3<sup>rd</sup> DSM Japan Sustainability Forum Sustainable Food System, Nutrition and Health: Creating Healthy Planet for Healthy People

Innovation to build a Healthier, more Sustainable and Resilient Society! May 25, 2021

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# The DSM difference - Products with Purpose



Where others see products, we see purpose.

We see success in keeping the world's growing population healthy.



Developments in science & technology opening exciting new opportunities







# Biotechnology Data & Digital breakthroughs

Precision & Personalization

# Health through Nutrition

**Unprecedented Precision** 



# Purpose in action: Micronutrient deficiencies

Figure 3.1a Anaemia as a public health problem by country: Preschool-age children



WHO (2008) Worldwide prevalence of anaemia 1993 – 2005

Figure 2 Biochemical vitamin A deficiency (retinol) as a public health problem by country 1995-2005: Preschool-age children a) Countries and areas with survey data



WHO (2009) Global prevalence of vitamin A deficiency in populations at risk 1993 – 2005

# Purpose in action: Micronutrient deficiencies

# Managing micronutrient deficiencies is urgent & feasible



WHO collaborates with UN partners to disseminate global guidance on the assessment of micronutrient status and effective micronutrient interventions. These guidelines allow WHO and other agencies to better respond to populations affected by emergencies when micronutrient deficiencies are more common due to chronic and severe food insecurity.





# Purpose in action: Healthy ageing

Proportion of population aged 60 years or older, by country, 2015

Fig. 3.1.

Percentage aged 0 -9 10 -19 2 - 24 3 0 or more Fig. 3.2. Proportion of population aged 60 years or older, by country, 2050 projections





WHO (2015) World Report on Ageing and Health

Purpose in action: Healthy ageing

### Nutritional management is key to support healthy ageing



### Nutrition

Ageing is accompanied by physiological changes that can negatively impact nutritional status. Sensory impairments, such as a decreased sense of taste or smell, or both, may result in reduced appetite. Poor oral health and dental problems can lead to difficulty chewing, inflammation of the gums and a monotonous diet that is poor in quality, all of which increase the risk of malnutrition (183) (Box 3.4). Gastric acid secretion may be impaired, leading to reduced absorption of iron and vitamin B12. The progressive loss of vision and hearing, as well as osteoarthritis, may limit mobility and affect elderly people's ability to shop for food and prepare meals. Along with these physiological changes, ageing may also be associated with profound psychosocial and environmental changes, such as isolation, loneliness, depression and inadequate finances, which may also have significant impacts on diet.



# Purpose in action: Is nutritional status associated with COVID-19?

Obesity



### High Prevalence of Obesity in Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) Requiring Invasive Mechanical Ventilation

Arthur Simonnet<sup>1</sup>\*, Mikael Chetboun<sup>2</sup>\*, Julien Poissy<sup>1</sup>, Violeta Raverdy  $\bigcirc$ <sup>2</sup>, Jerome Noulette<sup>2</sup>, Alain Duhamel<sup>3</sup>, Julien Labreuche<sup>3</sup>, Daniel Mathieu<sup>1</sup>, Francois Pattou<sup>2,4</sup>, and Merce Jourdain  $\bigcirc$ <sup>1,2</sup>, On behalf of the LICORN and the Lille COVID-19 and Obesity study group

Review

Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients

Kai Liu<sup>a,1,\*</sup>, Ying Chen<sup>b,1</sup>, Ruzheng Lin<sup>c</sup>, Kunyuan Han<sup>c</sup>

<sup>a</sup>Hainan General Hospital, Geriatric center, China <sup>b</sup>Hainan General Hospital, Medical Laboratory, China <sup>c</sup>Hainan General Hospital, General Practice, China

### **Overweight subjects:**

More vulnerable Higher mortality Severity increases with  $\uparrow$  BMI

Simonnet (2020) Obesity

### **Elderly subjects:**

More vulnerable Higher mortality

More likely to progress to severe disease

Liu (2020) J. Infect.







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# Viral infections: A recurrent, global challenge

- Upper respiratory tract infections represent a major public health burden
- Influenza, despite vaccination efforts, is annually and globally responsible for approx. 3–5 million cases of severe illness that require hospitalization, and 290,000–650,000 deaths
- <u>COVID-19</u>, with vaccination campaign ongoing, is to date globally responsible for approx. 167 million cases, and 3.5 million deaths
- Other respiratory tract infections (e.g., MERS, SARS) created to a lesser extent also global concerns
- Continuous caution is appropriate and needed



The purpose of this policy brief is to provide a concise summary of information and considerations to ensure optimal management of influenza adming the COVID-19 pandemic. It addresses key issues policymalkers may face, including potential co-circulation of influenza and SARS-CoV-2, differentiation between influenza and COVID-19 in patients and planning influenza prevention and control interventions. The document also includes links to detailed technical guidance and other resources regarding the intersection of influenza and COVID-19, including monitoring the situation, preventing seasonal influenza, reducing severe complications and mortality, protecting specific populations and communicating and engaging with the public.

### Introduction

With the arrival of the influenza season in the Northern Hemisphere and the year-round activity in the tropics, countries need to review their influenza plans and policies and adapt them. as needed, to fue concomitant COVID-19 pandemic. Each year, seasonal influenza affects individuals in every country and results in up to one billion cases, three to five million severe cases and up to 650 000 respiratory-related deaths worldwide [1]. The Southern Hemisphere the alterady experienced its influenza season, providing valuable insights that may be informative for other areas. The dramatic reduction in influenza detections during the 2020 Southern Hemisphere influenza season, as compared to previous years, may have resulted from public health and social measures (PEISM) and travel restrictions put in place for COVID-19 [2]. However, it is uncertain whether the situation will be similar for the 2020-21 Northern Hemisphere influenza season, and that if PEISM and travelse, leading to potential co-circulation of influenza and SARS-CoV-2, the virus that causes COVID-19, and creating an additional burden on vulnerable populations and health asystems.

It is therefore important to ensure that overarching coordination mechanisms and partnerships are leveraged at national and sub-national levels to enhance influenza readiness during the COUD-19 pandemic and review influenza prevention and control plans and policies ahead of the relevant influenza season should they require adaptation to concurrent COUD-19 risk. In addition, influenza prevention and control programmes include a comprehensive package of interventions, such as vaccines, antitivirils and PISM (hand hygiene, physical distancing respiratory hygiene/chiquette and mask use in certain circumstances). These interventions are effective in reducing the impact of influenza and could be synergistic with efforts to reduce the impact of COVID-19.

### Monitoring the situation

Influenza and SARS-CoV-2 are respiratory pathogens with similar modes of transmission. The two infections often have similar clinical presentation, with the exception of loss of taste and smell, which seems more specific to, although not exclusively associated with, COVID-19. It is thus necessary to distinguish between the two viruses and associated diseases.

Global influenza surveillance and monitoring is conducted through the Global Influenza Surveillance and Response System (GISRS), a WH0-coordinated network of over 155 institutions in 123 Member States. GISRS is tasked with conducting year-round surveillance and monitoring of influenza viruses and serving as the global alert mechanism for the emergence of influenza viruses with pandemic potential.

Influenza is usually monitored through influenza-like illness (ILI) and severe acute respiratory infections (SARJ) sentinel surveillance systems. The objectives of global influenza surveillance after described in WHO's *Global* Epidemiological Surveillance Standards for Influenza [3]. Influenza surveillance often uses information from multiples



# Public health guidance and nutrition

- The COVID-19 pandemic showed how our lifestyle spreads viral infections fast and global
- Wake-up call to think about our health status
- Basic hygiene guidance and social rules have been key in managing the pandemic
- Balanced nutrition is critical for health, in particular when an optimal immune response is needed
- Experts are addressing the importance of adequate nutrition, and urge authorities to take action





# Nutritional status and COVID-19

### The Malnutritional Status of the Host as a Virulence Factor for New Coronavirus SARS-CoV-2

Matteo Briguglio <sup>1\*</sup>, Fabrizio Ernesto Pregliasco <sup>2,3</sup>, Giovanni Lombardi<sup>4,5</sup>, Paolo Perazzo <sup>6</sup> and Giuseppe Banfi<sup>1,7</sup>

### Key facts:

- Malnutrition or absence of nutritional care can increase severity of the virus infection
- A possible link between the nutritional status of the host, the virulence of SARS-CoV-2, and the clinical outcome of COVID-19 needs to be discussed.

Coronavirus Disease (COVID-19–SARS-CoV-2) and Nutrition: Is Infection in Italy Suggesting a Connection?

Hellas Cena<sup>1,2\*</sup> and Marcello Chieppa<sup>3,4</sup>

### Key facts:

Recommendation to pay close attention to nutrition as it contributes to modulating some important consequences of COVID-19 infection.

Cena (2020) Frontiers Immunology



# Nutrition and immune response: Expert guidance

### **SCIENTIFIC OPINION**



ADOPTED: 29 June 2015 doi:10.2903/j.efsa.2015.4182 PUBLISHED: 17 July 2015

### Vitamin D and contribution to the normal function of the immune system: evaluation of a health claim pursuant to Article 14 of Regulation (EC) No 1924/2006

EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)

### Abstract

Following an application from Specialised Nutrition Europe (formerly IDACE), submitted for authorisation of a health claim pursuant to Article 14 of Regulation (EC) No 1924/2006 via the Competent Authority of France, the EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) was asked to deliver an opinion on the scientific substantiation of a health claim related to vitamin D and its contribution to the normal function of the immune system. The Panel considers that vitamin D is sufficiently characterised. A contribution to the normal function of the immune system is a beneficial physiological effect. The Panel has previously assessed claims on vitamin D and its contribution to the normal function of the immune system with favourable outcomes. The target populations were the general population and children aged 3 to 18 years. The Panel considers that the role of vitamin D in the functioning of the immune system applies to all ages, including infants and young children (from birth to three years of age). The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin D and contribution to the normal function of the immune system. The following wording reflects the scientific evidence: 'Vitamin D contributes to the normal function of the immune system.' The target population is infants and young children up to three years of age.

© European Food Safety Authority, 2015

Vitamin A, B<sub>6</sub>, B<sub>12</sub>, C, D & folic acid Copper, iron,

selenium & zinc



EFSA Journal 2014;12(5):3653

### SCIENTIFIC OPINION

Scientific Opinion on the substantiation of a health claim related to zinc and normal function of the immune system pursuant to Article 14 of Regulation (EC) No 1924/2006<sup>1</sup>

EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)<sup>2,3</sup>

European Food Safety Authority (EFSA), Parma, Italy

### ABSTRACT

Following an application from Specialised Nutrition Europe (formerly IDACE), submitted pursuant to Article 14 of Regulation (EC) No 1924/2006 via the Competent Authority of France, the EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) was asked to deliver an opinion on the scientific substantiation of a health claim related to zinc and normal function of the immune system. The food constituent, zinc, which is the subject of the health claim is sufficiently characterised. Normal function of the immune system is a beneficial physiological effect for infants and young children. A claim on zinc and function of the immune system in the general population has already been assessed with a favourable outcome. The Panel considers that the role of zinc in normal function of the immune system applies to all ages, including infants and young children (from birth to three years). The Panel concludes that a cause and effect relationship has been established between the dietary intake of zinc and normal function of the immune system. The following wording reflects the scientific evidence: "zinc contributes to normal function of the immune system".

© European Food Safety Authority, 2014



# Many publications on COVID-19 & nutrition over last year



# Vitamin D key facts

# Vitamin D metabolism



# Vitamin D status

# 25(OH)D serum level is the relevant indicator of vitamin D status nmol/L < 25 25 - 50 50 - 75 > 75



# Vitamin D functions

Apart from immunity, vitamin D is best known for its support of bone health



# Vitamin D status: Generally insufficient

### Vitamin D status of older European adults



Hypovitaminosis D in British adults at age 45 y: nationwide cohort study of dietary and lifestyle predictors<sup>1-3</sup>

Elina Hyppönen and Chris Power



 □
 5-9.9%
 □
 10-19.9%
 □
 20-29.9%
 □
 30-39.9%
 □
 40-49.9%
 □
 50-59.9%
 □
 60-69.9%

 FIGURE 3. Seasonal and geographical variation in the prevalence of hypovitaminosis D (25-hydroxyvitamin D <40 nmol/L) in Great Britain.</td>

### **Conclusion:**

- Low vitamin D status in the general population was alarmingly high in winter and spring
- Action at population level is warranted.



Hyppönen (2007) AJCN

# Vitamin D supplementation & respiratory tract infections

### RESEARCH

### 

### Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data

Adrian R Martineau,<sup>1,2</sup> David A Jolliffe,<sup>1</sup> Richard L Hooper,<sup>1</sup> Lauren Greenberg,<sup>1</sup> John F Aloia,<sup>3</sup> Peter Bergman,<sup>4</sup> Gal Dubnov-Raz,<sup>5</sup> Susanna Esposito,<sup>6</sup> Davaasambuu Ganmaa,<sup>7</sup> Adit A Ginde,<sup>8</sup> Emma C Goodall,<sup>9</sup> Cameron C Grant,<sup>10</sup> Christopher J Griffiths,<sup>1,2,11</sup> Wim Janssens,<sup>12</sup> Ilkka Laaksi,<sup>13</sup> Semira Manaseki-Holland,<sup>14</sup> David Mauger,<sup>15</sup> David R Murdoch,<sup>16</sup> Rachel Neale,<sup>17</sup> Judy R Rees,<sup>18</sup> Steve Simpson,Jr<sup>19</sup> Iwona Stelmach,<sup>20</sup> Geeta Trilok Kumar,<sup>21</sup> Mitsuyoshi Urashima,<sup>22</sup> Carlos A Camargo Jr<sup>23</sup>

### CONCLUSIONS

Vitamin D supplementation was safe and it protected against acute respiratory tract infection overall. Patients who were very vitamin D deficient and those not receiving bolus doses experienced the most benefit.

### Study's recommendation:

These findings support the introduction of public health measures such as food fortification to improve vitamin D status, particularly in settings where profound vitamin D deficiency is common.



# Low vitamin D status in COVID-19 patients

### Brief Report

### 25-Hydroxyvitamin D Concentrations Are Lower in Patients with Positive PCR for SARS-CoV-2

Antonio D'Avolio <sup>1,\*</sup>, Valeria Avataneo <sup>1</sup>, Alessandra Manca <sup>1</sup>, Jessica Cusato <sup>1</sup>, Amedeo De Nicolò <sup>1</sup>, Renzo Lucchini <sup>2</sup>, Franco Keller <sup>2</sup> and Marco Cantù <sup>2</sup>

### Key facts:

- Assessment of vitamin D status in a Swiss patient cohort
- Lower vitamin D status in PCR-positive patients
- Similar observation when stratifying patients according to age
- Vitamin D supplementation might be useful to reduce the risk of infection.





# Vitamin D supplementation & survival of COVID-19 patients

### Article

### Vitamin D Supplementation Associated to Better Survival in Hospitalized Frail Elderly COVID-19 Patients: The GERIA-COVID Quasi-Experimental Study

Gaëlle Annweiler <sup>1,2</sup>, Mathieu Corvaisier <sup>3,4</sup>, Jennifer Gautier <sup>3</sup>, Vincent Dubée <sup>1,5,6</sup>, Erick Legrand <sup>1,7</sup>, Guillaume Sacco <sup>3,8</sup> and Cédric Annweiler <sup>1,3,8,9,10,\*</sup> on behalf of the GERIA-COVID study group

### Key facts:

- Vitamin D supplementation improves survival of frail geriatric COVID-19 patients
- 3 Groups 1) regular vit. D supplement before COVID-19, 2) high vit. D supplement following COVID-19 & 3) no vit. D supplement
- Survival is higher in Group 1 (93%) as compared to Group 3 (69%) at day 14 post hospitalization
- Vitamin D supplementation was associated with less severe COVID-19 and better survival in frail elderly.



**Figure 2.** Kaplan–Meier estimates of the cumulative probability of COVID-19 participants' survival according to vitamin D interventions (n = 77). Arm 1: regular vitamin D supplementation; Arm 2: vitamin D supplementation initiated after COVID-19 diagnosis; Arm 3: no vitamin D supplementation.



# **COVID-19: Strong call for vitamin D** supplementation

### Comment

Vitamin D Insufficiency May Account for Almost Nine of Ten COVID-19 Deaths: Time to Act. Comment on: "Vitamin D Deficiency and Outcome of COVID-19 Patients". *Nutrients* 2020, *12*, 2757

Hermann Brenner <sup>1,2,\*</sup> and Ben Schöttker <sup>1,2</sup>

### Key facts:

- Mortality was much higher among vitamin D insufficient patients
- Public health risk assessment estimates that 87% of COVID-19 deaths may be statistically attributed to vitamin D insufficiency and could potentially be avoided
- While caution is always needed the data are solid.

### Urgent call for action:

- Given the dynamics of the COVID-19 pandemic and the proven safety of vitamin D supplementation, it appears highly debatable and potentially even unethical to await results of large randomized controlled trials before public health action is taken;
- Population-wide measures, and in particular vitamin D supplementation of high-risk groups (e.g., older adults), should be promoted;
- Targeted vitamin D supplementation of people tested positive for COVID-19 may be warranted.



# Experts: Focus on nutrition & immunity is smart!

### Review

### **Optimal Nutritional Status for a Well-Functioning Immune System Is an Important Factor to Protect against Viral Infections**

Philip C. Calder <sup>1</sup>, Anitra C. Carr <sup>2</sup>, Adrian F. Gombart <sup>3</sup> and Manfred Eggersdorfer <sup>4</sup>,\*

### 3. Recommendations and Conclusions

Thus, a set of clear nutritional recommendations is needed (Table 1). First, supplementation with micronutrients and omega-3 fatty acids is a safe, effective, and low-cost way to help eliminate nutritional gaps and support optimal immune function, and therefore reduce the risk and consequences of infections [10,12]. Intakes should follow recommended upper safety limits set by expert authorities, such as the European Food Safety Authority and, in the United States, the IOM. Thus, a multivitamin and mineral supplement that supplies the basic micronutrient requirements (e.g., RDA) for vitamins and minerals is recommended in addition to the consumption of a well-balanced diet.

Nutrient Rationale Recommendation A multivitamin and trace element supplement These micronutrients play important roles in that supplies the nutrient requirements (e.g., 100% US RDA for age and gender) [78] for supporting the cells and tissues of the immune system. Deficiencies or suboptimal status in vitamins and trace elements including vitamins Vitamins and trace elements these micronutrients negatively affect immune A, B<sub>6</sub>, B<sub>12</sub>, C, D, E, and folate, and trace function and can decrease resistance to elements including zinc, iron, selenium, infections. magnesium and copper. This is in addition to the consumption of a well-balanced diet. Doses of  $\geq 200 \text{ mg/day}$  provide saturating levels in the blood, and support reduction in the risk, Daily intake of at least 200 mg/day for healthy Vitamin C severity and duration of upper and lower individuals. In individuals who are sick, 1-2 respiratory tract infections. Requirements for g/day is recommended. vitamin C increase during infection. Daily supplementation of vitamin D reduces Vitamin D Daily intake of 2000 IU/day (50 µg/day). the risk of acute respiratory tract infections. Marginal zinc deficiency can impact immunity. Those deficient in zinc, particularly children, Daily intake in the range of 8-11 mg/day. Zinc are prone to increased diarrheal and respiratory morbidity. Omega-3 fatty acids support an effective Omega-3 fatty acids (EPA + DHA) immune system, including by helping to Daily intake of 250 mg/day of EPA + DHA. resolve inflammation.





# Authorities start to take action!

# UK Government

# Free vitamin D supplement

### Key facts:

- Public Health England re-issued advice on vitamin D supplementation
- Free winter supply of vitamin D supplements to
   2.7 million of the most vulnerable people in
   England
- Vitamin D dose is 400 IU or 10  $\mu g$
- Vitamin D supplements are acquired through a public tender
- Supplements will be delivered to people's home as of January and cover 4 months of vitamin D.

# Food Safety Authority Ireland

# Vitamin D supplement guidance

# Key facts:

- High vitamin D insufficiency in Irish older adults (>65 years of age);
- Vitamin D intake from food is too low;
- A vitamin D supplement at 10  $\mu g/day$  is recommended for free-living older adults with exposure to sunlight in winter;
- A vitamin D supplement at 15 μg/day is recommended for house-bound older adults with limited sunlight exposure all year around;
- Dark skin people should take a vitamin D supplement all year around.



FSAI (2020)



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# Vitamin D: Key facts to consider

# **General facts:**

- Vitamin D deficiency and inadequacy globally common
- Dietary vitamin D intake is low
- Optimal vitamin D status supports a wellfunctioning immune system
- Vitamin D inadequacy has been associated with increased risk for upper respiratory tract infections
- Recent data associate low vitamin D status with increased risk for COVID-19
- Adequate vitamin D status and complementing diet is recommended by experts
- Health authorities start to provide guidance to improve vitamin D status

# **Specific considerations:**

- Sunlight exposure is reduced in specific situations (e.g., COVID-19 quarantine, wintertime, elderly)
- Some population groups are at increased risk for low vitamin D skin synthesis (e.g., darker skin pigmentation)
- Specific conditions also increase risk for suboptimal vitamin D status (e.g., malabsorption syndromes, vegetarians/vegans, obesity, diabetes, immuno-compromised subjects)



# Vitamin D: Examples from Japan confirm global data

### Vitamin D status of pregnant women:



Almost all women were deficient throughout the year, dietary supplements improved vitamin D status

Kanatani (2019) PloS One 14(3): e0213264.

### Vitamin D status of athletes:



Figure 1 COVID-19 affected the serum vitamin D level.

Vitamin D status of athletes was low and dropped during COVID-19 quarantine



# Targeting nutrition is smart for your health

# Focus on a well-balanced diet is important Complement your diet, even if well-balanced

# Nutrient intake should ideally come from a well-balanced diet

### but is this feasible to achieve?

- Dietary sources of vitamin D are limited and synthesis in the skin is affected by season, climate, skin color, avoidance of sun exposure.
- An orange contains about 50 mg vitamin C. To reach the recommended intake of 200 mg one would have to consume 4 oranges per day.

A balanced diet may not provide the essential nutrients in sufficient amounts. Therefore, nutrient shortfalls are common in most countries.





# Targeting nutrition is smart for your health: Vitamin D

### Assess your vitamin D status:

- Vit. D status using 25(OH) Vitamin D blood test
- <12 ng/mL (< 30 mM) indicates vit. D deficiency</p>
- <30 ng/mL (<75 mM) indicates suboptimal vit. D status
- Classical validated clinical methods
- Home test kits have become available

# <complex-block>

# Select the right dose and source:

- Depending your vit. D status you may want to tackle it differently
- 25(OH) vitamin  $D_3$  or calcifediol is 3 x faster and more effective as compared to vitamin  $D_3$
- Upper safe tolerable (UL) vit. D intake is set at 100  $\mu g/day$



# Take away messages

- Optimal intake/status of vitamin D are key to support vitamin D body functions
- Vitamin D supports a well-functioning immune system
- Optimal vitamin D status reported to reduce risk and improved health outcomes for COVID-19
- Optimizing vitamin D status seems the right choice particularly now
- Optimal vitamin D status requires to complement a well-balanced diet, particularly in winter
- The older/ageing population, people with health conditions (e.g., diabetes, obesity), people with dark skin and subjects with immune disorder require special attention
- Check your vitamin D status and when available complement your balanced diet with rapid source of vitamin D, such as calcifediol



# Thank you!



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# **Questions?**

DSM