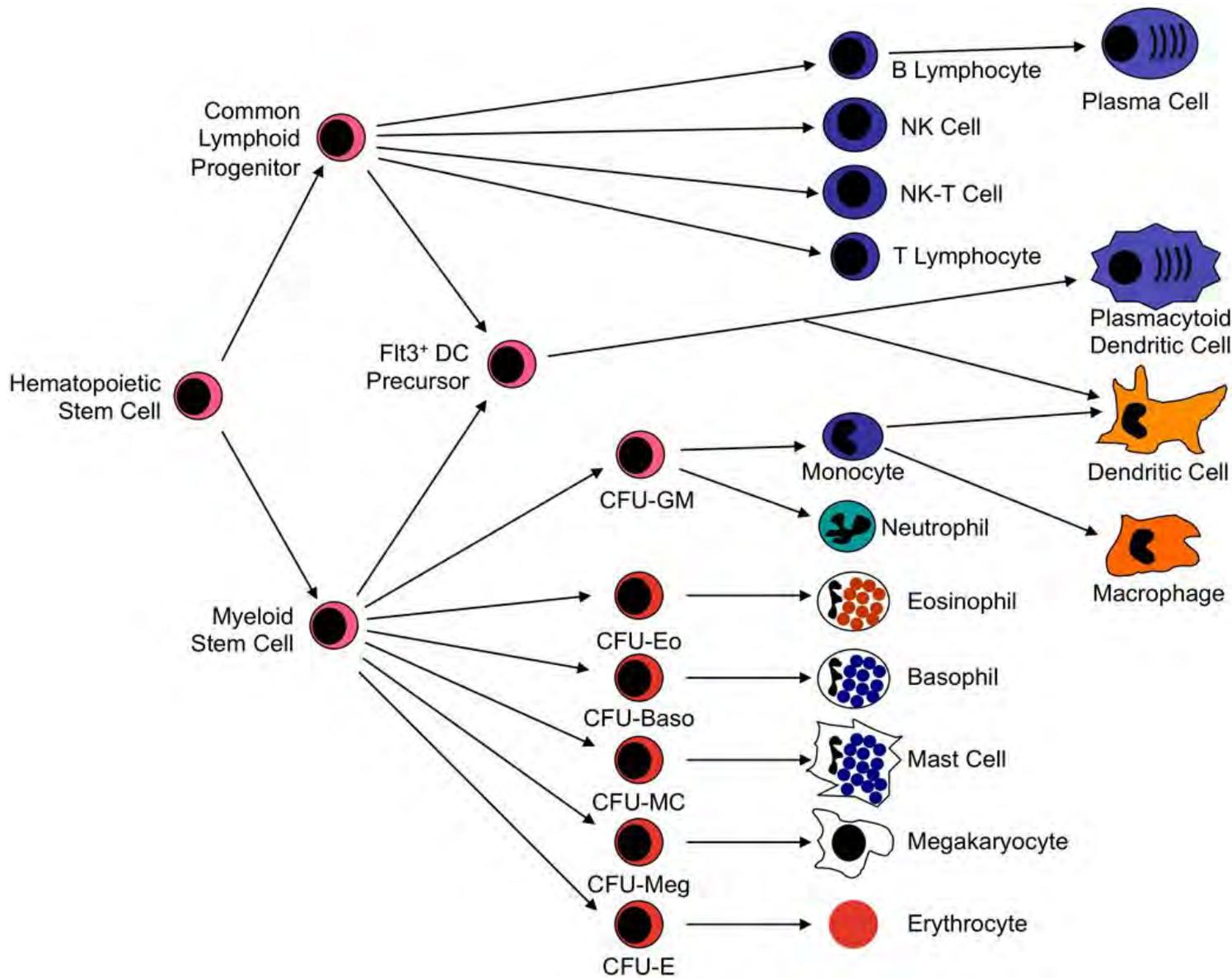
To cover

- **The immune system : a brief introduction**
- **Ageing and the immune response**
- **Link between (micro)nutrient status and age-related immune decline**
- **(Micro)nutrient interventions to improve immune function in the elderly**
- **Summary and conclusions**

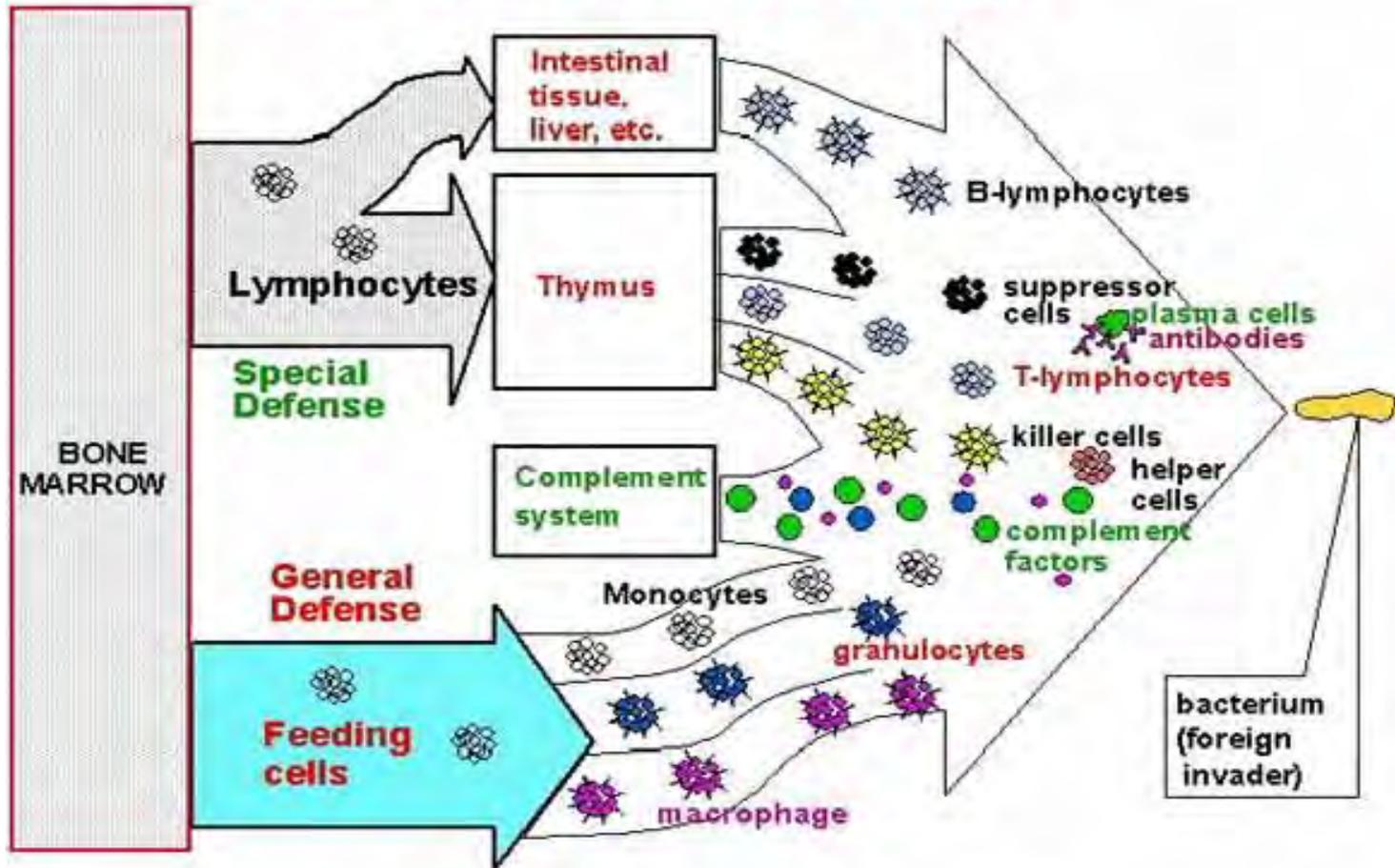
The immune system

... is a cell and tissue system that protects the individual from invading pathogens





THE IMMUNE SYSTEM

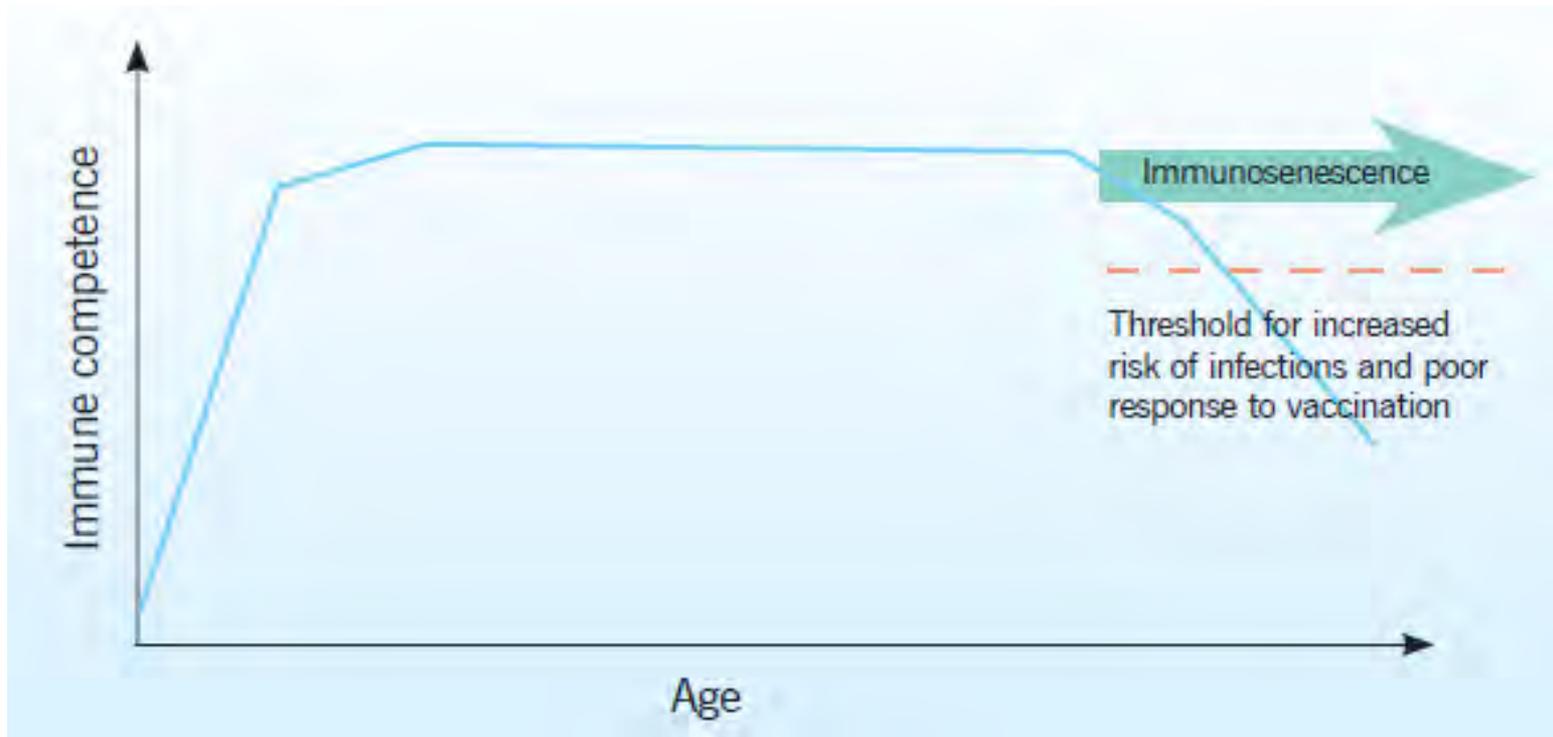


The four general functional features of the immune system

- **Exclusion barrier**
- **Identification of “non-self”/Tolerance of “self”**
- **Elimination**
- **Memory**

**A well functioning immune system
is key to providing robust defence
against pathogenic organisms**





Calder & Hall (2012) Nursing Older People 24, 29-37

- **More infections -> More illness**
- **More hospitalisations**
- **More antibiotic use (-> antibiotic resistance)**
- **Poor outcome from surgery**
- **Poor outcome from other interventions**
- **More deaths**



Antibody response to influenza vaccination in the elderly:
A quantitative review

Katherine Goodwin^a, Cécile Viboud^b, Lone Simonsen^{a,*}

Vaccine 24 (2006) 1159–1169

- **Systematic review of 31 trials of seasonal influenza vaccination conducted between 1986 and 2002**
- **The odds ratio of responses in elderly versus young adults ranged from 0.24 to 0.59 in terms of seroconversion and seroprotection to all three antigens**
- **The US CDC estimates protective clinical efficacy in 70-90% of cases of young adults and of only 17-53% in elderly individuals**
- **“We conclude that the antibody response in the elderly is considerably lower than in younger adults”**

- **Inadequate protection**
- **Wasted resource**
- **False sense of security**

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FLU JAB IS A WASTE OF TIME FOR 97% OF PATIENTS

THE FLU jab will protect just three per cent of patients this winter, health experts warned last night.

They say the virus that causes the illness has mutated so much that it 'no longer matches' the current vaccine, which was only developed a

By Sophie Borland
Health Correspondent

year ago. The 3 per cent figure predicted by experts at Public Health England would be the worst in at least a decade.

The NHS spends around £100m each year on the flu vaccination programme, with each jab costing £7.50. Although it is never totally effective, it usually protects

around 60 per cent of patients. Last night questions were being asked about why health officials did not raise the alarm earlier.

Researchers at Public Health England assessed the effectiveness of the jab by looking at saliva samples from 2,314 patients with flu. They found that only 3 per cent had the H3N2 strain of the virus, the remainder had a mutated

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Email spat: Broadcaster Myleene Klass

Myleene's war on grasping school mums

SEE PAGE 3

Immune decline is greater in older people with low intakes (or status) of:

- **Energy**
- **Protein (specific amino acids?)**
- **Vitamins b6, b12 and folate**
- **Vitamin E**
- **Iron**
- **Zinc**

Zinc and immunocompetence in the elderly: baseline data on zinc nutriture and immunity in unsupplemented subjects¹⁻³

John D Bogden, PhD; James M Oleske, MD; Elizabeth M Munves, PhD, RD; Marvin A Lavenhar, PhD; Kay S Bruening, MA, RD; Francis W Kemp, BS; Kimberly, J Holding, BS; Thomas N Denny, BS; and Donald B Louria, MD

Am J Clin Nutr 1987;46:101-9

Nutritional Status Predicts Primary Subclasses of T Cells and the Lymphocyte Proliferation Response in Healthy Older Women¹

Roshni R. Molls,* Namanjeet Ahluwalia,^{†**2} Andrea M. Mastro,[‡]
Helen Smiciklas-Wright,[†] and Gordon C. Handte^{††}

J. Nutr. 135: 2644-2650, 2005.

- **Protein, iron and zinc important**

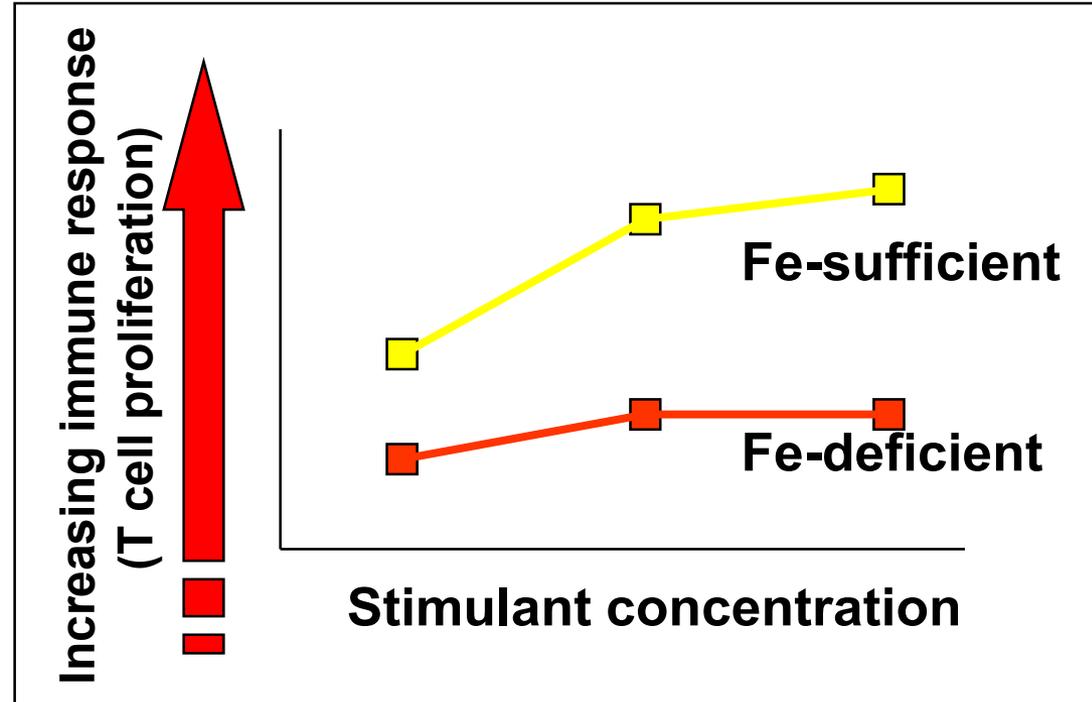
Micronutrient Deficiencies Are Associated with Impaired Immune Response and Higher Burden of Respiratory Infections in Elderly Ecuadorians^{1,2}

Davidson H. Hamer,^{3,4,7,8} Fernando Sempértegui,⁹ Bertha Estrella,⁹ Katherine L. Tucker,^{3,4} Alicia Rodríguez,⁹ Josefina Egas,¹⁰ Gerard E. Dallal,^{3,4} Jacob Selhub,^{3,4} Jeffrey K. Griffiths,⁴⁻⁶ and Simin Nikbin Meydani^{3,4,6*}

J. Nutr. 139: 113–119, 2009

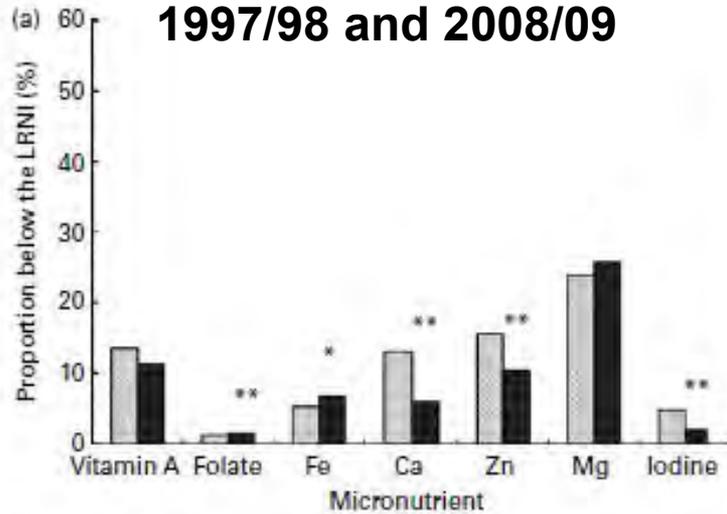
- **Many micronutrients (incl. zinc) important**

- Homebound but fairly healthy elderly women in Canada
- Some had low Fe status, some didn't
- Immune functions measured using cells isolated from the blood
- Immune functions were lower in the Fe deficient women

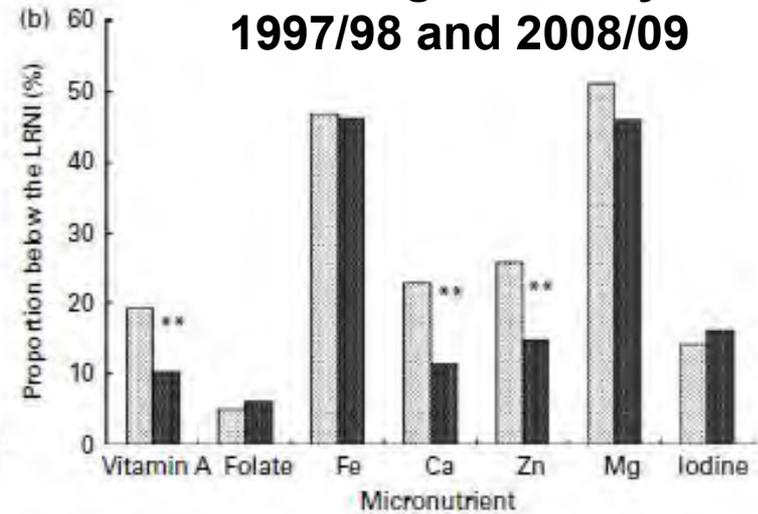


These studies suggest that improving intake and status of certain nutrients (mainly micronutrients, but also protein/amino acids and perhaps omega-3 fatty acids) will slow immune decline

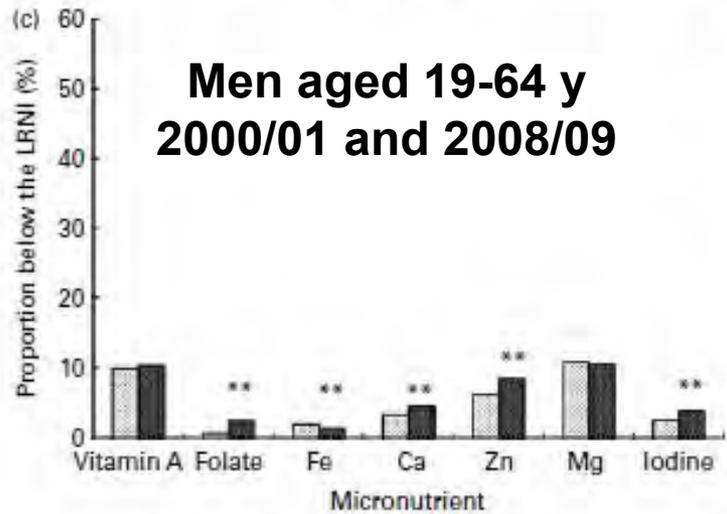
**Boys aged 11-18 y
1997/98 and 2008/09**



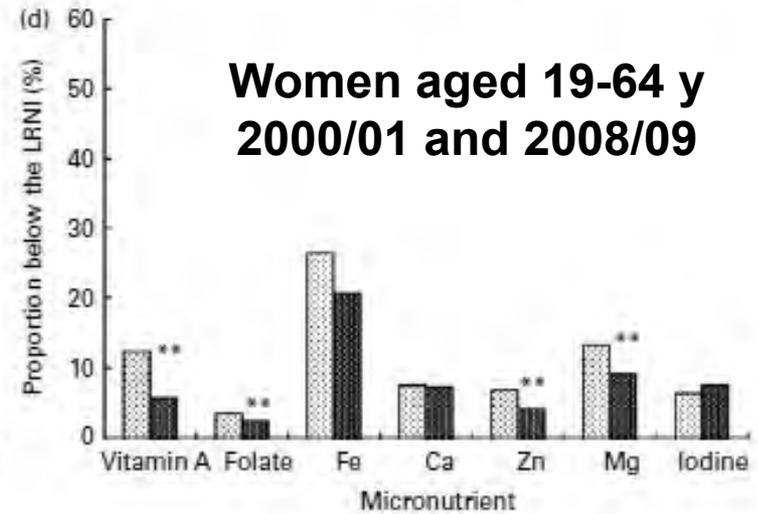
**Girls aged 11-18 y
1997/98 and 2008/09**



**Men aged 19-64 y
2000/01 and 2008/09**



**Women aged 19-64 y
2000/01 and 2008/09**



Am J Med 1981;70:1001-4.

Beneficial effects of oral zinc supplementation on the immune response of old people

Duchateau J, Delepesse G, Vrijens R, Collet H.

Effect of zinc supplementation on serum zinc concentration and T cell proliferation in nursing home elderly: a randomized, double-blind, placebo-controlled trial¹

Junaidah B Barnett,² Maria C Dao,² Davidson H Hamer,^{2,3,5} Ruth Kandel,^{6,7} Gary Brandeis,⁴ Dayong Wu,² Gerard E Dallal,² Paul F Jacques,² Robert Schreiber,^{6,7} Eunhee Kong,² and Simin N Meydani^{2}*

Am J Clin Nutr 2016;103:942-51.

- **30 mg/day**
- **3 months**
- **> 65 y**
- **Low zinc status**

 **T-cell proliferation**

Vitamin E supplementation enhances cell-mediated immunity in healthy elderly subjects¹⁻⁴

*Simin Nikbin Meydani, M Patrice Barklund, Sandra Liu, Mohsen Meydani, Richard A Miller,
Joseph G Cannon, Frank D Morrow, Ross Rocklin, and Jeffrey B Blumberg*

Am J Clin Nutr 1990;52:557-63.

Vitamin E Supplementation and In Vivo Immune Response in Healthy Elderly Subjects A Randomized Controlled Trial

Meydani et al. (1997) JAMA 277, 1380-1386

Vitamin E and Respiratory Tract Infections in Elderly Nursing Home Residents

A Randomized Controlled Trial

Simin Nikbin Meydani, DVM, PhD

Lynette S. Leka, BS

Basil C. Fine, MD

Gerard E. Dallal, PhD

Gerald T. Keusch, MD

Maria Fiatarone Singh, MD

Davidson H. Hamer, MD

JAMA. 2004;292:828-836

- **200 IU vitamin E/d**
- **One year**

Results:

Outcome	RR	P
All respiratory tract infections	0.88	0.04
LRTI	1.02	0.89
URTI	0.81	0.01
Colds	0.80	0.02

Summary

- **The immune system provides defence against pathogens**
- **Immune function declines with ageing (immunosenescence)**
- **Immune decline in ageing results in increased susceptibility to infection, poor responses to vaccination, greater morbidity, higher mortality, poor outcome from surgery and trauma**
- **Low intake and status of many micronutrients is believed to play a role in immune decline**
- **Some interventions with micronutrients improve immune function in older subjects (but need to consider multiple nutrients)**

Conclusions

- **Age-related immune decline occurs**
- **This is of both public health and clinical importance**
- **Poor nutritional state (energy, micronutrients ...) seems to contribute to immune decline**
- **Some interventions “reverse” components of immune decline but we need to consider multiple nutrients**
- **We need long-term studies to look at PREVENTION of immune decline**
- **Life long strategies**