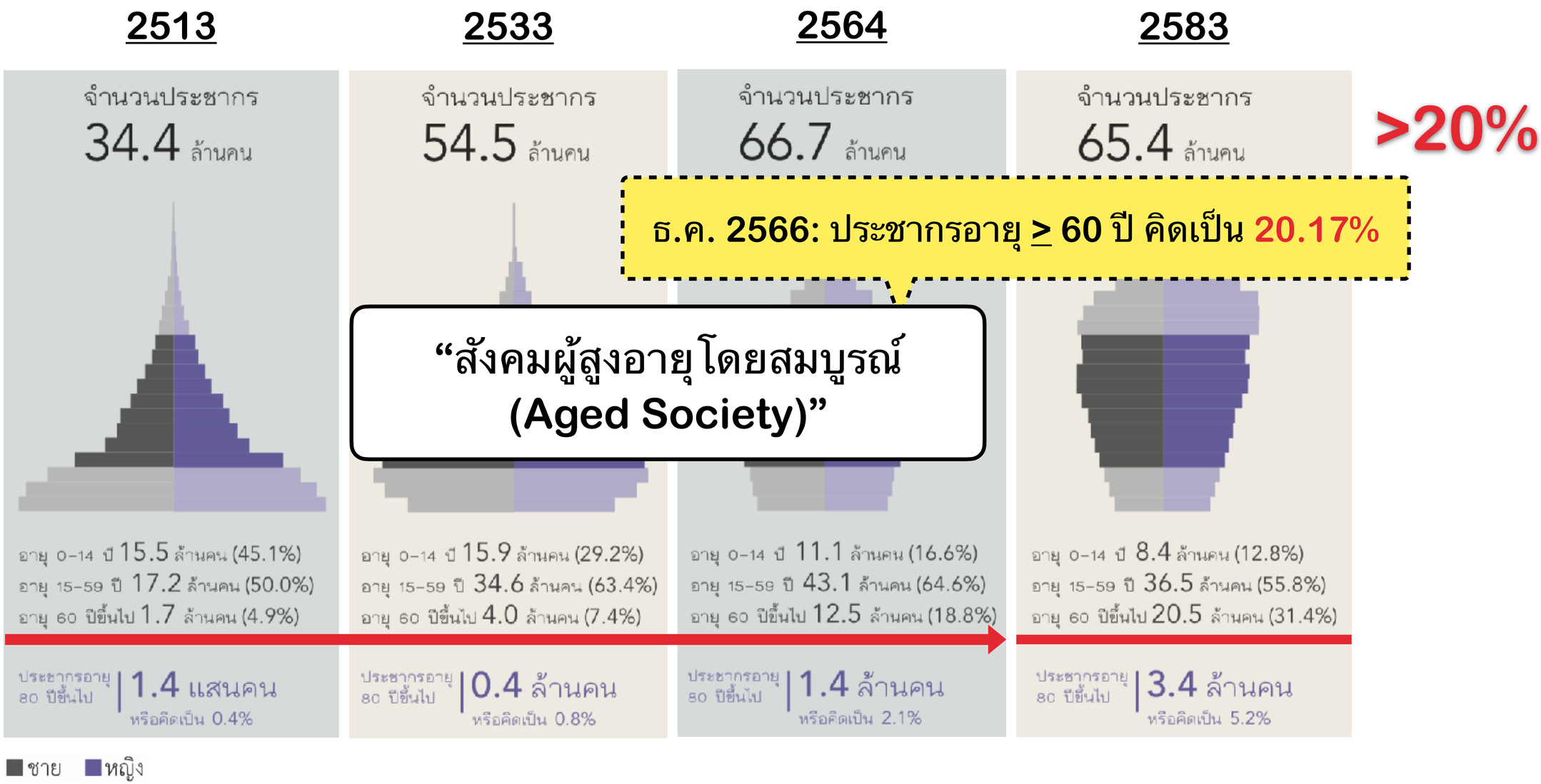
Muscles and Immunity Interplay

Harness the benefit of ONS with immune enhancing property

Dr. Saranchaya Chanpongsang, M.D.

Clinical Nutrition Instructor

Situation of Thai Elderly Population



>20%

ธ.ค. 2566: ประชากรอายุ ≥ 60 ปี คิดเป็น 20.17%

“สังคมผู้สูงอายุโดยสมบูรณ์ (Aged Society)”

มูลนิธิสถาบันวิจัยและพัฒนาผู้สูงอายุไทย (2564). รายงานสถานการณ์ผู้สูงอายุไทย ปี พ.ศ. 2564. มูลนิธิสถาบันวิจัยและพัฒนาผู้สูงอายุไทย.
สำนักงานสภาพัฒนาการเศรษฐกิจและสังคมแห่งชาติ.(2562).การคาดประมาณประชากรของประเทศไทย พ.ศ. 2553-2583 (ฉบับปรับปรุง). กรุงเทพฯ: สำนักงานสภาพัฒนาการเศรษฐกิจและสังคมแห่งชาติ.

????

Malnutrition

Chewing/swallowing problems

↓ Calorie & protein intake

↓ Micronutrient intake

Endocrine dysfunction

Physiologic changes of GI tract

↓ Nutrient utilization

↓ Food accessibility

Frailty

Underweight

Fatigue

Functional decline

Sarcopenia

↓ Muscle mass

↓ Muscle strength

↓ Physical performance

Lifestyle & Eating patterns

Physical inactivity & Decompensation

Comorbidity

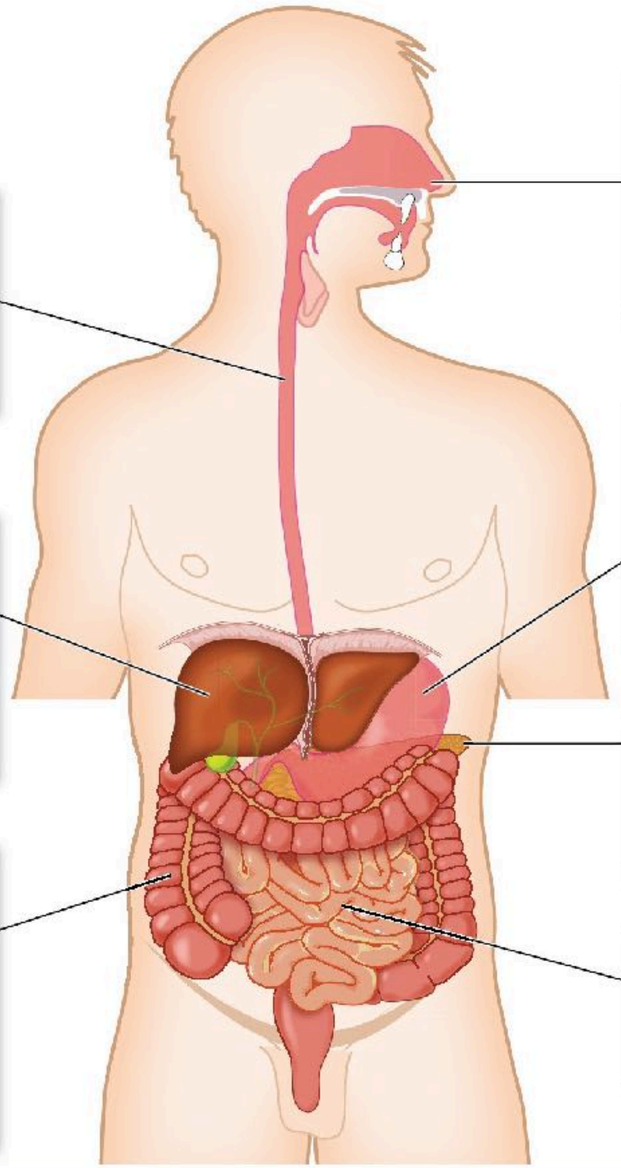
- CVD
- DM
- Depression
- Dementia
- Cancer
- Polypharmacy

Illnesses

- Infection
- Trauma
- Fall & Fracture
- Surgery

Socioeconomic status & Living situation

Age-related Changes of GI function



Esophagus
- Oesophageal peristalsis decreases
- Oesophageal sphincters lose tension

Liver
- Shrinkage of liver occurs with loss of hepatocytes
- Reduced ability to detoxify substances including drugs
- Changes in bile constitution

Colon
- Peristalsis slows down
- Decline in rate of cell division and lining repair
- Changes in microbial fauna
- Changes in DNA of epithelial cells

Nose & Mouth
- Reduction in sense of smell and taste
- Gum recession
- Difficulty in swallowing

Stomach
- Reduced elasticity of stomach wall
- Decreased bicarbonate production and gastromucosal protection
- Delayed gastric emptying

Pancreas
- Decreased secretion of pancreatic protease and lipase

Small intestine
- Compromised gut-associated lymphoid tissue capacity

Anorexia of ageing

GI dysmotility

Malabsorption & Maldigestion

⬇ Nutrient intake & Absorption

Wilkinson DJ, et al. Ageing Res Rev. 2018;47:123-32.

Burden of Malnutrition

Surgical site infection

Length of stay

Readmission

Mortality

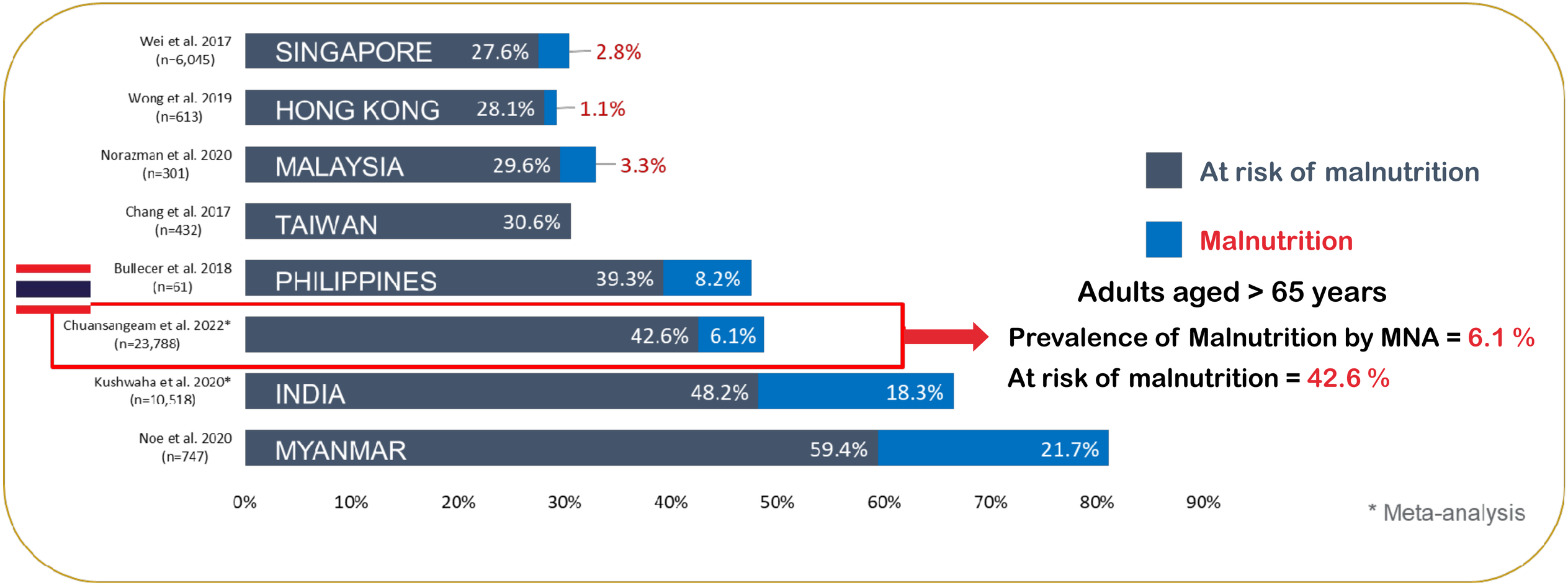
Increase hospital cost

Impaired quality of life

Anastomosis leakage

Nosocomial infection

Prevalence of Malnutrition among Asian Older Adults



1. Wei K, et al. *J Am Med Dir Assoc*. 2017;18(12):1019-1028.
2. Wong MMH, et al. *BMC Geriatr*. 2019;19(1):138.
3. Norazman CW, et al. *Nutrients*. 2020;12(6):1713.
4. Chang SF. *J Nurs Scholarsh*. 2017;49(1):63-72.
5. Bullecer ER. *Acta Medica Philippina*. 2018; 52(3).
6. Chuansangeam M, et al. *Asia Pac J Clin Nutr. 2022; 31(1): 128-141*
7. Kushwaha S, et al. *Ageing Res Rev*. 2020;63:101137.
8. Noe MTN, et al. *Nutrition*. 2020;79-80:110933.

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- Infection
- Trauma
- Fall & Fracture
- Surgery

Socioeconomic status & Living situation

What is “Sarcopenia”

“Sarcopenia” = ภาวะมวลกล้ามเนื้อน้อย

Age-related loss of skeletal muscle mass

Mass

Loss of muscle strength

And/Or

Reduced physical performance

Strength

Function

Chen LK, et al. Asian Working Group for Sarcopenia: 2019 Consensus Update on Sarcopenia Diagnosis and Treatment. J Am Med Dir Assoc. 2020;21(3):300-7.e2.

Sarcopenia Diagnosis

JAMDA 21 (2020) 300–307

ELSEVIER

JAMDA

journal homepage: www.jamda.com

Special Article

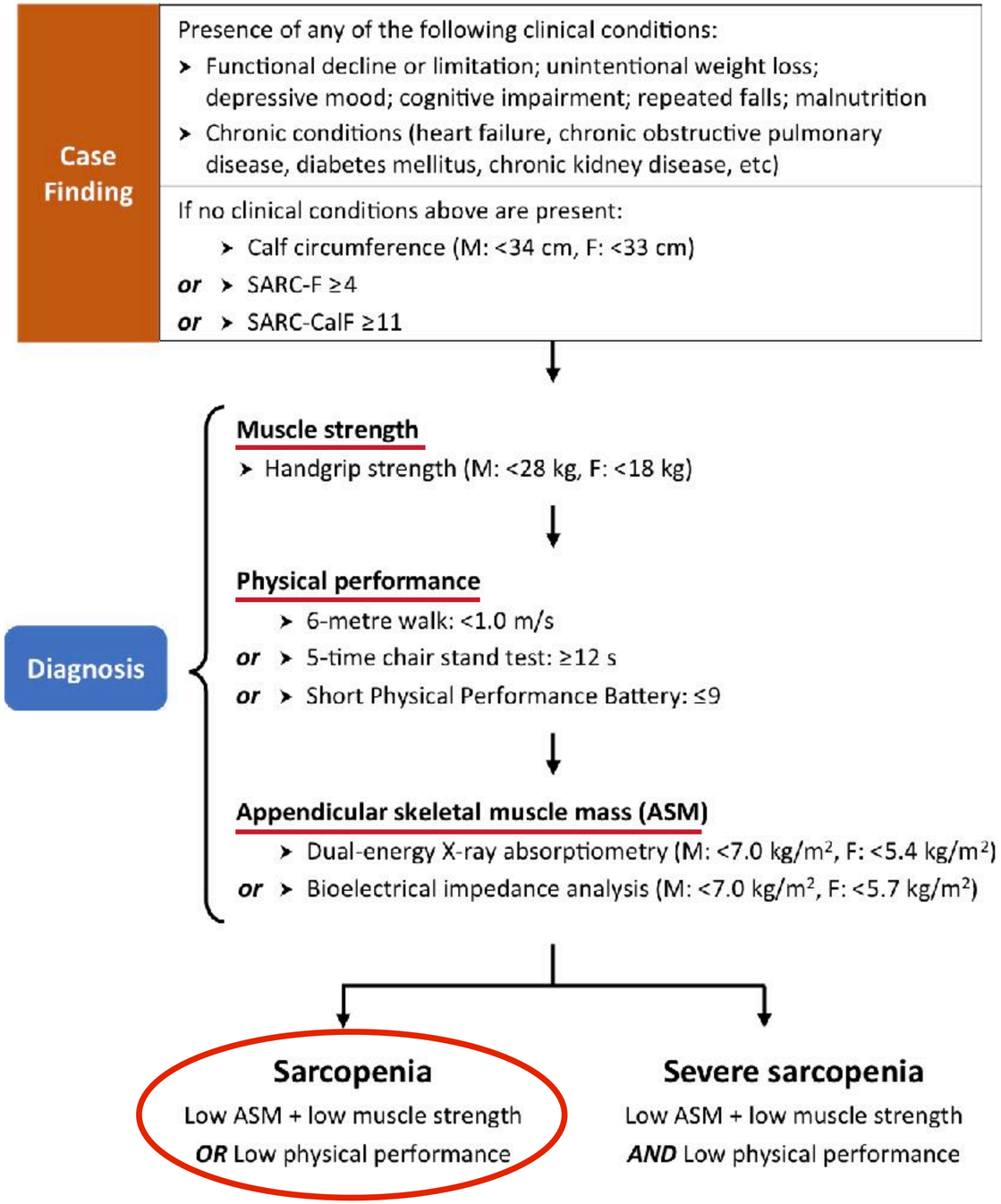
Asian Working Group for Sarcopenia: 2019 Consensus Update on Sarcopenia Diagnosis and Treatment

AWGS 2019

Liang-Kung Chen MD, PhD [a,b,*], Jean Woo MD [c,**], Prasert Assantachai MD, PhD [d], Tung-Wai Auyeung MD [e], Ming-Yueh Chou MD [a,f], Katsuya Iijima MD, PhD [g], Hak Chul Jang MD, PhD [h], Lin Kang MD [i], Miji Kim PhD [j], Sunyoung Kim MD, PhD [k], Taro Kojima MD, PhD [l], Masafumi Kuzuya MD, PhD [m], Jenny S.W. Lee MD [e], Sang Yoon Lee MD, PhD [n,o], Wei-Ju Lee MD, MSc, PhD [a,p], Yunhwan Lee MD, MPH [q], Chih-Kuang Liang MD [a,f], Jae-Young Lim MD, PhD [n], Wee Shiong Lim MD [r], Li-Ning Peng MD, MSc, PhD [a,b], Ken Sugimoto MD, PhD [s], Tomoki Tanaka PhD [f], Chang Won Won MD, PhD [k], Minoru Yamada PhD [t], Teimei Zhang PhD [u], Masahiro Akishita MD, PhD [l], Hidenori Arai MD, PhD [v,***]

Chen LK, et al. Asian Working Group for Sarcopenia: 2019 Consensus Update on Sarcopenia Diagnosis and Treatment. J Am Med Dir Assoc. 2020;21(3):300-7.e2.

AWGS 2019
Sarcopenia Diagnosis



Chen LK, et al. Asian Working Group for Sarcopenia: 2019 Consensus Update on Sarcopenia Diagnosis and Treatment. J Am Med Dir Assoc. 2020;21(3):300-7.e2.

Prevalence of Sarcopenia among Thai Elderly

RESEARCH Open Access

Sarcopenia in Thai community-dwelling older adults: a national, cross-sectional, epidemiological study of prevalence and risk factors

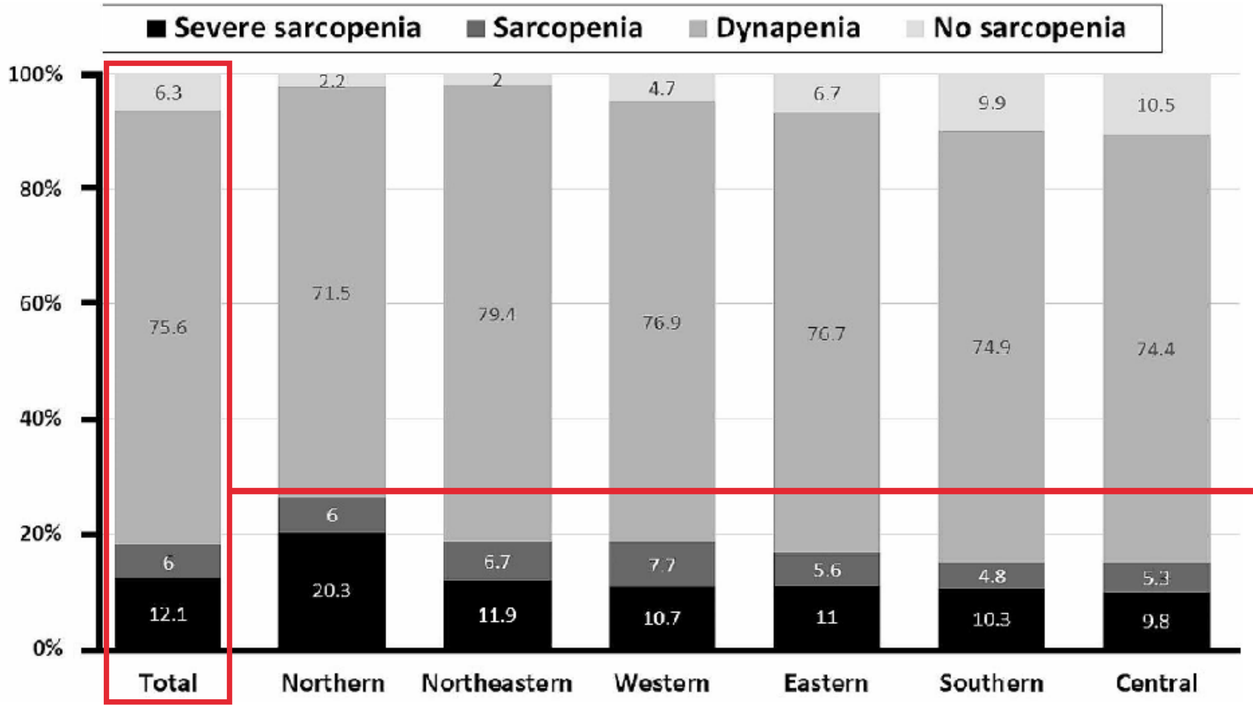


Fig. 3 Overall prevalence of dynapenia, sarcopenia, and severe sarcopenia by geographic region in Thailand

Adults aged ≥ 60 years
N = 2456

Prevalence of Dynapenia = 75.6 %

Overall Prevalence of Sarcopenia = 18.1 %

Prevalence of Sarcopenia among Thai Elderly

10-31.6%

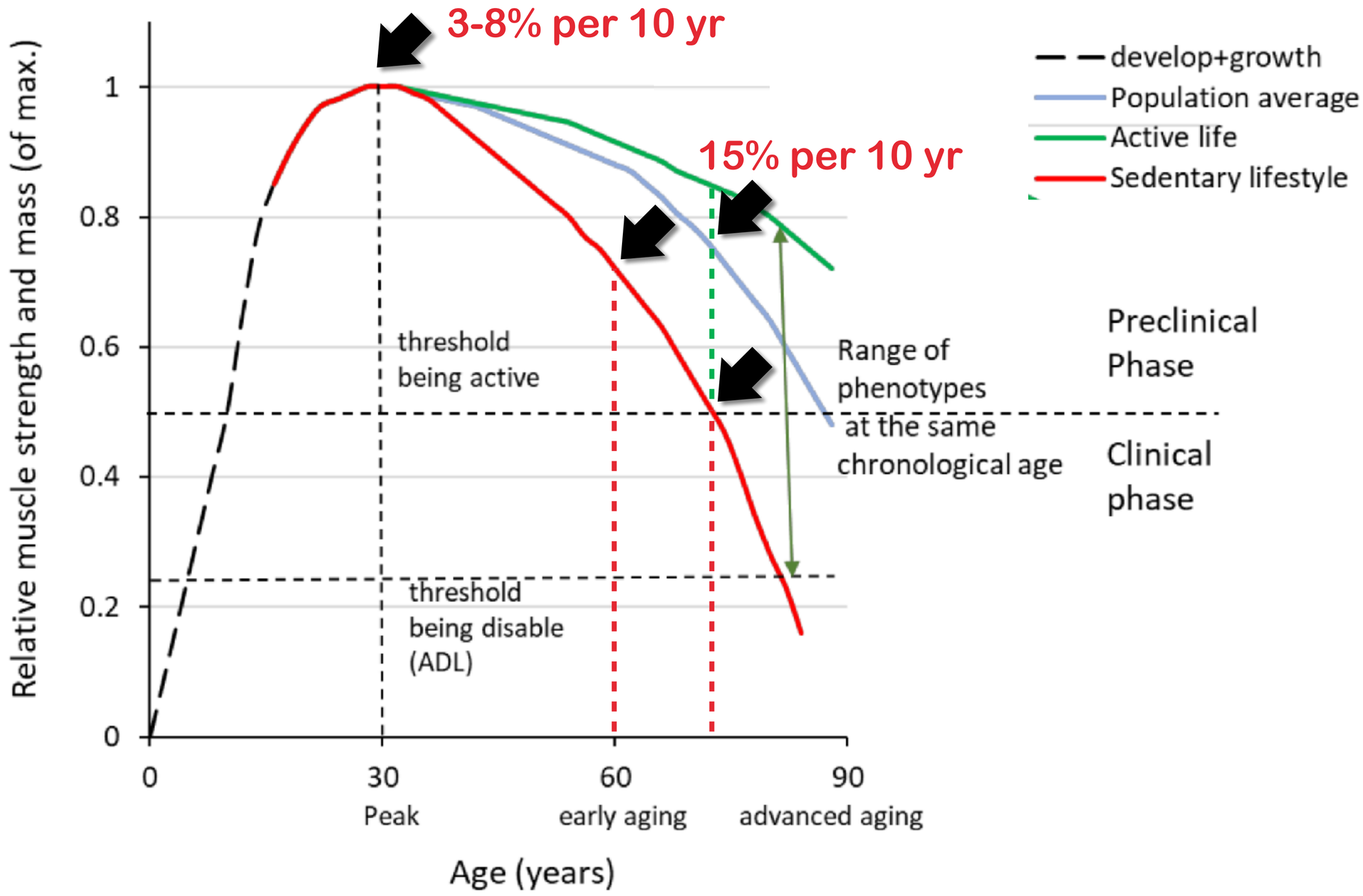
Table 3 Literature review of previous studies reporting the prevalence and risk factors of sarcopenia among older Thai adults according to the AWGS 2019 criteria

Paper	Publication year	Study type	Study population	Sample size	Sarcopenia prevalence	Associated risk factors
Sri-on et al. [10]	2022	Cross-sectional	Older adults aged > 60 years in Bangkok	892	31.6%	Age ≥ 70 years, low BMI, and inadequate nutrition
Yuenyongchaiwat et al. [9]	2022	Prospective cohort	Older adults aged ≥ 60 years in community-dwelling	205	21.5%	Low physical activity
Therakomen et al. [8]	2020	Cross-sectional	Older adults aged > 60 years in outpatient clinic at King Chulalongkorn Memorial Hospital	330	10%	Age ≥ 70 years, prefrailty, lower physical activity
The present study		Cross-sectional, nationwide	Older adults aged ≥ 60 years in community-dwelling	2456	18.1%	Age ≥ 80 years, male sex, low BMI, lower leg calf circumference, increased time in TUG test, and history of COPD

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; TUG, timed up-and-go

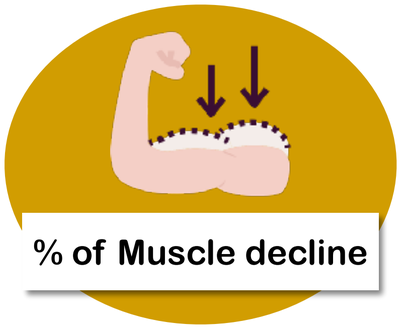
- **Age ≥ 80**
- **Male**
- **Low BMI**
- **Lower CC**
- **Increased TUG test**
- **Hx of COPD**

Progression of Muscle Function with Advancing Age



Gustafsson T, et al. Int J Mol Sci. 2024;25(20):10932.

Complications related to loss of muscle mass



% of Muscle decline

100
75
50
25
0

- 10%
- 20%
- 30%
- 40%

- ↓ Immunity
- ↑ Risk of Infection

- ↓ Wound healing
- ↑ Muscle weakness
- ↑ Risk of Infection

- Difficult sitting
- Pressure sore
- Pneumonia

- ↑ Death
(usually from pneumonia)

Mortality rate

10%
30%
50%
100%

Argilés JM, et al. J Am Med Dir Assoc. 2016 Sep 1;17(9):789-96.
Demling RH., Eplasty. 2009;9:65-94.

Structural functions

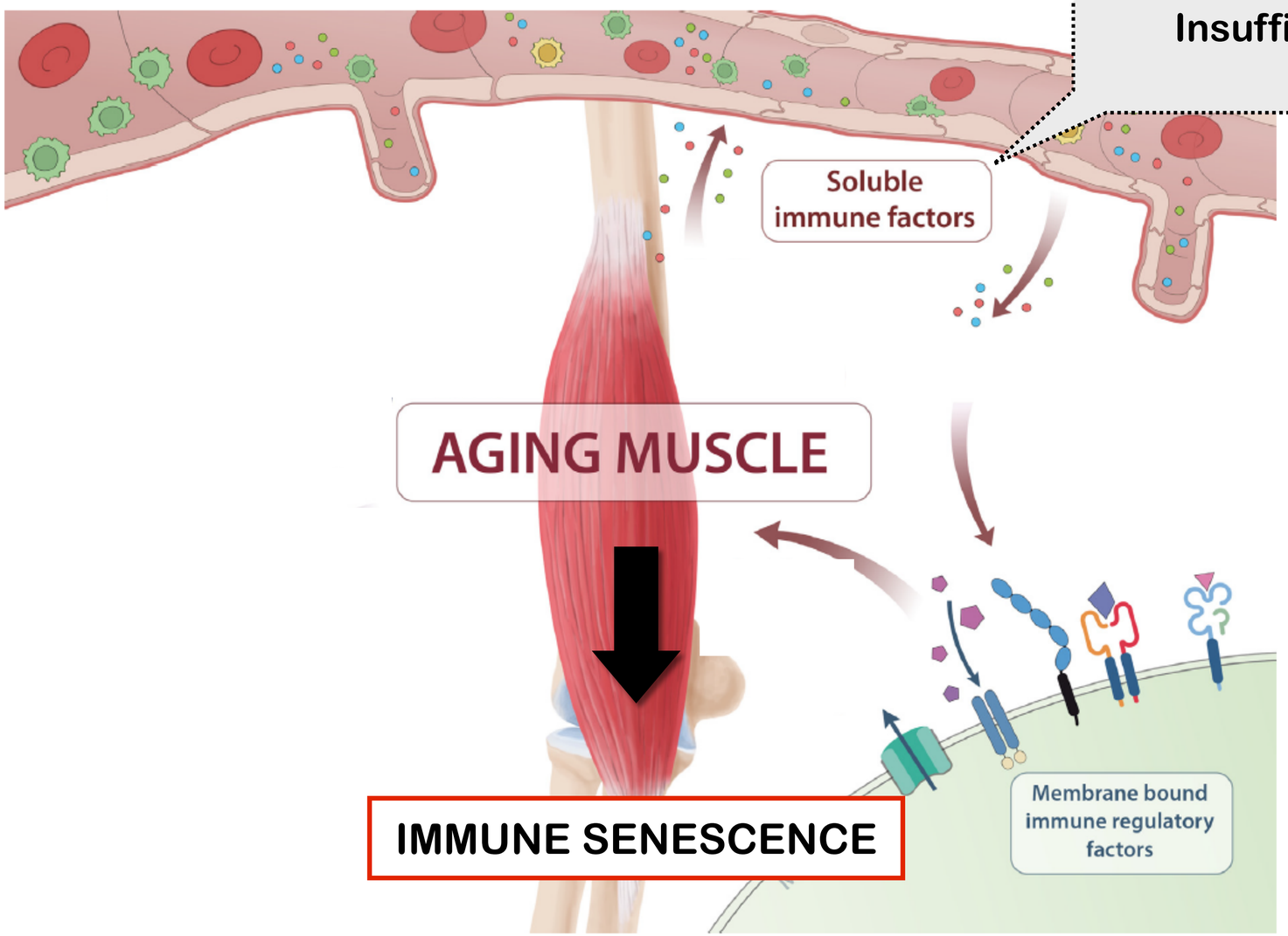
Metabolic functions

Immune senescence

Inter-organ crosstalk

“Role of Muscle”

Aging Muscle & Immune Senescence



IL-6

- Inflammatory conditions: Pro-inflammatory and catabolic effects
- During exercises: Anti-inflammatory and anabolic effects

IL-7

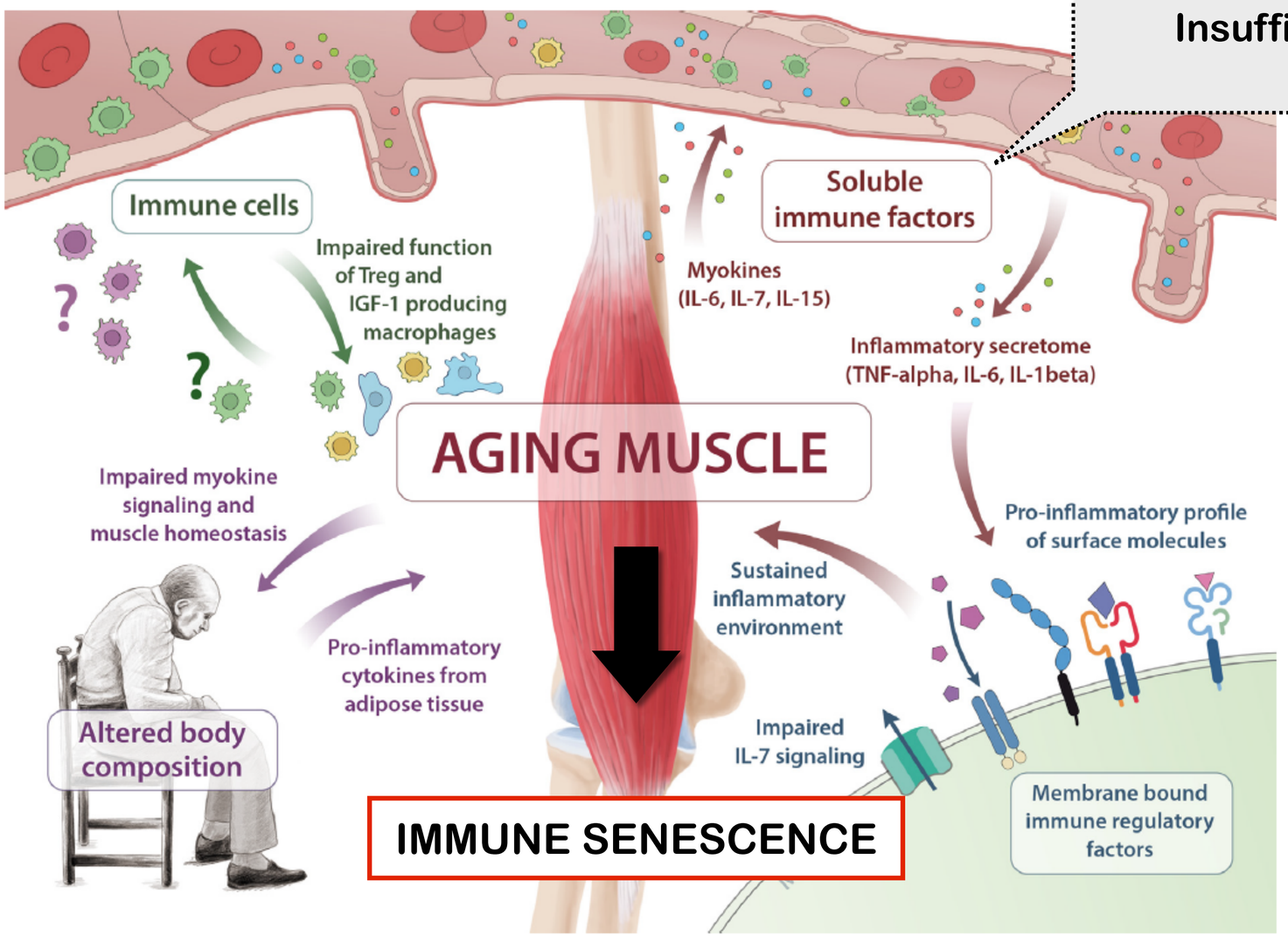
- Development and maintenance of lymphocytes

IL-15

- Development and maintenance of immune cells
- Stimulating myogenesis
- Promoting muscle regeneration
- Reducing adipose tissue distribution

Fig. 1. Aging of skeletal muscle is central in the pathogenesis of immune senescence and sarcopenia. Multiple pathways are affected, including insufficient myokine signalling (IL-6, IL-7, IL-15), shifting of membrane bound immune regulatory factors towards a pro-inflammatory profile, impaired immune cell function and altered body composition.

Aging Muscle & Immune Senescence



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- Development and maintenance of immune cells
- Stimulating myogenesis
- Promoting muscle regeneration
- Reducing adipose tissue distribution

C. Nelke, R. Dziewas and J. Minnerup et al./ EBioMedicine 49 (2019) 381–388

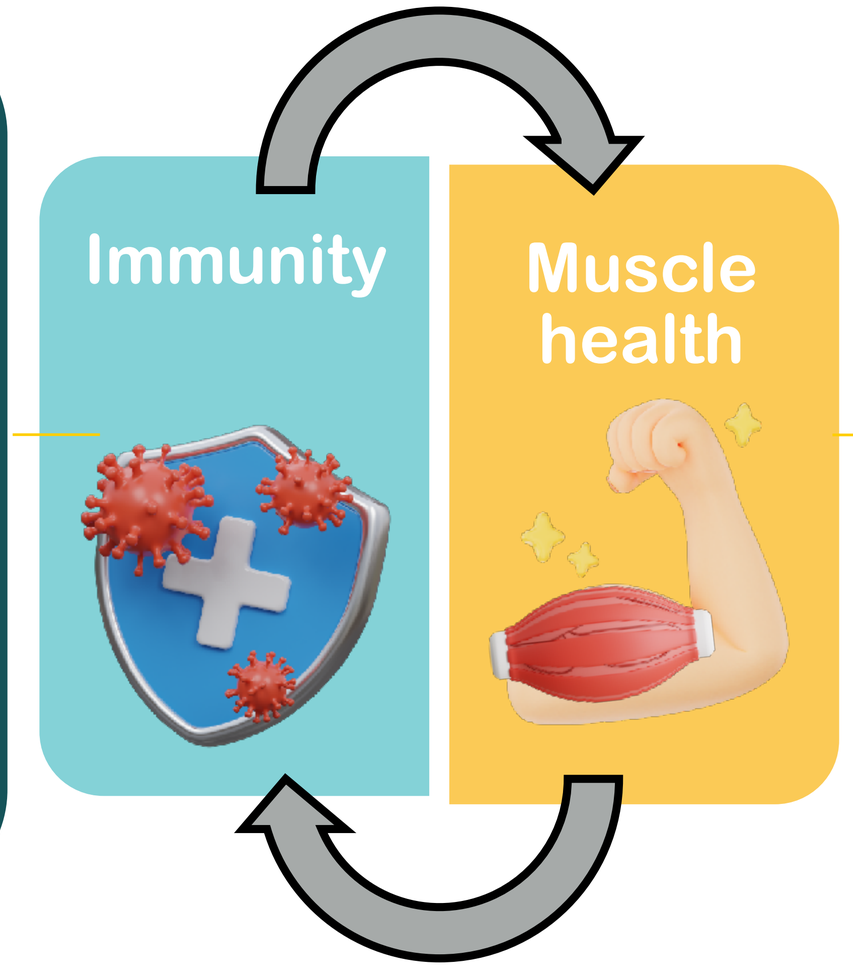
Bidirectional Relationship of Muscles & Immunity

Muscle Repair & Regeneration

"Chronic Inflammation & Immunosurveillance"

↓

Muscle Wasting



Produce myokines for immune cells proliferation, activation, and distribution

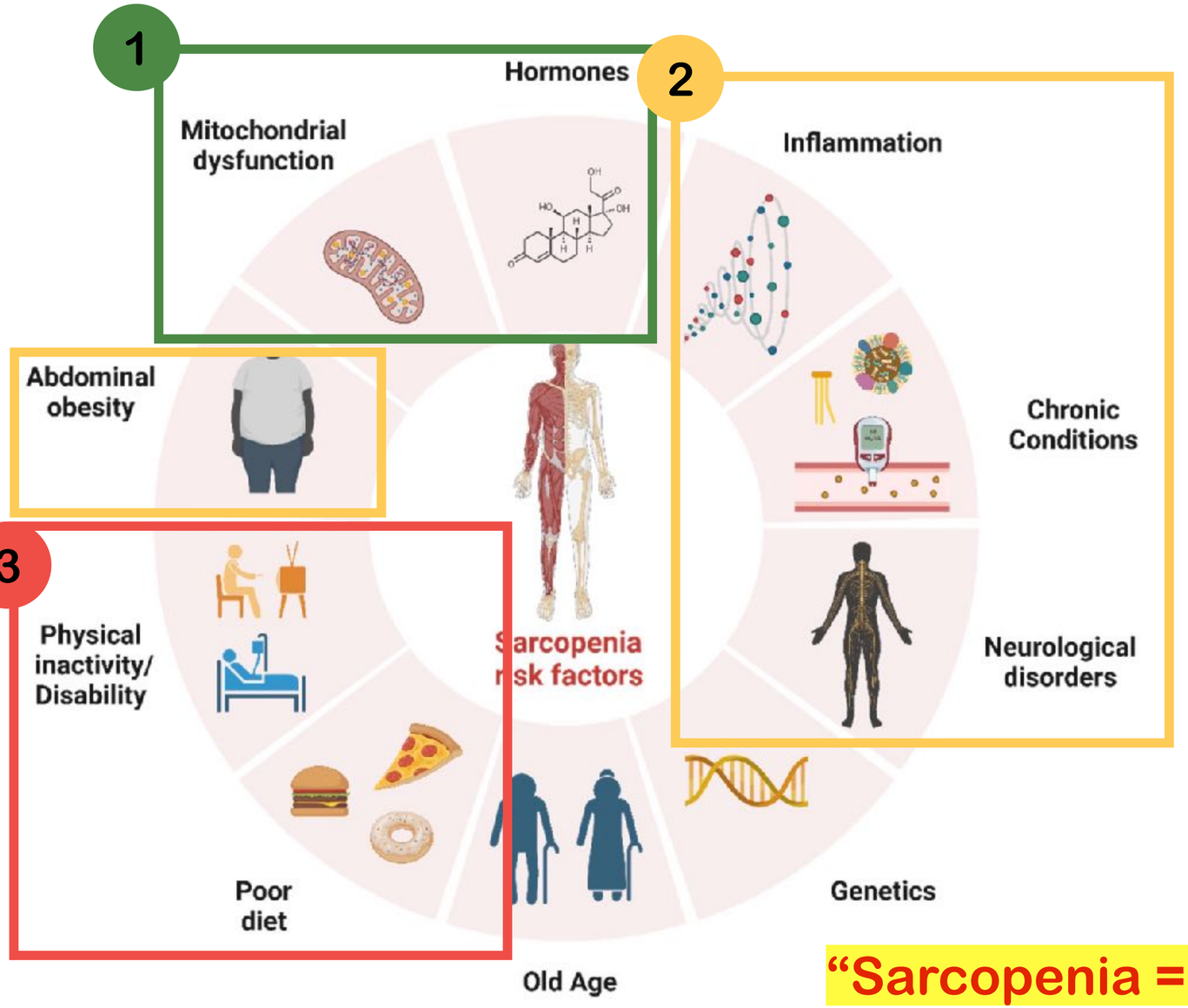
"Low muscle mass"

↓

Immune senescence
Compromised immunity and infections

De Araujo AL, et al. *Immunotherapy*. 2013;5(8):879-893.
Lee JH, Jun HS. *Front Physiol*. 2019;10:42.
Nelke C, et al. *EBioMedicine*. 2019;49:381-388.

Causes of Sarcopenia



Aging processes
- **Hormonal imbalances**
- **Mitochondrial dysfunction**

Disease-related
- **Systemic Inflammation**
  1. Acute illnesses: infection, organ failure
  2. Chronic: malignancy
- **Metabolic syndrome**
- **Cardiovascular diseases**
- **Neurologic conditions**

Unhealthy lifestyles
- **Malnutrition**
- **Unbalanced/unhealthy diet**
- **Physical inactivity**

"Sarcopenia = Multifactorial geriatric syndrome"

Mechanism of Muscle Loss

Activation of inflammatory pathway

Metabolic Stress ..... **Acute inflammation** .....

- Sepsis
- Organ failure
- Major trauma etc.

↑ Breakdown of muscle proteins for gluconeogenesis

↓ Rate of muscle protein synthesis

\+

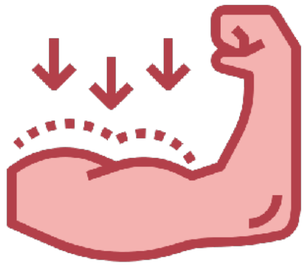
Inadequate nutritional support

Argilés HM, et al. *JAMDA*. 2016;17:789-796.
Xi P, et al. *Frontiers in Bioscience*. 2011;16:578-597.
Demling RH. *ePlasty*. 2009;9:65-94.
Wolfe RR. *Am J Clin Nutr*. 2006;84:475-82.

Accelerated Muscle Loss during Hospitalization

Normal rate of muscle loss
by ageing q 10 years

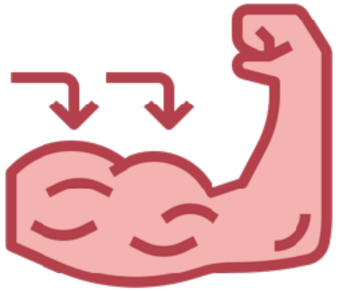
In healthy adults > 40 y



-8%

Inactivity
10 days

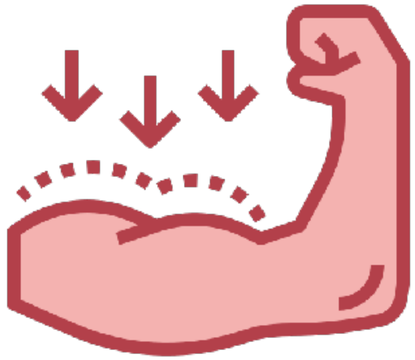
Disuse atrophy
after 10 days of hospitalization



-5%

ICU stay
10 days

“Critically-ill patients”



Disuse
Inflammation
Malnutrition

-18%

English KL et al. *Curr Opin Clin Nutr Metab Care*. 2010;13(1):34-39.
Kortebein P, et al. *JAMA*. 2007;297(16):1772-1774.
Puthucheary ZA, et al. *JAMA*. 2013;310:1591-1600.

Strategies for Sarcopenia Managements

Maintain bone health

Reduce risk of osteoporotic fracture

Maintain muscle strength

Provide amino acids for substrate metabolisms

Site for glucose disposal & storage

Maintain self-worth & satisfaction

Maintain balance, gait, walking speed

Continue occupational pursuits

Reduce risk of falls

Maintain independence & IADL

Avoid disability

Maintain physical function

Importance of Preserving muscle quantity & quality in old age

✓ Reduce hospitalization

✓ Reduce mortality

Parise G, et al. Curr Opin Clin Nutr Metab Care. 2000;3(6):489-95.

NON-PHARMACOLOGIC MANAGEMENTS

"Multidisciplinary approach"

+

https://www.netmeds.com/health-library/post/national-nutrition-week-must-have-essential-nutrients-in-your-regular-diet

Aims of Nutritional Support

- Provide adequate energy, protein, micronutrients, fluid
- Maintain/Improve nutritional status
- Maintain/Improve function, activity, capacity for rehabilitation
- Improve quality of life
- Reduce morbidity & mortality

Nutrient requirements in Elderly patients

Clinical Nutrition 38 (2019) 10–47

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

ESPEN Guideline

ESPEN guideline on clinical nutrition and hydration in geriatrics

Dorothee Volkert [a, *], Anne Marie Beck [b], Tommy Cederholm [c], Alfonso Cruz-Jentoft [d], Sabine Goisser [e], Lee Hooper [f], Eva Kiesswetter [a], Marcello Maggio [g, h], Agathe Raynaud-Simon [i], Cornel C. Sieber [a, j], Lubos Sobotka [k], Dieneke van Asselt [l], Rainer Wirth [m], Stephan C. Bischoff [n]

ENERGY

30 kcal/kg/day

PROTEIN

≥ 1 g/kg/day

MICRONUTRIENTS

As RDA + vitamin D & Ca supplement

FLUID

♂ **≥ 1.5 L/d**

♀ **≥ 2 L/d**

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Protein requirement in Elderly

Clinical Nutrition 38 (2019) 10–47

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Clinical Nutrition 33 (2014) 929–936

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

ESPEN endorsed recommendation

Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group

Nicolaas E.P. Deutz [a, *], Jürgen M. Bauer [b], Rocco Barazzoni [c], Gianni Biolo [c], Yves Boirie [d], Anja Bosy-Westphal [e], Tommy Cederholm [f, g], Alfonso Cruz-Jentoft [h], Zeljko Krznariç [i], K. Sreekumaran Nair [j], Pierre Singer [k], Daniel Teta [l], Kevin Tipton [m], Philip C. Calder [n, o]

Age >65, Healthy

1-1.2 g/kg/day

Age >65, active/exercise

> 1.2 g/kg/day

Acute/Chronic disease

1.2-1.5 g/kg/day

Malnutrition

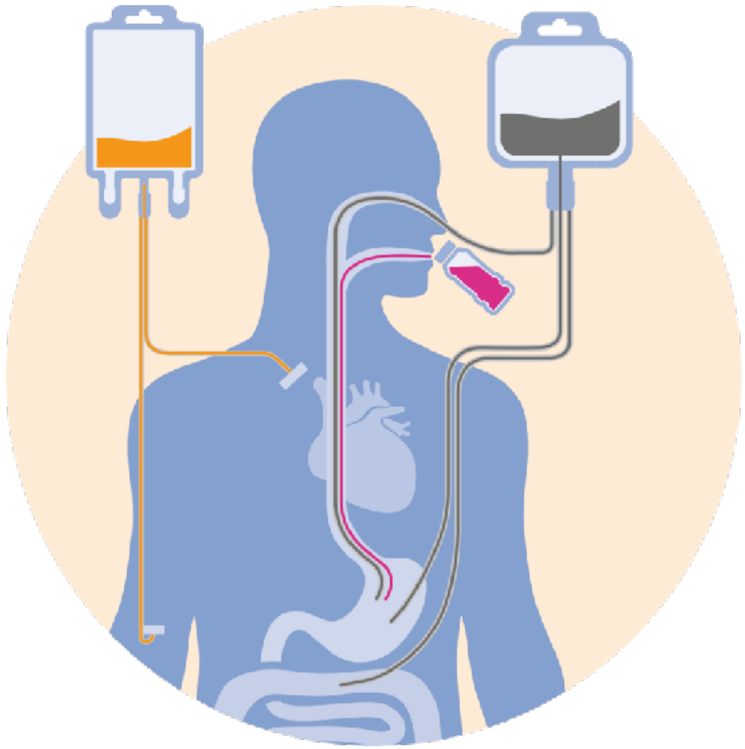
1.2-1.5 g/kg/day

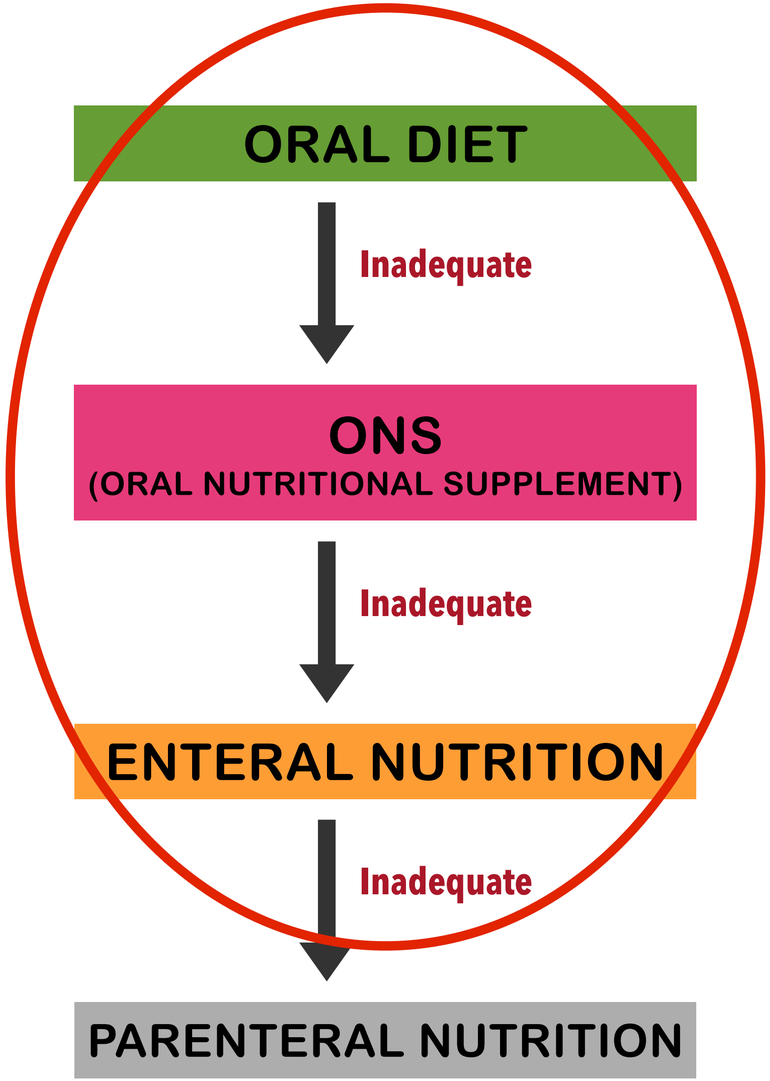
ICU/Severe illness

Up to 2 g/kg/day

Deutz NE, et al. Clin Nutr. 2014;33(6):929-36.
Volkert D, et al. Clin Nutr. 2019;38(1):10-47.

Route for Medical Nutrition Therapy



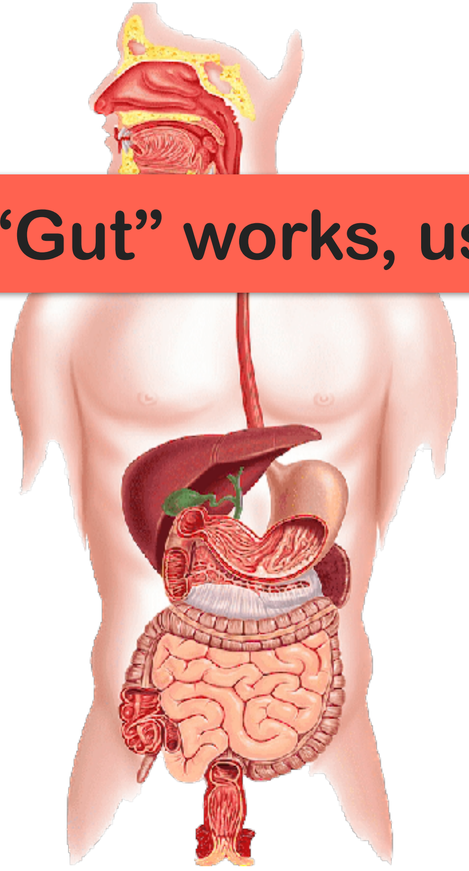


SPENT Guideline in Adult Hospitalized Patients. 2017.
https://www.medicalnutritionindustry.com/medical-nutrition/about-medical-nutrition

Nutritional & Non-Nutritional Benefits Oral/EN

- Maintain GI integrity
- Maintain digestive & absorptive capabilities
- Promote efficient nutrient utilization
- Stimulate GI motility & contractility
- Stimulate GI hormone secretion
- Promote insulin sensitivity
- Support gut microbiota
- Maintain normal gallbladder function

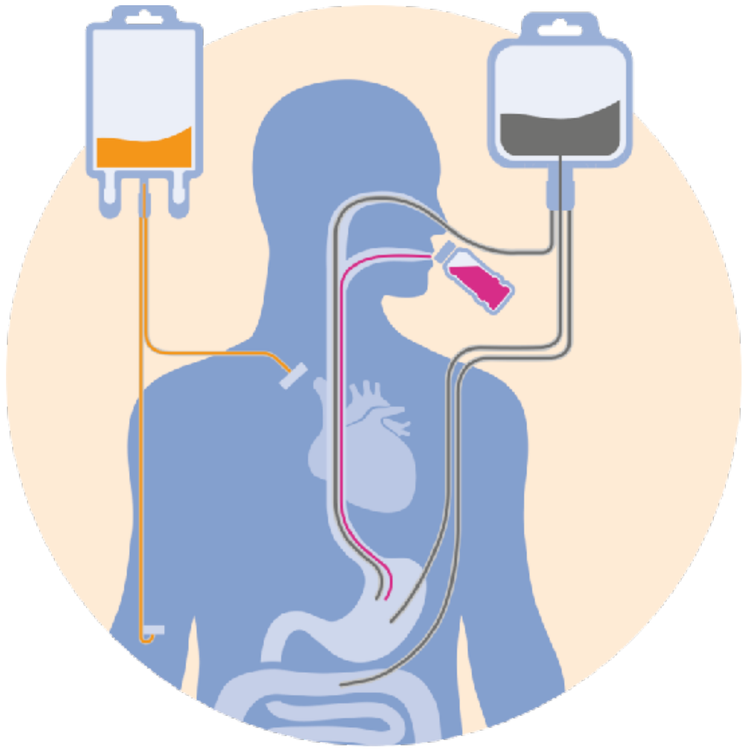
If the "Gut" works, uses it!!!



- Support & maintain GALT
- Promote IgA secretion
  (↓ bacterial adherence & translocation)
- ↓ Oxidative stress & inflammatory response
- Decrease risk of stress ulcer
- Maintain lean body mass
  (↑ protein synthesis & mitochondrial function)
- ↓ Infectious complications
- ↓ ICU stay

McClave SA, et al. Crit Care Med. 2014;42:2600-10.
The ASPEN Adult Nutrition Support Core Curriculum, 3rd Edition. 2017.

Route for Medical Nutrition Therapy



ORAL DIET

Inadequate

ONS
(ORAL NUTRITIONAL SUPPLEMENT)

Inadequate

ENTERAL NUTRITION

Inadequate

PARENTERAL NUTRITION

SPENT Guideline in Adult Hospitalized Patients. 2017.
https://www.medicalnutritionindustry.com/medical-nutrition/about-medical-nutrition

Route for Medical Nutrition Therapy

Regular diets

1800-2000 kcal/d

Soft diets

1500-1800 kcal/d

Full liquid diet

โจ๊กปั่น 600-750 kcal/d

Oral nutritional supplement

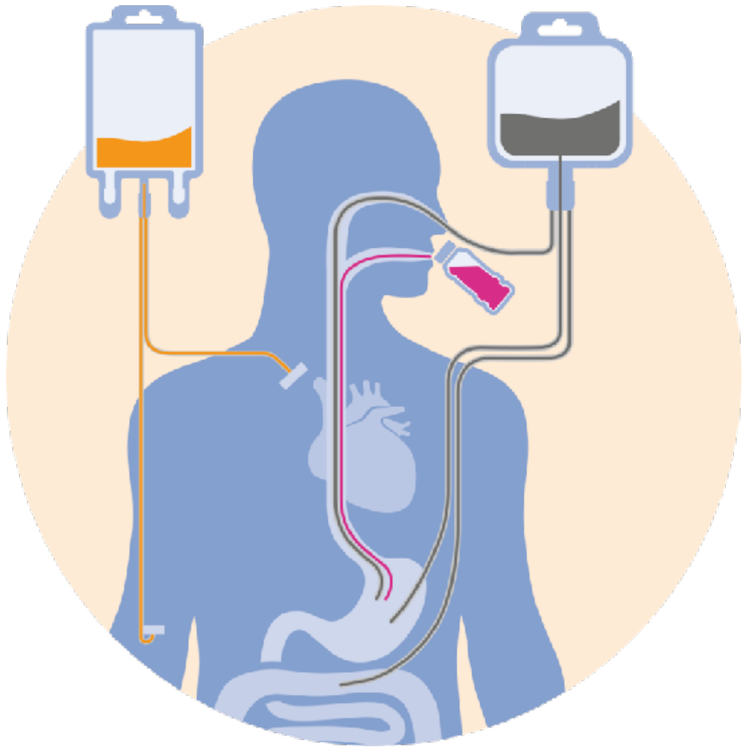
200-250 kcal/bottle

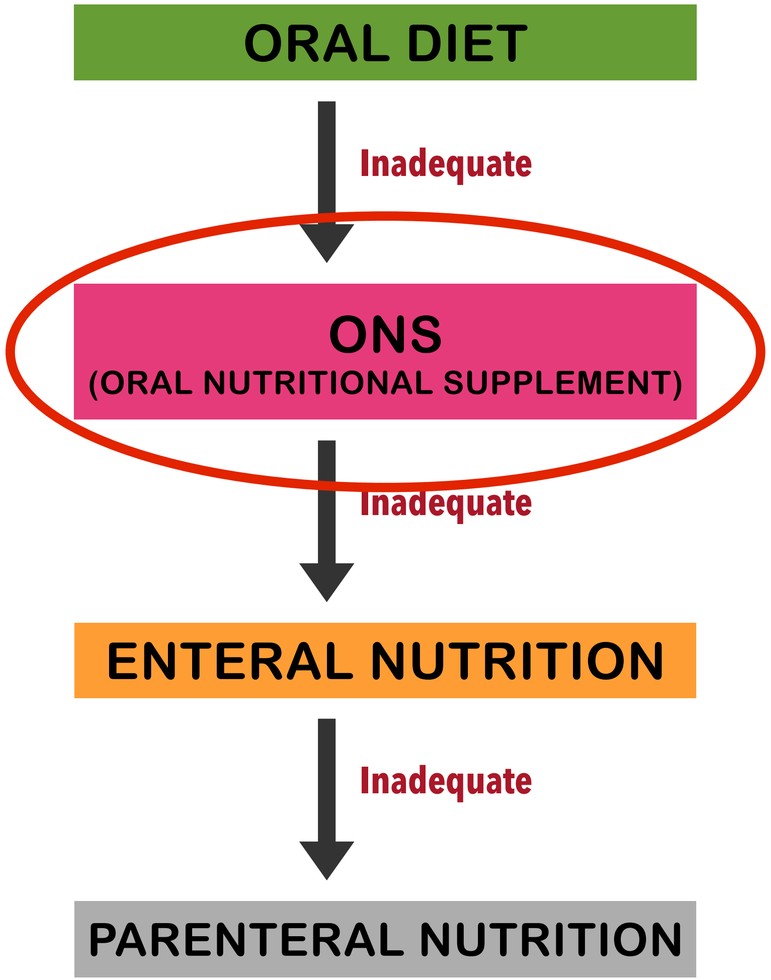
Clear liquid diet

น้ำหวาน 60 kcal/bottle

Church A, et al. Enteral nutrition product formulations: A review of available products and indications for use. Nutr Clin Pract. 2023 Apr;38(2):277-300.

Route for Medical Nutrition Therapy





SPENT Guideline in Adult Hospitalized Patients. 2017.
https://www.medicalnutritionindustry.com/medical-nutrition/about-medical-nutrition

Oral Nutritional Supplement (ONS)

"Complete balanced diet"

- **Provide additional nutrients** for people who are not meeting their needs through oral diet alone
- **Timing:** within 24 hrs of admission
  - Added after main meals
  - Between main meals
  - Before bedtime

ONS/EN formulas

Commercial Formulas

Hang time 4 hours

ปริมาณสารอาหารครบถ้วนถ้า feed ≥ 1500 kcal/day

Food-based Blenderized EN

Hang time 2 hours

ต้องอยู่ในความดูแลของนักกำหนดอาหารวิชาชีพ

Loss micronutrients via heat & water

สามารถปรับสัดส่วน CHO:Protein:Fat ได้ตามต้องการ

Oral Nutritional Supplement (ONS)

ESPEN Guideline

ESPEN guideline on clinical nutrition and hydration in geriatrics

Dorothee Volkert [a, *], Anne Marie Beck [b], Tommy Cederholm [c], Alfonso Cruz-Jentoft [d], Sabine Goisser [e], Lee Hooper [f], Eva Kiesswetter [a], Marcello Maggio [g, h], Agathe Raynaud-Simon [i], Cornel C. Sieber [a, j], Lubos Sobotka [k], Dieneke van Asselt [l], Rainer Wirth [m], Stephan C. Bischoff [n]

Recommendation 23

Older persons with malnutrition or at risk of malnutrition with chronic conditions shall be offered ONS when dietary counseling and food fortification are not sufficient to increase dietary intake and reach nutritional goals.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 24

Hospitalized older persons with malnutrition or at risk of malnutrition shall be offered ONS, in order to improve dietary intake and body weight, and to lower the risk of complications and readmission. (BM)

Grade of recommendation A strong consensus (100% agreement)

Recommendation 25

After discharge from the hospital, older persons with malnutrition or at risk of malnutrition shall be offered ONS in order to improve dietary intake and body weight, and to lower the risk of functional decline. (BM)

Grade of recommendation A – strong consensus (100% agreement)

Indications for ONS

1) Malnourished or at risk of malnutrition

- **Older persons.**
- **At risk of malnutrition with chronic disease.**
- **Hospitalized older persons.**

2) Shall be offered and continue after discharge.

Dorothee Volkert. et al. ESPEN guidelines on clinical nutrition and hydration in geriatrics. Clinical Nutrition 38(2019) 10-47

Oral Nutritional Supplement (ONS)

ESPEN Guideline

ESPEN guideline on clinical nutrition and hydration in geriatrics

Dorothee Volkert [a, *], Anne Marie Beck [b], Tommy Cederholm [c], Alfonso Cruz-Jentoft [d], Sabine Goisser [e], Lee Hooper [f], Eva Kiesswetter [a], Marcello Maggio [g, h], Agathe Raynaud-Simon [i], Cornel C. Sieber [a, j], Lubos Sobotka [k], Dieneke van Asselt [l], Rainer Wirth [m], Stephan C. Bischoff [n]

Recommendation 26

Oral nutritional supplements offered to an older person with malnutrition or at risk of malnutrition, shall provide at least 400 kcal/day including 30 g or more of protein/day. (BM)

Grade of recommendation A – strong consensus (97% agreement)

Recommendation 27

When offered to an older person with malnutrition or at risk of malnutrition, ONS shall be continued for at least one month. Efficacy and expected benefit of ONS shall be assessed once a month.

Grade of recommendation GPP – strong consensus (100% agreement)

ONS prescription

- **At least 400 kcal/ day, 30 g or more of protein/day.**
- **Shall be continued at least 1 months.**

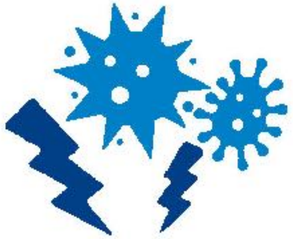
Dorothee Volkert. et al. ESPEN guidelines on clinical nutrition and hydration in geriatrics. Clinical Nutrition 38(2019) 10-47

Oral Nutrition Supplementation (ONS) has Shown Significant Clinical Benefits

Reduction in
Pressure Ulcer Incidence[1]

25%
0.75 95% CI
(0.62-0.89)

Reduction in
Serious Complications (e.g., infections)[2]



19%
P<0.001

Reduction in
Avoidable Rehospitalizations[2]

30%
P=0.004

1. Stratton RJ et al, Ageing Res Rev.2005;4(3):422-450;2. Cawood et al. Ageing Res Rev. 2012;11(2)278-296.

Oral Nutrition Supplementation Provided During Hospitalization was Associated with

21.0%

DECREASE
IN LENGTH OF STAY

21.6%

DECREASE†
IN EPISODE COSTS

Nutritional supplementation provided during hospitalization was associated with a reduced probability of 30-day readmissions for patients with at least one known follow-up[1]

6.7%*
DECREASE
IN 30 DAY
READMISSIONS

† Monetary figures are based on 2010 US dollars and inflation adjusted.
*Readmission defined as return to study hospital for any diagnosis. Data measured delayed readmission and does not include patients not readmitted due to recovery or death.

1. Philipson T et al. Am J Monag Care. 2013;19(2):121-128

Formula Selection

คำแนะนำที่ 6 ควรเลือกใช้อาหารทางการแพทย์สูตรมาตรฐานชนิด polymeric (standard polymeric formula) หรือ อาหารชนิดปั่นผสม (blenderized diet) เป็นอันดับแรก

คุณภาพหลักฐาน 4 น้ำหนักคำแนะนำ +

Commercial formulas

- ☑ Sterile
- ☑ Low viscosity
- ☑ Lactose-free
- ☑ Defined caloric density
- ☑ Reliable micronutrient contents

Composition of Commercial Enteral Formula

Standard Polymeric Formula

Name		Blendera-MF		ONCE Complete		Ensure (powder)		Ensure (liquid)	
									
Company		Thai otsuka		Thai otsuka		Abbott		Abbott	
Caloric distribution P:C:F (%)		15:55:30		18:47:35		15:56:29		14:64:22	
Kcal/ 1 scoop (g)		38 (8.3 g)		34.29 (8.0 g)		38 (9.0 g)		266 kcal/ 250 mL	
Protein(g)/ 1 serving		8.4 (224 kcal)		10.7 (240 kcal)		8.6 (230 kcal)		9.3 (266 kcal ,can)	
Protein(g)/ 1,000 kcal		37.3 Casein, Soy		44.8 Whey, Casein		37 Casein, Whey, Soy		35 Casein, Whey, Soy	
Fat source		MCT oil (2% total calorie), Rice bran oil)		Safflower oil, Canola oil, Rice bran oil MCT oil (13% total calorie)		Sunflower oil, Canola oil, Soy bean oil		Sunflower oil, Canola oil, Corn oil	
Fiber(g)/ 1,000 kcal		5.04 FOS(s)		5.98 FOS(s)		10.0 FOS(s)+Inulin(s)		No fiber	
Osmolality mOsm/kg.H2O		320 (1:1)		480 (1:1)		418 (1:1)		590 (1:1)	
Micronutrients/ 1,000 kcal	Na	794	mg	672	mg	841	mg	789	mg
	K	1103	mg	995	mg	1,565	mg	1,466	mg
	P	565	mg	398	mg	549	mg	1,195	mg
	Ca	540	mg	537	mg	1,051	mg	1,195	mg
	Mg	250	mg	174	mg	80	mg	395	mg
	Vit A	1,674	IU	1,327	IU	3,508	IU	4,954	IU
	Vit C	574	mg	199	mg	126	mg	124	mg

(s) = soluble fiber, (ins) = insoluble fiber

Composition of Commercial Enteral Formula

Standard Polymeric Formula

Name		Ensure Gold (powder)		Boost optimum		Boost fiber		Pan enteral	
									
Company		Abbott		Nestle		Nestle		Thai otsuka	
Caloric distribution P:C:F (%)		17:53:30		16:50:34 L. Paracasei *Probiotics (<45°c)		16:50:34		12:43:45	
Kcal/ 1 scoop (g)		43.67 (10.10 g)		35 (7.8 g)		36 (8.3 g)		40 (8.0 g)	
Protein(g)/ 1 serving		11.97 (262 kcal)		10.1 (251 kcal)		10.0 (250 kcal)		6.1 (204 kcal)	
Protein(g)/ 1,000 kcal		43.67 Casein, Whey, Soy		40 Whey, Casein		40 Whey, Casein		38 Casein	
Fat source		Sunflower oil, Canola oil, Soy bean oil, Non Vegetable Oil		Sunflower oil, Rapeseed oil MUFA (23% total calorie)		Sunflower oil, Canola oil, Soy bean oil		Vegetable oil, Corn oil, MCT oil (5.7% total calorie)	
Fiber(g)/ 1,000 kcal		10.9 FOS(s)		13.2 FOS(s) 9.1 g + Inulin(s) 3.9 g		10.4 of which 4.8 g FOS(s)		16.9 of which 7.0 g FOS(s)	
Osmolality mOsm/kg.H2O		445 (1.14:1)		340 (1:1)		343 (1:1)		304 (1:1)	
Micronutrients/ 1,000 kcal	Na	840	mg	368	mg	744	mg	440	mg
	K	1410	mg	1,200	mg	1,076	mg	1,100	mg
	P	687	mg	468	mg	492	mg	430	mg
	Ca	950	mg	864	mg	516	mg	860	mg
	Mg	559	mg	198	mg	152	mg	80	mg
	Vit A	3,952	IU	2,275	IU	1,668	IU	2,620	IU
	Vit C	143	mg	83	mg	52	mg	98	mg

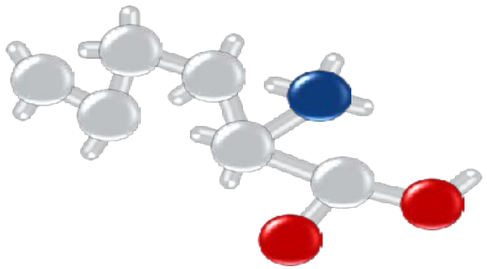
(s) = soluble fiber, (ins) = insoluble fiber

CLINICAL NUTRITION update 2023.

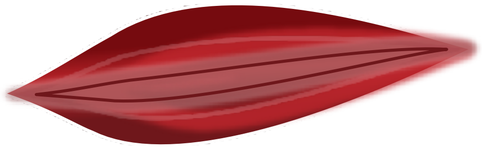
Harness the benefit of ONS with Immune enhancing property

“Role and benefit of ONS with HMB & YBG”

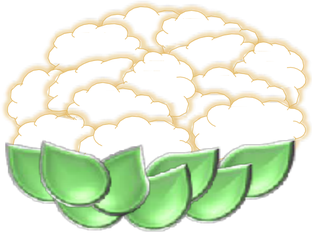
"HMB" β-Hydroxy-β-Methylbutyrate



Active metabolite of amino acid leucine



Occur naturally in the body

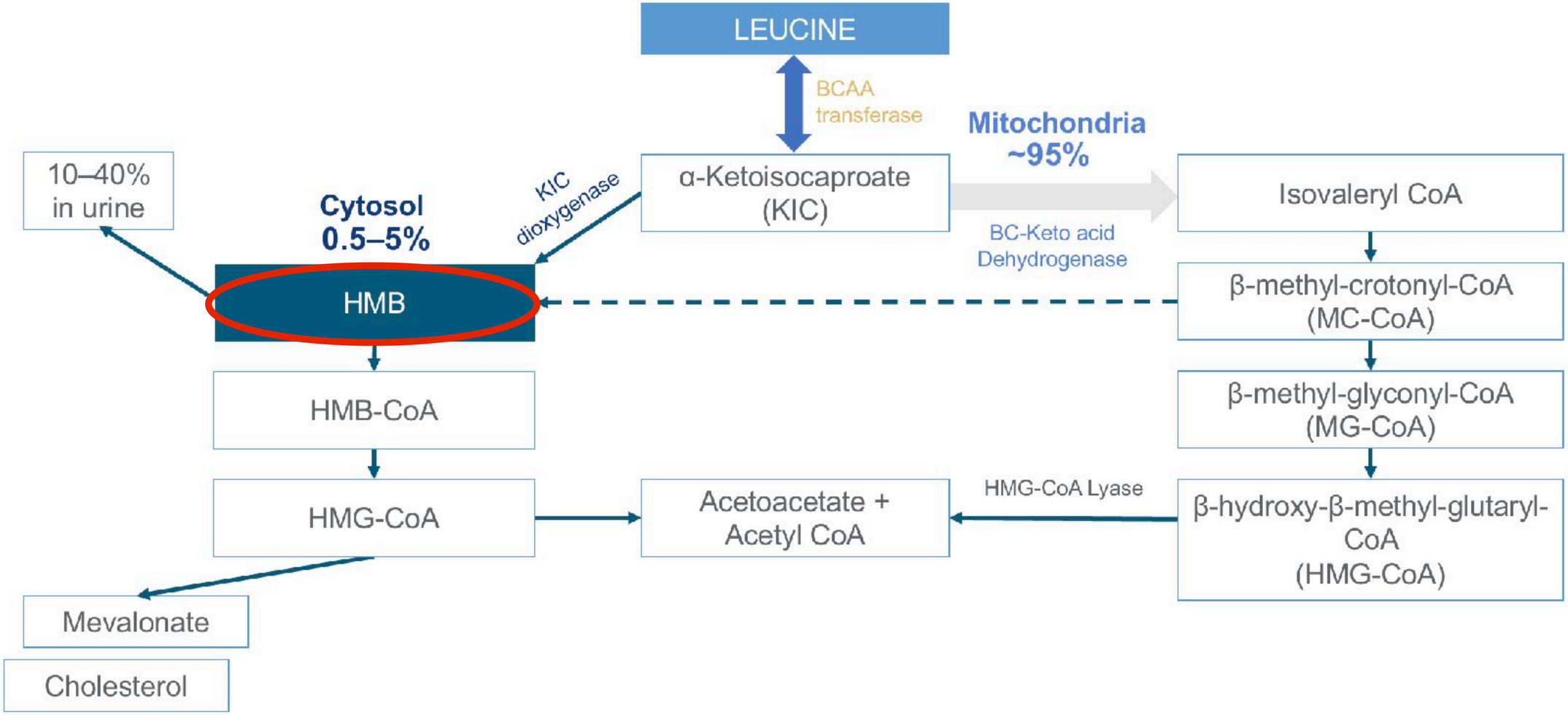


Found in small quantities in some foods

HMB supports muscle health

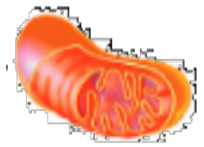
Nissen SL, Abumrad NN. *J Nutr Biochem*. 1997;8:300-11.
Wilkinson, DJ, et al. *J Physiol. 2013;*591(11):2911-23.
Eley HL, et al. *Am J Physiol Endocrinol Metab.2008;*295:E1409-16.

HMB = Metabolite of Leucine



Sabourin PJ, Bieber LL. *Metabolism*. 1983;32(2):160-164.
Nissen SL, Abumrad NN. *J Nutr Biochem*. 1997;8:300-301.
Walker D, et al. *J Chromat B*. 2017;1040:233-238.
Holeček M. *J Cachexia Sarcopenia Muscle*. 2017;8(4):529-541.
Landi F, et al. *Curr Opin Clin Nutr Metab Care*. 2019;22(1):37-43.

Effects of HMB to muscle during stress



Mitochondria
→ energy production

Inflammation / Oxidative stress
PIF, TNF-a , IFN-g, Ang II, LPS, ROS

ROS

NFkβ

Nucleus

Oncogenes

Apoptosis

Caspase

Cytochrome C

ROS

HMB

Myogenesis

Apoptosis

IGF-1

Insulin

Satellite cells

Myogenesis

IRS-1

PI3-K

Myo D, MEF-2

AKT

mTOR

mTOR

Muscle regeneration for repair

* Based on cell culture and animal study results.

Always SE, et al. *Exp. Gerontol.* 2013;48(9):973-984.
Hao Y, et al *Am. J. Physiol.* 2011;301:R701-R715.
Stanley RA, et al. *J. Appl Physiol.* 2017;123(5):1092-1100.

HMB preserves muscle mass

Muscle protein synthesis

Low postprandial amino acid availability • Anabolic resistance • Low blood flow •

Aging • Cancer • Glucocorticoid • COPD • Diabetes • Disuse •

Muscle protein breakdown

Inflammation

HMB

Anabolic pathways

Catabolic pathways

Supports homeostasis

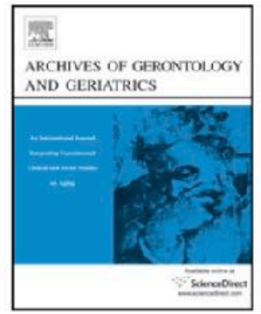
muscle mass, strength, function

Archives of Gerontology and Geriatrics 61 (2015) 168–175

Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

journal homepage: www.elsevier.com/locate/archger



Effect of beta-hydroxy-beta-methylbutyrate supplementation on muscle loss in older adults: A systematic review and meta-analysis

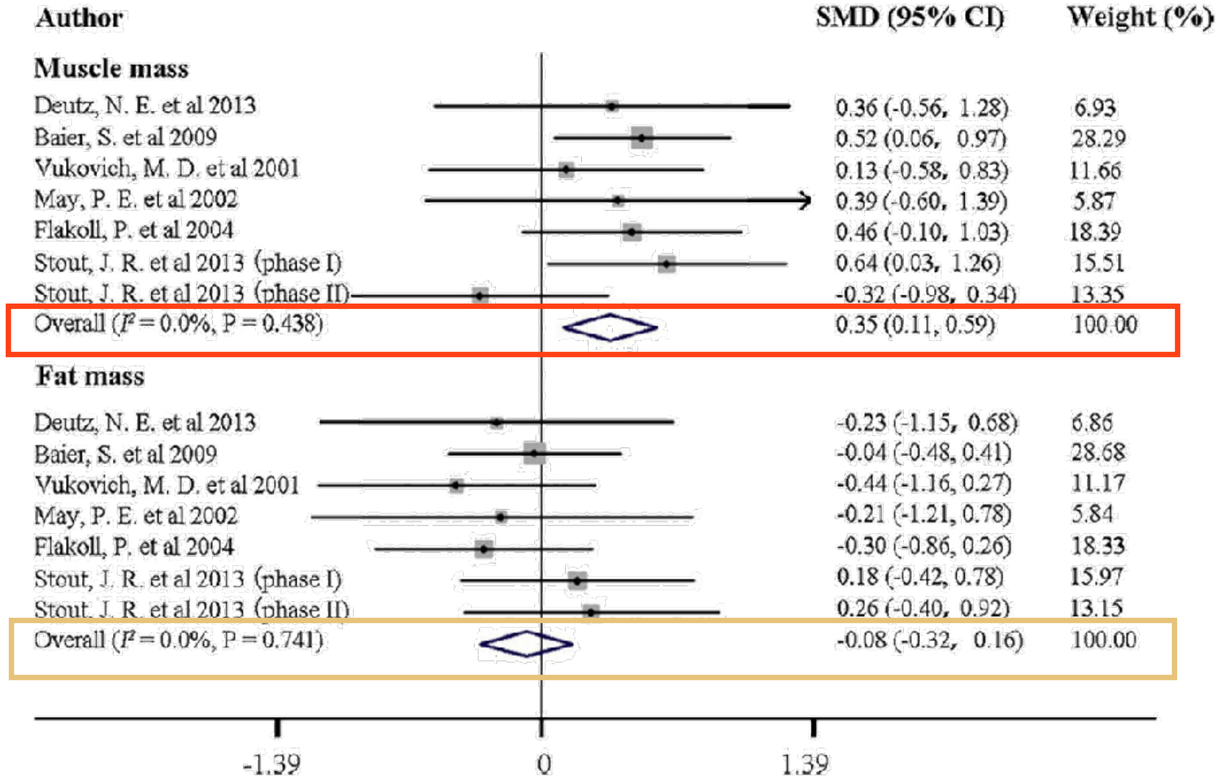
- Systematic review & Meta-analysis of **7 RCTs** among 2 groups of **287 older adults**
  - **Intervention**: **HMB** supplementation dose **2-3 g/day (≥ 8 weeks)** alone or combination
  - Control: placebo or standard treatments
- **Outcomes**: **Body composition, muscle strength, physical function**

1. Wu H, et al. *Arch Gerontol Geriatr*. 2015;61(2):168-175.

Effect of beta-hydroxy-beta-methylbutyrate supplementation on muscle loss in older adults: A systematic review and meta-analysis

Hongmei Wu, Yang Xia, Jin Jiang, Huanmin Du, Xiaoyan Guo, Xing Liu, Chunlei Li, Guowei Huang, Kaijun Niu*

Body composition



Supplementation HMB alone or in combination with other compounds showed **greater muscle mass gain** in the intervention groups compared with the control groups, but **not** fat mass.

1. Wu H, et al. *Arch Gerontol Geriatr*. 2015;61(2):168-175.

β-Hydroxy-β-methylbutyrate and its impact on skeletal muscle mass and physical function in clinical practice: a systematic review and meta-analysis

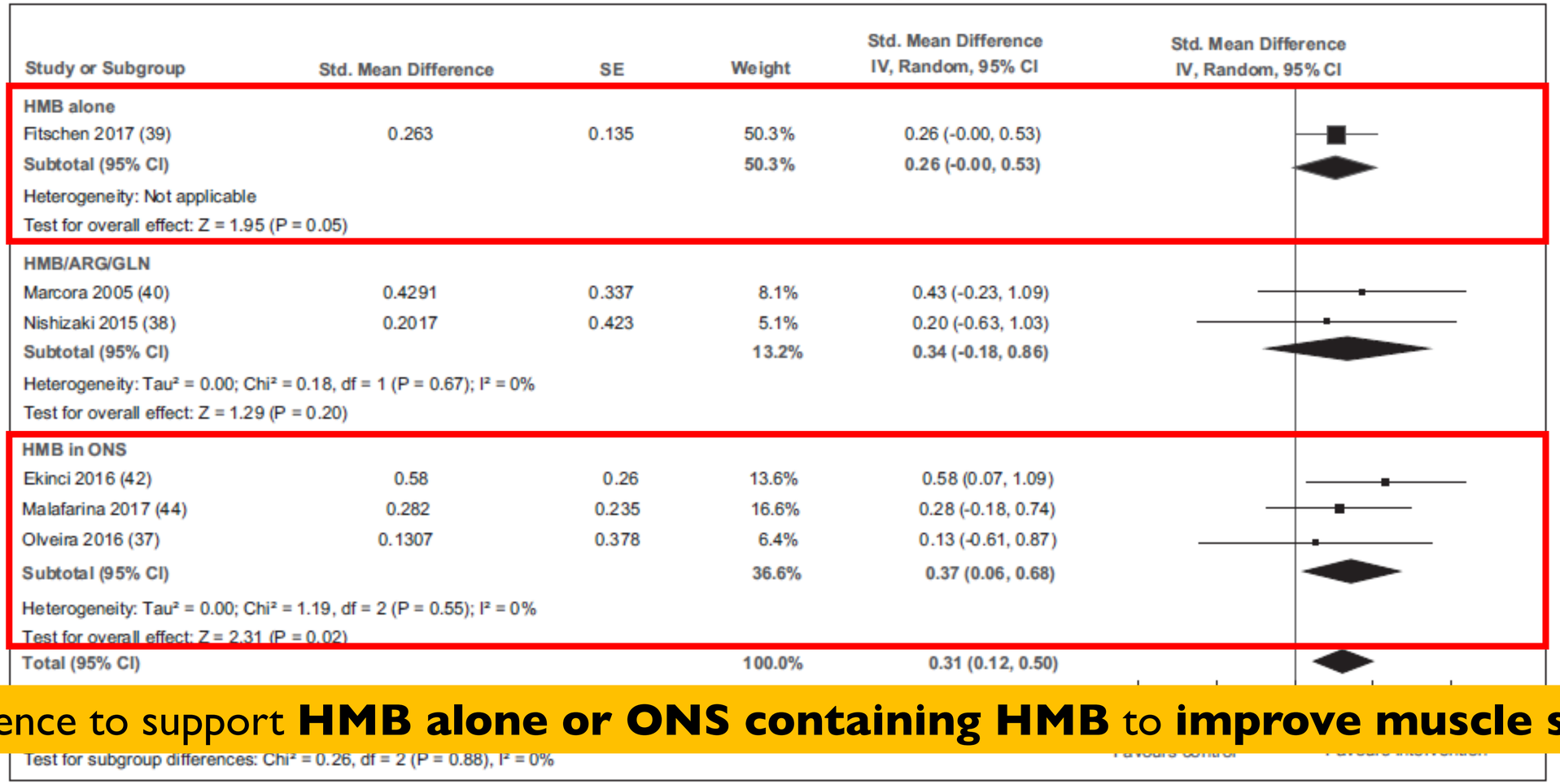
- Meta-analysis of **15 RCTs** among 2 groups of **2137 adults with primary clinical diagnosis** (e.g. hospitalized patients, cancer, HIV, ICU, elderly patients with malnutrition)
  - **Intervention**: **HMB alone or HMB + amino acids or HMB + ONS** (**Minimum 1.5 g HMB/day**, any duration)
  - Control: placebo or usual care
- **Outcomes**: **Muscle mass, muscle strength, physical function**

β-Hydroxy-β-methylbutyrate and its impact on skeletal muscle mass and physical function in clinical practice: a systematic review and meta-analysis

Muscle strength

HMB alone

HMB-ONS



Strong evidence to support **HMB alone or ONS containing HMB** to **improve muscle strength.**

Bear DE, et al. *Am J Clin Nutr*. 2019;109(4):1119-1132.

SHIELD TRIAL:
Strengthening Health In ELDerly through nutrition

STUDY POPULATION

1211 community-dwelling older adults enrolled (≥ 65 years) = **400** With normal nutrition + **811** At risk of undernutrition

STUDY OBJECTIVES

PART 1

CROSS-SECTIONAL STUDY
(1211 community-dwelling elderly)

- To examine factors influencing nutritional status
- To determine reference values for anthropometric and biochemical measurements

PART 2

RANDOMISED CONTROLLED TRIAL
(811 community-dwelling elderly at risk of undernutrition)

- To evaluate the effects of Ensure Gold plus dietary counselling (intervention group) for 180 days on survival, unexpected hospital (re)admission and nutritional status in comparison with a placebo supplement plus dietary counselling (control group)

1. Tey SL, et al. *PLoS ONE*. 2019;14(10): e0223222.
2. Chew STH, et al. *Clin Nutr*. 2020

SHIELD TRIAL

Impact of specialized oral nutritional supplement on clinical, nutritional, and functional outcomes: A randomized, placebo-controlled trial in community-dwelling older adults at risk of malnutrition

- Multi-centered (4 sites in Singapore), randomized, double-blind, placebo-controlled trial
- N = **811** (intervention n=406, control n=405)
- **Population**:
  - Community dwellers aged ≥ 65 years
  - At medium/high nutritional risk (assessed by MUST)
  - Stable chronic diseases
  - Excluded dementia, DM, severe GI disorders, end-stage organ failure, active cancer, MI

Total HMB ~ 1.5 g/day

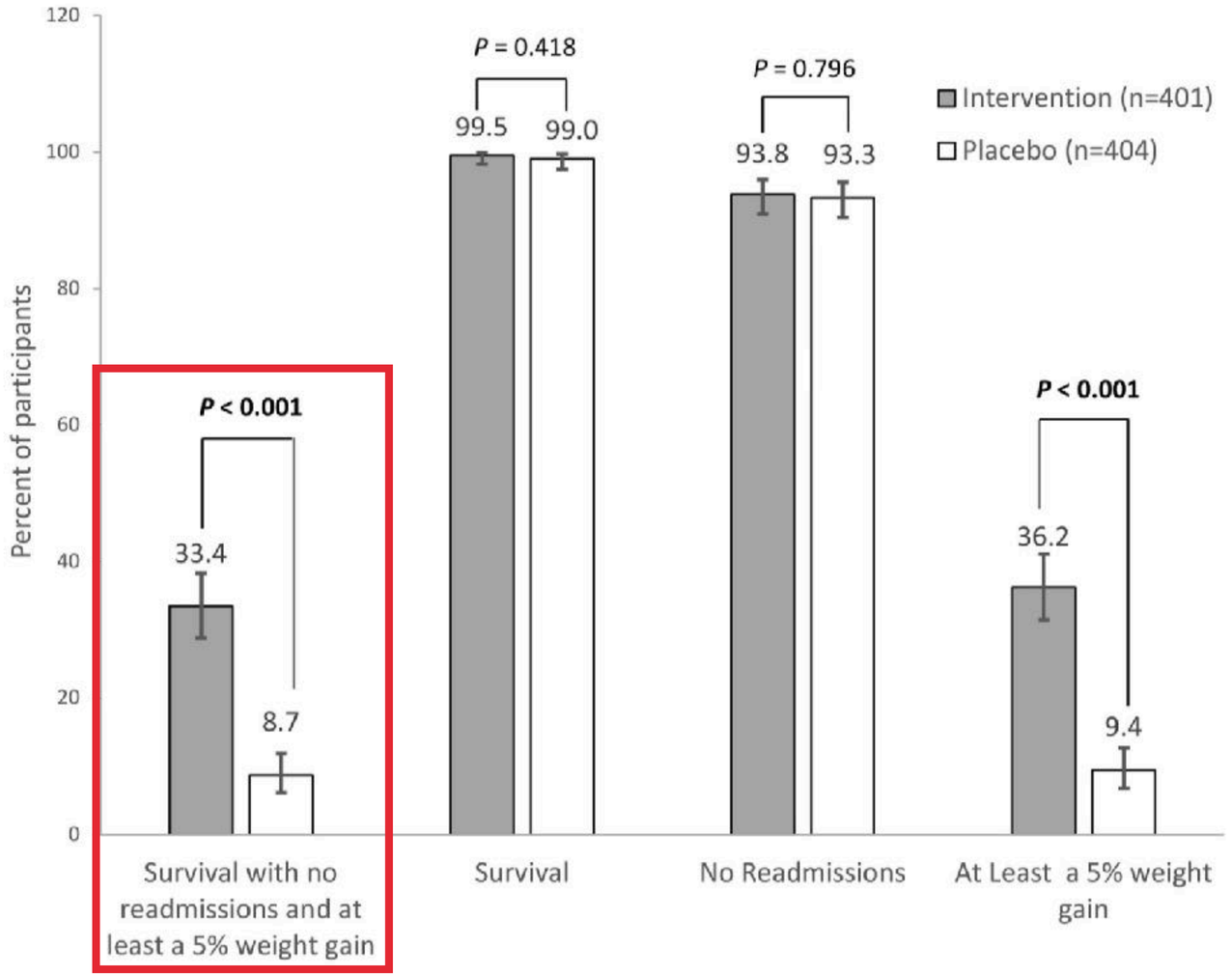
Intervention: **High protein-HMB ONS 262 kcal (protein 10.5 g, HMB 0.74 g) x2 servings/d**

Control: Placebo 62 kcal, protein 1.07 g

- **Outcomes**: **Survival without hospital readmission with ≥ 5% weight gain to day 180**

SHIELD TRIAL

Primary composite outcome:
Survival without readmission + ≥ 5% BW gain



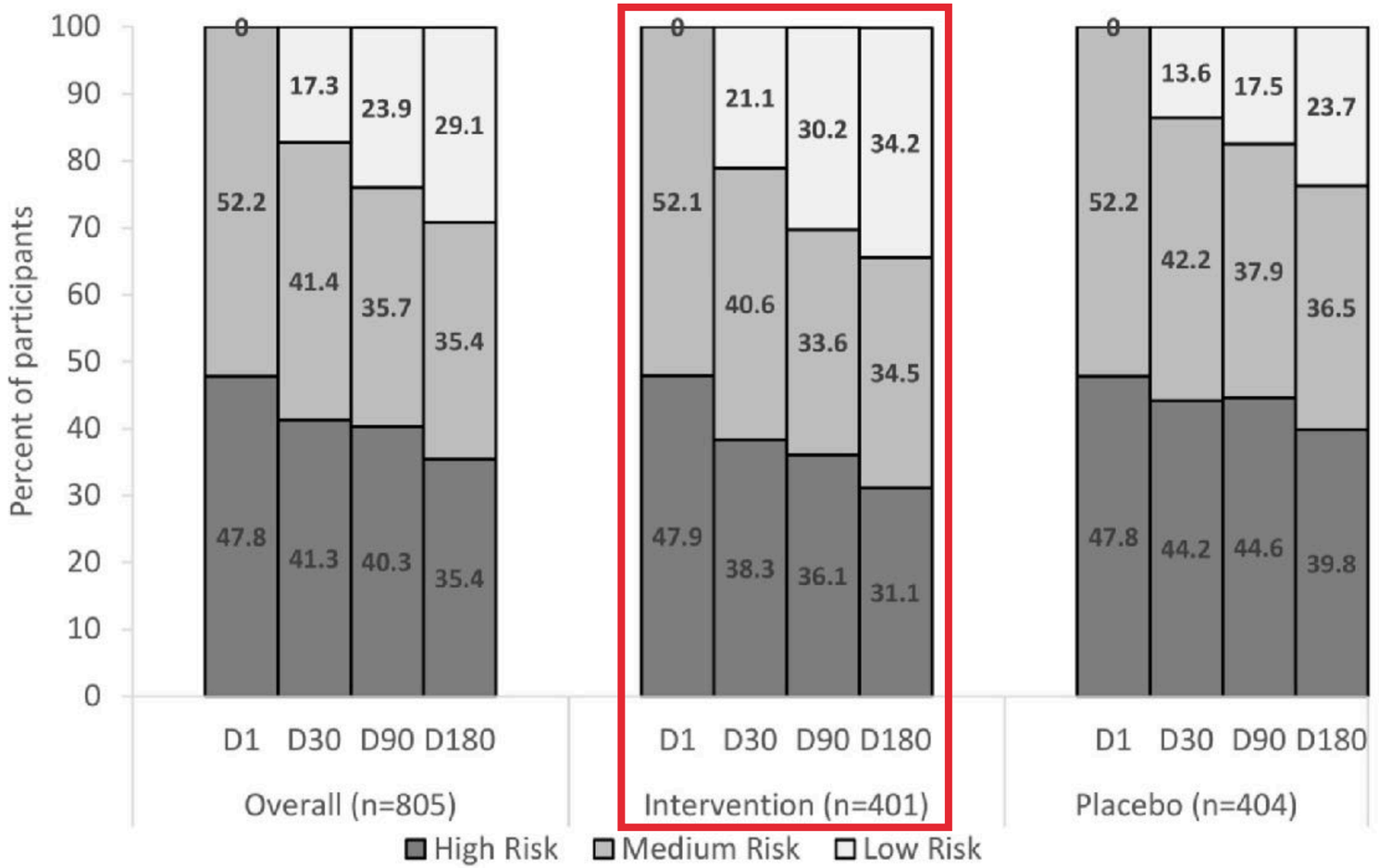
* Muscle mass measured as Appendicular Skeletal Muscle Mass Index (ASMI)

Reference: 1. Tey SL, et al. *PLoS ONE*. 2019;14(10): e0223222. 2. Chew STH, et al. *Clin Nutr*. 2020; https://doi.org/10.1016/j.clnu.2020.10.015.

STRENGTH AMBASSADOR

SHIELD TRIAL

Nutritional status



BL: baseline, MUST: Malnutrition Universal Screening Tool.

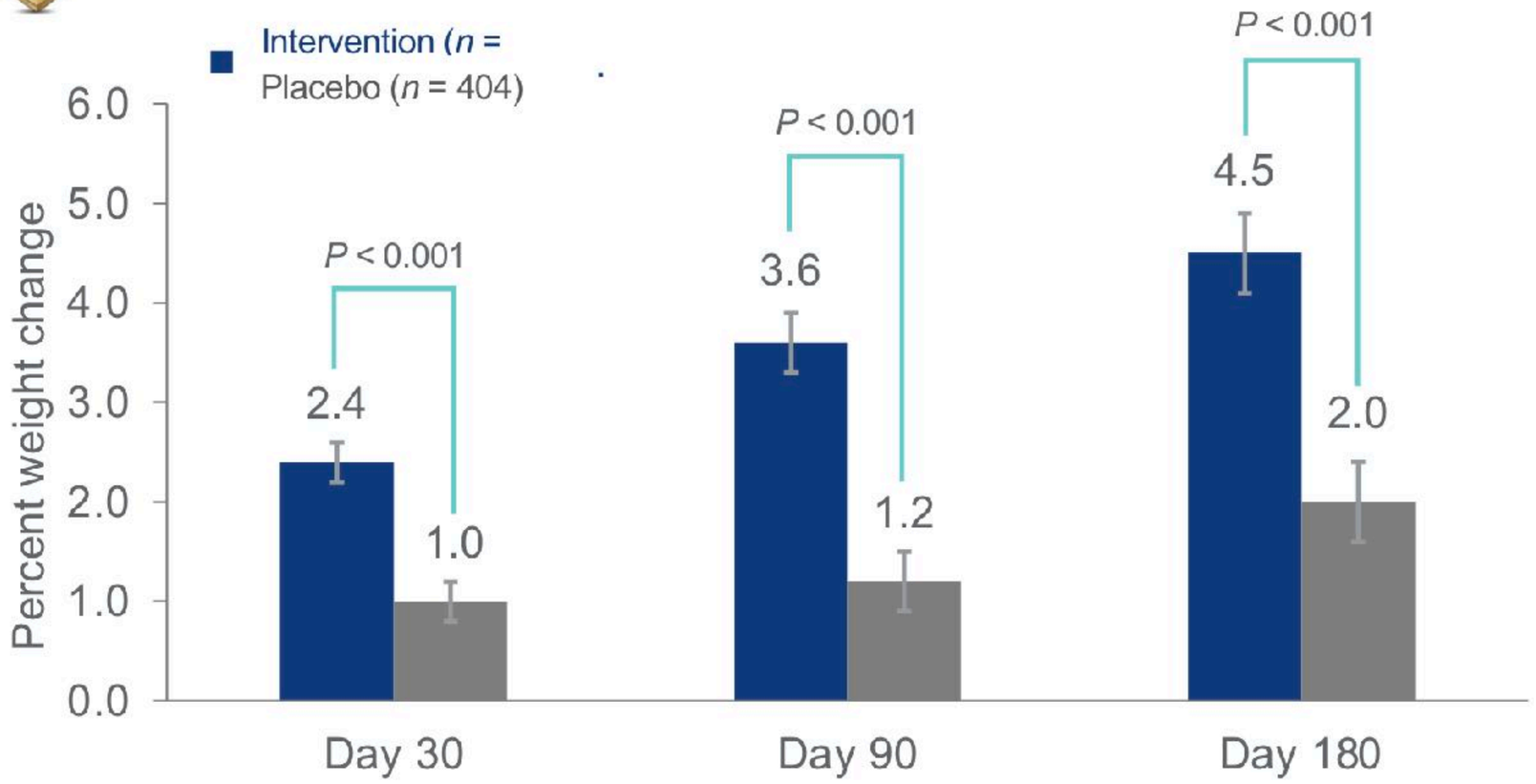
Fig. 3. MUST risk (low, medium, high) at baseline, day 30, day 90, and day 180. BL: baseline, MUST: Malnutrition Universal Screening Tool.

Reference: 1. Tey SL, et al. *PLoS ONE*. 2019;14(10): e0223222. 2. Chew STH, et al. *Clin Nutr*. 2020; https://doi.org/10.1016/j.clnu.2020.10.015.

STRENGTH AMBASSADOR

SHIELD TRIAL

Weight gain



ONS group >> significant greater weight gain

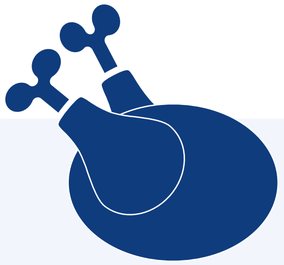
Reference: 1. Tey SL, et al. *PLoS ONE*. 2019;14(10): e0223222. 2. Chew STH, et al. *Clin Nutr*. 2020; https://doi.org/10.1016/j.clnu.2020.10.015.

STRENGTH AMBASSADOR

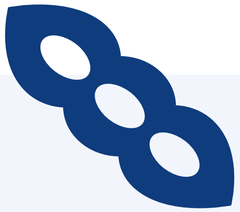
HMB 1.5 g

~50 **Eggs**

~11 **Beef steaks**



~7 **Chicken breasts**

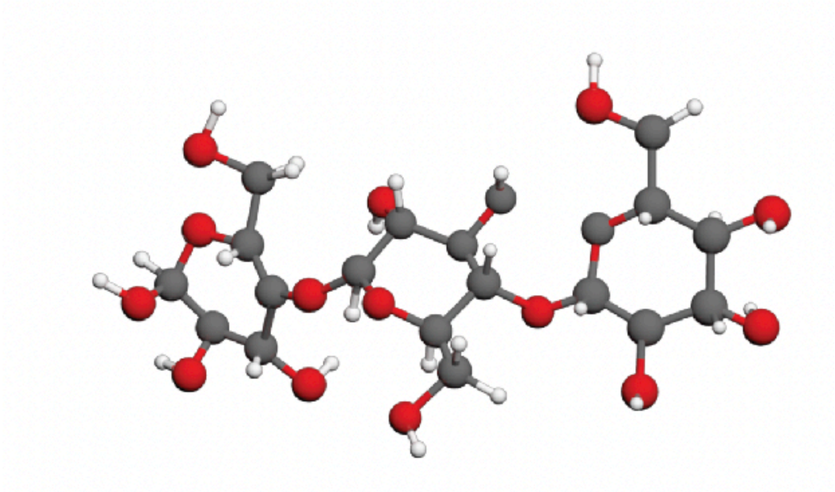


~10 **Cups of soybeans**

1. Deutz NE., et al. Clin Nutr. 2013;32(5):704-12. 2. Wilson, et al. Nutr Metab (Lond). 2008;5 3. Vukovich, et al. J Nutr. 2001;131(7) 4. Alfonso J. Cruz-Jentoft 2017;18(1-5)

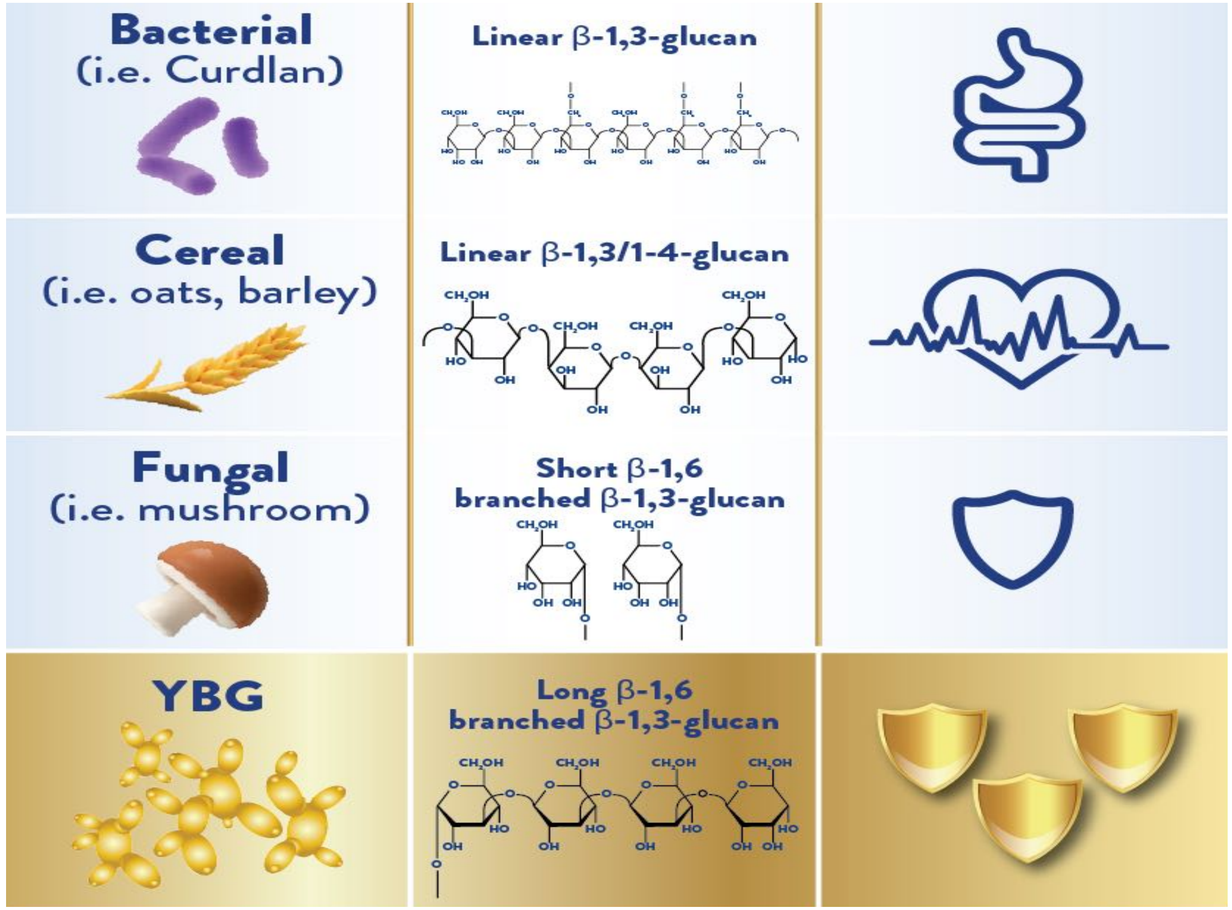
YBG

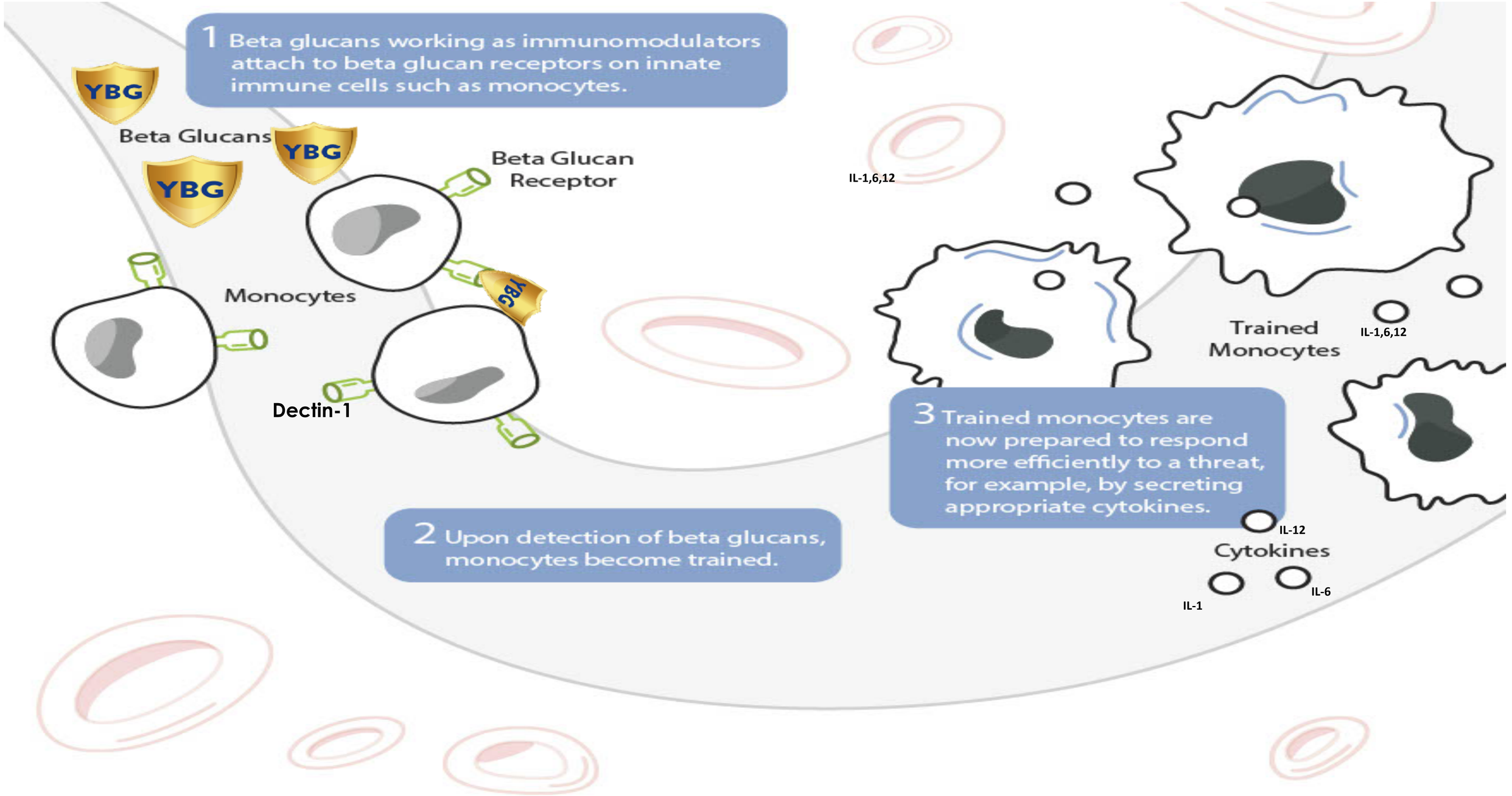
A NATURALLY-OCCURRING COMPLEX POLYSACCHARIDE[1]



Contains β-1,3/1,6-glucans

Derived from the cell wall of *Saccharomyces cerevisiae* (baker's yeast)




1 Beta glucans working as immunomodulators attach to beta glucan receptors on innate immune cells such as monocytes.
YBG
Beta Glucans
YBG
YBG
Beta Glucan Receptor
Monocytes
YBG
Dectin-1
IL-1,6,12
Trained Monocytes
IL-1,6,12
3 Trained monocytes are now prepared to respond more efficiently to a threat, for example, by secreting appropriate cytokines.
IL-12
Cytokines
IL-6
IL-1
2 Upon detection of beta glucans, monocytes become trained.

Baker's Yeast Beta Glucan Supplementation Increases Salivary IgA and Decreases Cold/Flu Symptomatic Days After Intense Exercise

Brian K. McFarlin[1], Katie C. Carpenter[2], Tiffany Davidson[3], & Meredith A. McFarlin[1]

To determine if YBG could positively affect the immune system of individuals undergoing intense exercise stress

Patient population

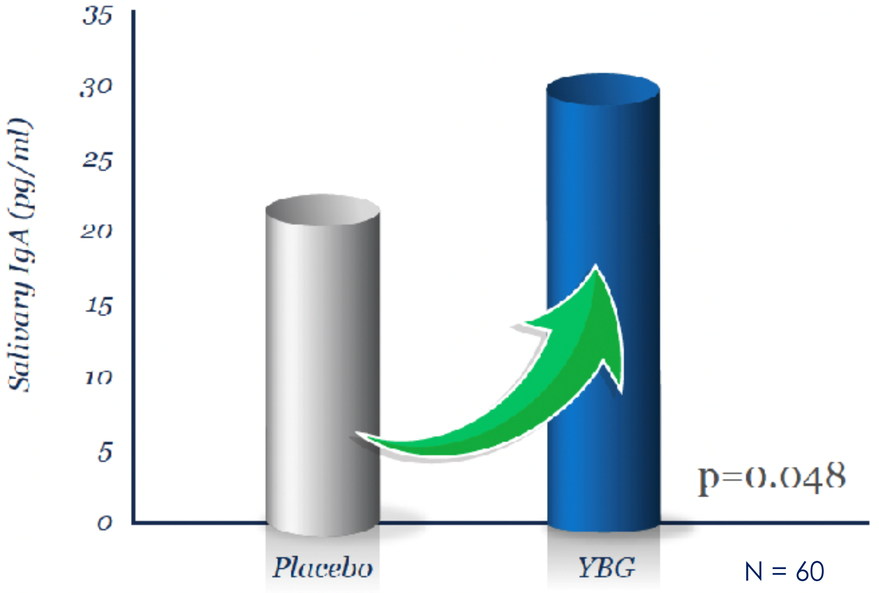
60 individuals between 18–35 years of age

Interventions

Yeast beta-glucan (250 mg) once daily for 10 days VS placebo

>> Prior to an experimental exercise trial consisting of 60 min of cycling in a hot, humid environment (**strenuous exercise**)

"Suppress mucosal immunity for up to 24 h
Increase the risk of developing an URI
Reduce performance capacity"



*When taking 250mg YBG daily for 10 days. Salivary IgA was measured at 2 hours post-exercise. N = 60 participants (18-35 years old), placebo was 250 mg rice flour.

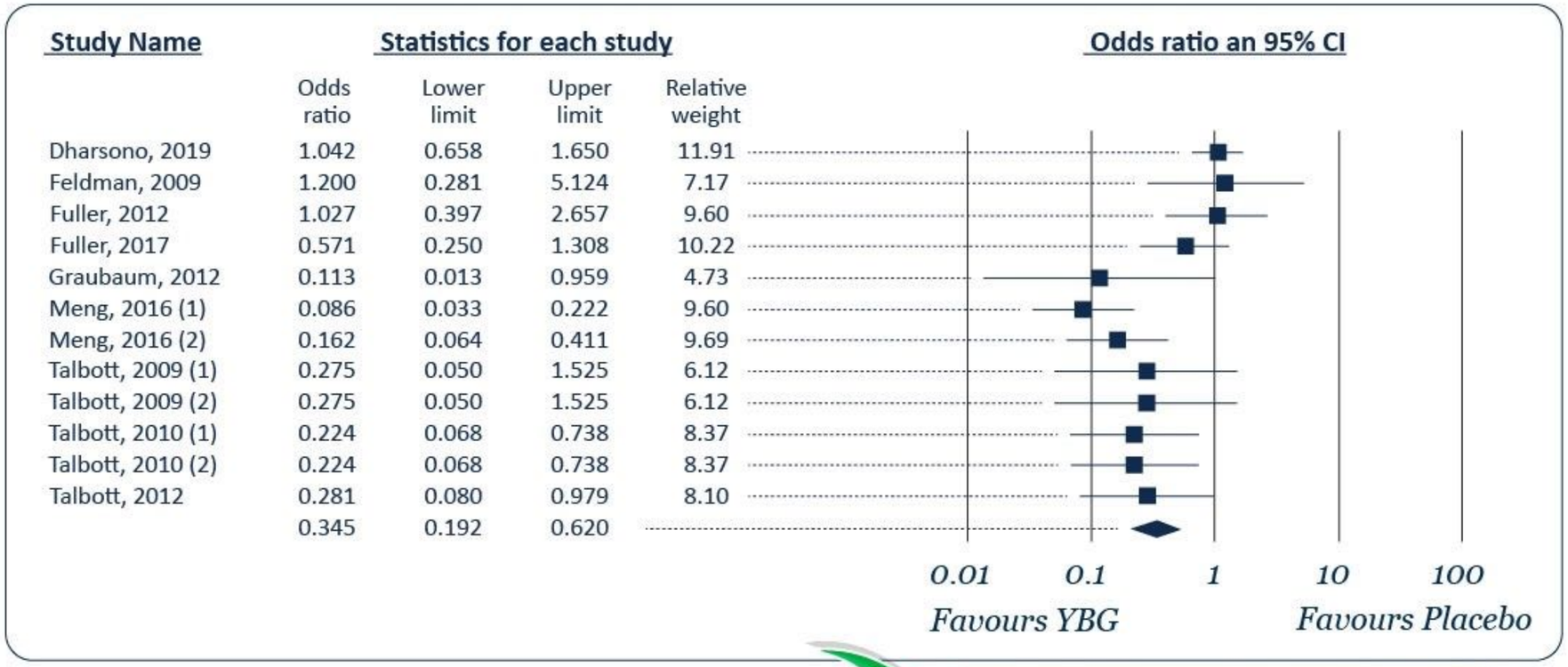
YBG administration was associated with **enhanced salivary IgA recovery** over placebo control.

1. McFarlin BK et al. *J Diet Suppl*. 2013 Sep;10(3):171-83

Effects of yeast β-glucans for the prevention and treatment of upper respiratory tract infection in healthy subjects: a systematic review and meta-analysis

Total of 13 RCTs

To investigate the effects of YBG for the prevention and treatment of URTIs in healthy subjects.



Tau²=0.693, Q=39.36, df=11, p<0.001, I2=72.06% z=-3.56 (p<0.001)

65.5% reduction in risk of getting URTIs*

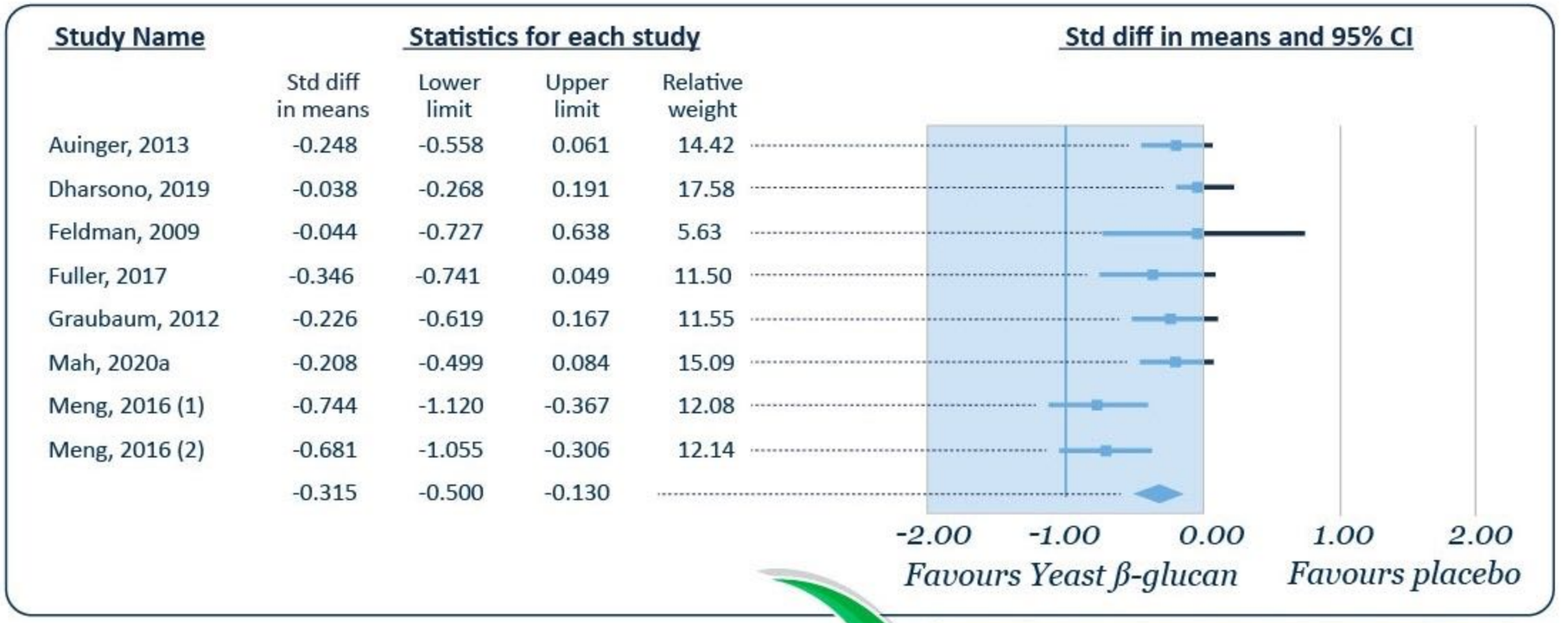
*Calculated from odds ratio (0.345) c

URTIs, upper respiratory tract infections.

1. Zhong K et al. *Eur J Nutr.* 2021;60(8):4175-4187

Effects of yeast β-glucans for the prevention and treatment of upper respiratory tract infection in healthy subjects: a systematic review and meta-analysis

Average number of URTIs



Tau²=0.037, Q=15.393, df=7, p<0.05, I² =54.53% z=-3.33 (p<0.01)

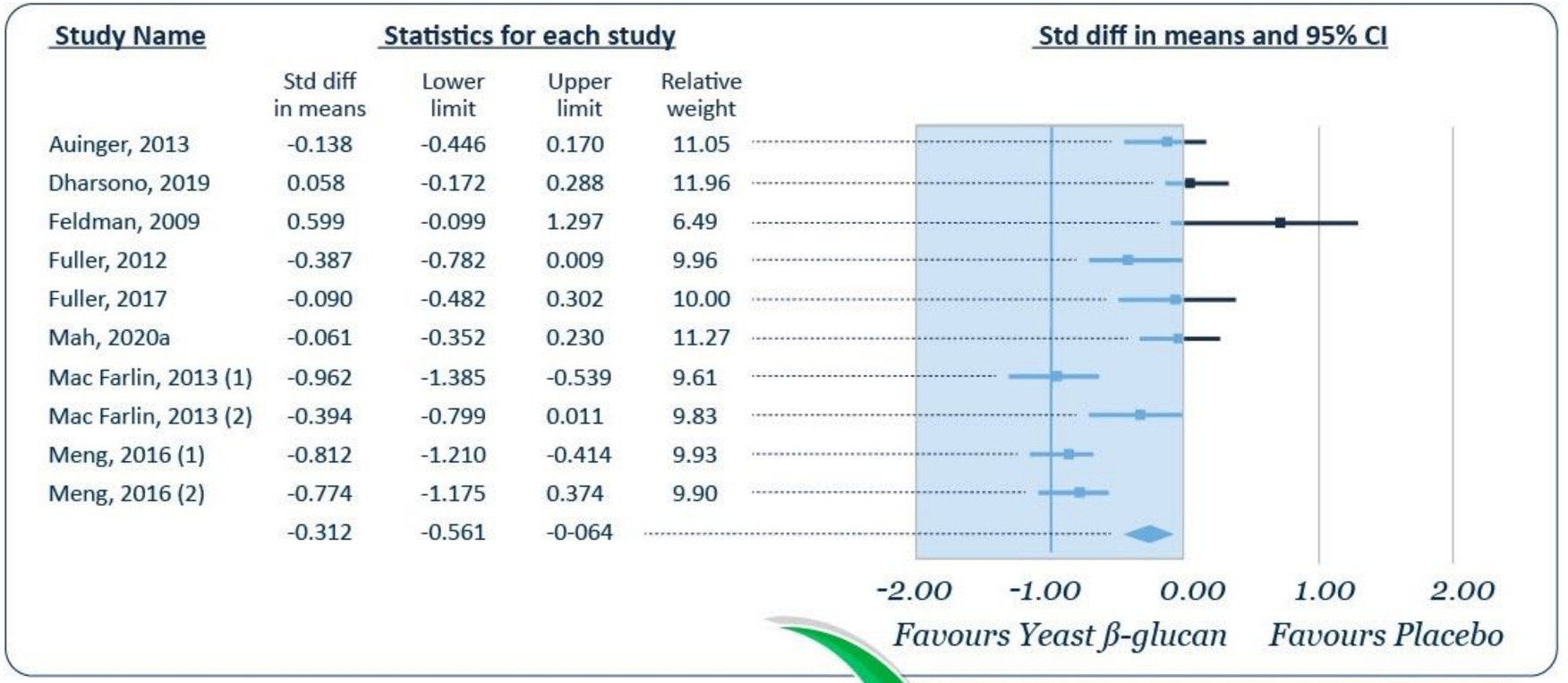
Reduced average number of URTI episodes
(SMD= -0.315
95% CI= -0.500 to -0.130, p<0.05

URTIs, upper respiratory tract infections.

1. Zhong K et al. *Eur J Nutr.* 2021;60(8):4175-4187

Effects of yeast β-glucans for the prevention and treatment of upper respiratory tract infection in healthy subjects: a systematic review and meta-analysis

Duration of URTIs



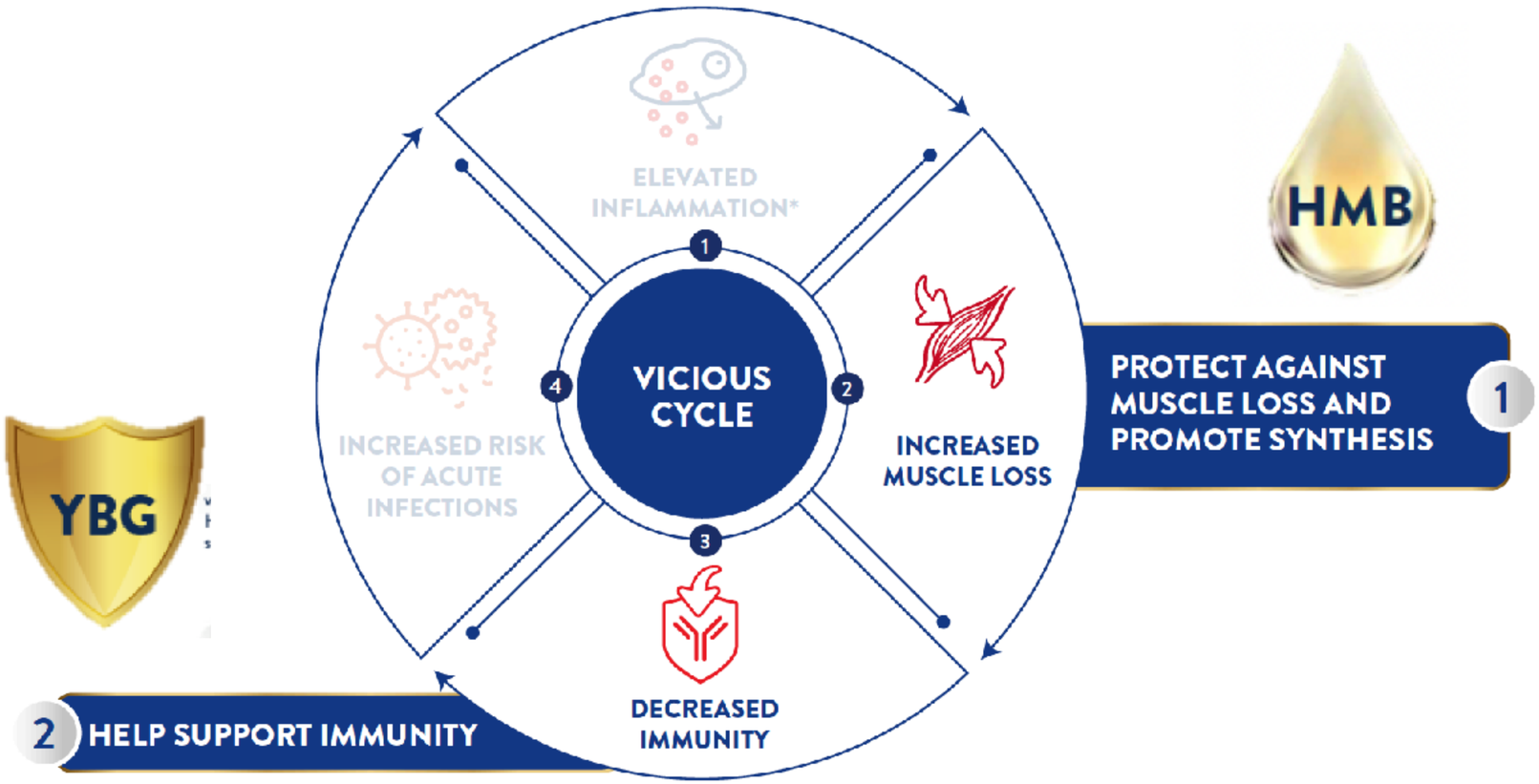
Tau²=0.121, Q=41.40, df=9, p<0.001, I²=78.26% z=-2.46 (p<0.05)

Reduction in duration of URTIs
(SMD=-0.312,
95% CI= -0.561 to -0.064, p<0.001

URTIs, upper respiratory tract infections.

1. Zhong K et al. *Eur J Nutr.* 2021;60(8):4175-4187

Effects of Nutritional Supplements on Muscle & Immunity



1. Londhe P, Guttridge DC. *Bone*. 2015;80:131-142. 2. Demling RH, et al. *Eplasty* 2009, 9: e9. 3. Iddir M, et al. *Nutrients* 2020;12:1562. 4. Oh S, Parikh NS. *Current Neurology and Neuroscience Reports*. 2022;22:161-170. 5. Remick DG. 2014. In: Pathobiology of human disease; 2014 315-322

HMB + PROTEIN

Support muscle and help bridge recovery gap[1,2]

YBG + 10 IMMUNITY NUTRIENTS† + FOS

Help support immunity[3,4]

	MEASURE	 ENSURE®	 ENSURE® PLUS ADVANCE	 ENSURE GOLD®	 ENSURE GOLD® ADVANCEPRO™
SERVING	ML	230	220	230	230
ENERGY	KCAL	230	330	262	262
CALORIC DIST.	PROTEIN:CHO:FAT	15:56:29	25:46:29	17:53:30	17:53:30
PROTEIN	G	8.55	20	10.5	10.5
CALCIUM HMB	G	-	1.5	0.74	0.74
HMB	G	-	1.2	0.59	0.59
YGB	MG	-	-	-	125
FIBER	G	2.3	1.7	2.4	2.4
CALCIUM	MG	240	499	273	265
VITAMIN C	MG	29	35	33	36
VITAMIN D	IU	102	500	300	310
VITAMIN A	IU	807	440	909	909
ZINC	MG	2.5	3.9	2.67	2.67
IRON	MG	2.2	4.6	2.42	2.67

Muscle mass turns over by ageing, metabolic stress and physical inactivity.

Sarcopenia causes burden and mortality in older adults in a relation with immune senescence.

Nutritional support with adequate energy and protein is essential to alleviate malnutrition and sarcopenia.

First line ONS = Standard polymeric formula

ONS with HMB + YBG has clinically shown to improve muscle homeostasis during metabolic stress and also modulate immune response particularly in improving URI symptoms.

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PCLIN
PHRAMONGKUTKLAO CLINICAL NUTRITION
Thank you.

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