

(20 min talk)

Chrono-nutritional effect of artichoke and inulin on blood glucose, microbiome, muscle/bone volumes in elderly person

Shigenobu Shibata

Waseda University emeritus professor

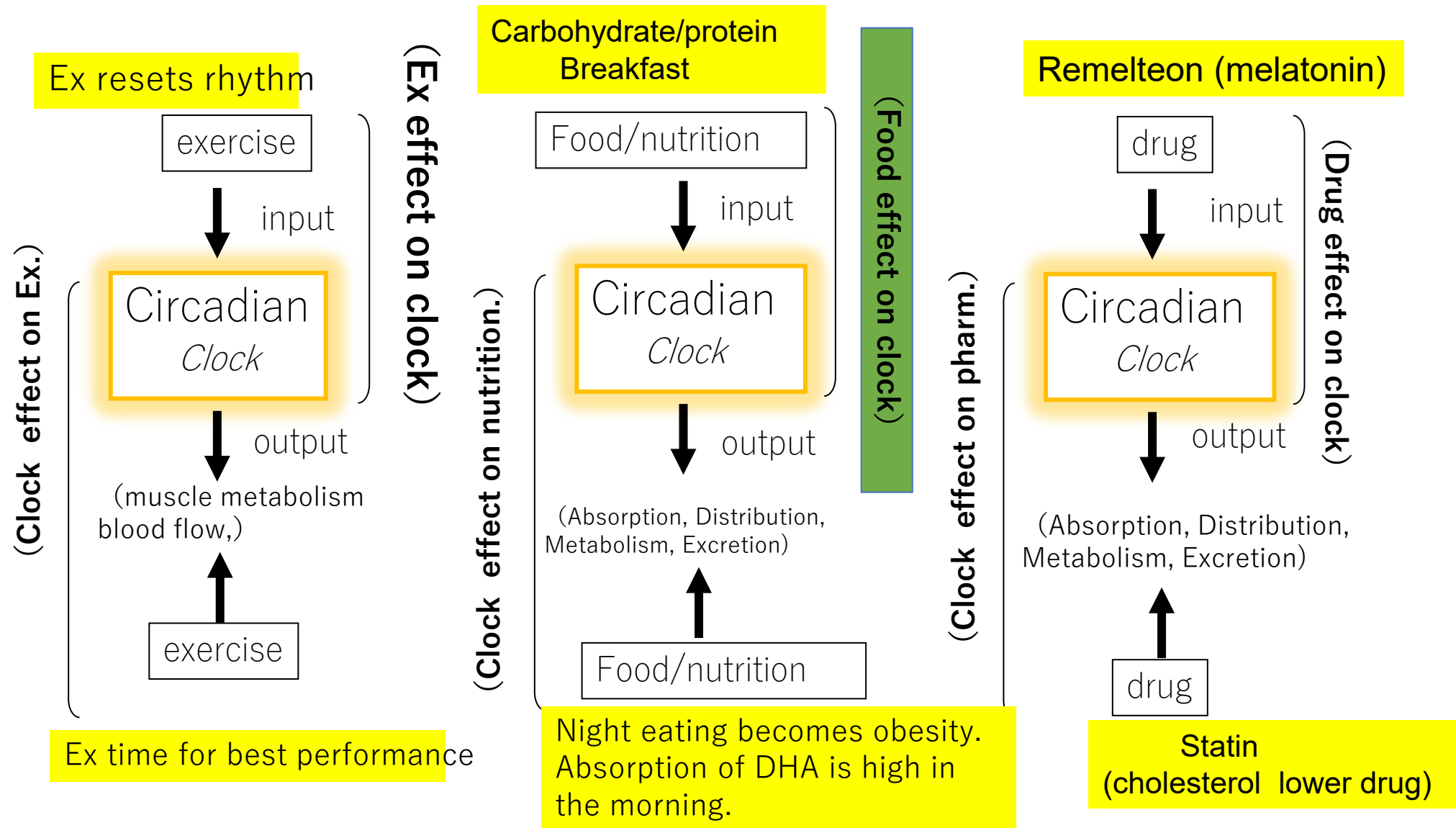
Hiroshima University special appointed professor

Aikoku gakuen college special appointed professor

SCUI university visiting professor

Development of chronobiology

Chrono-exercise ↔ Chrono-nutrition ↔ Chrono-pharmacology



Synchronizers of Circadian Rhythms

YU TAHARA^{a,b} AND SHIGENOBU SHIBATA^{*a,b}

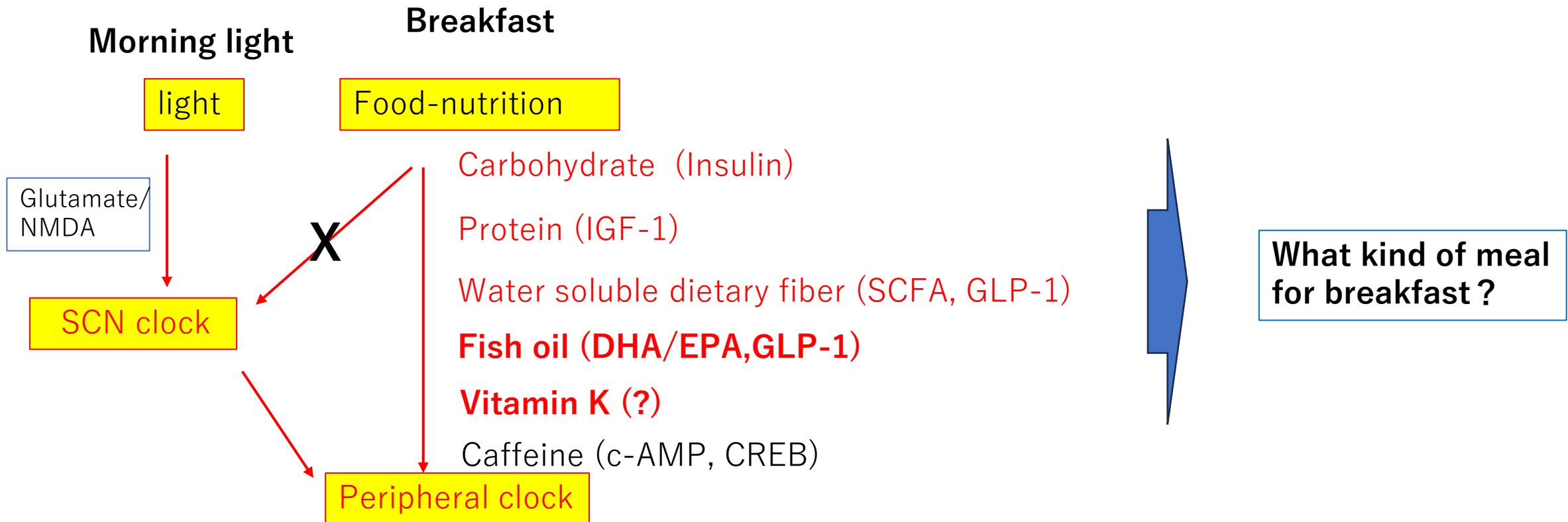
Chemical Biology No. 23

Chronobiology and Chronomedicine: From Molecular and Cellular Mechanisms to Whole Body Interdigitating Networks

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Malaysia is a multi-ethnic country, so there are many variations for breakfast

ナシ・レマツ (Nasi Lemak)



ミーゴレン (Mee Goreng)



カヤ・トースト (Kaya Toast) バクテー (肉骨茶/Bat Kut Teh)



ワンタンミー (雲吞麵/Wantan Mee)



ラクサ (Laksa)



お粥 (Porridge)



ロティ・チャナイ (Roti Canai)



UNESCO Intangible Cultural Heritage **Japanese food (Washoku)** from 2013

The Japanese meal style, which is based on one soup and three side dishes, is an ideal nutritional balance. It is called “Washoku”. Japanese food contains a lot of umami ingredients and contributes to seasoning that reduces salt content. Japanese food is low in animal lipids and helps prevent obesity and metabolic syndrome.

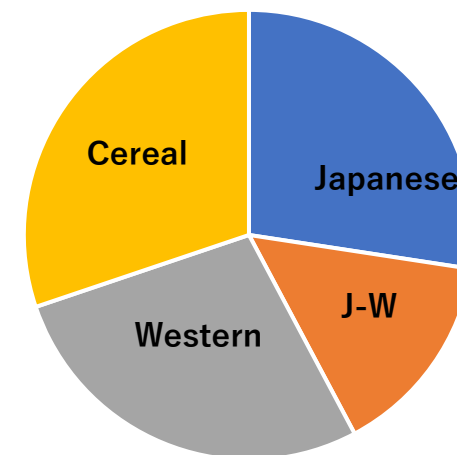
Type of breakfast

Asken (N=17496)



Food record application

(male 26%、age 20 – 65)



Typical Japanese breakfast



Protein, fiber

Protein, DHA/EPA

Protein, fiber

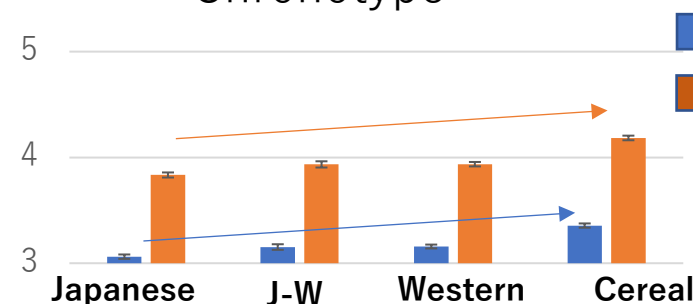
carbohydrate

Protein, fiber

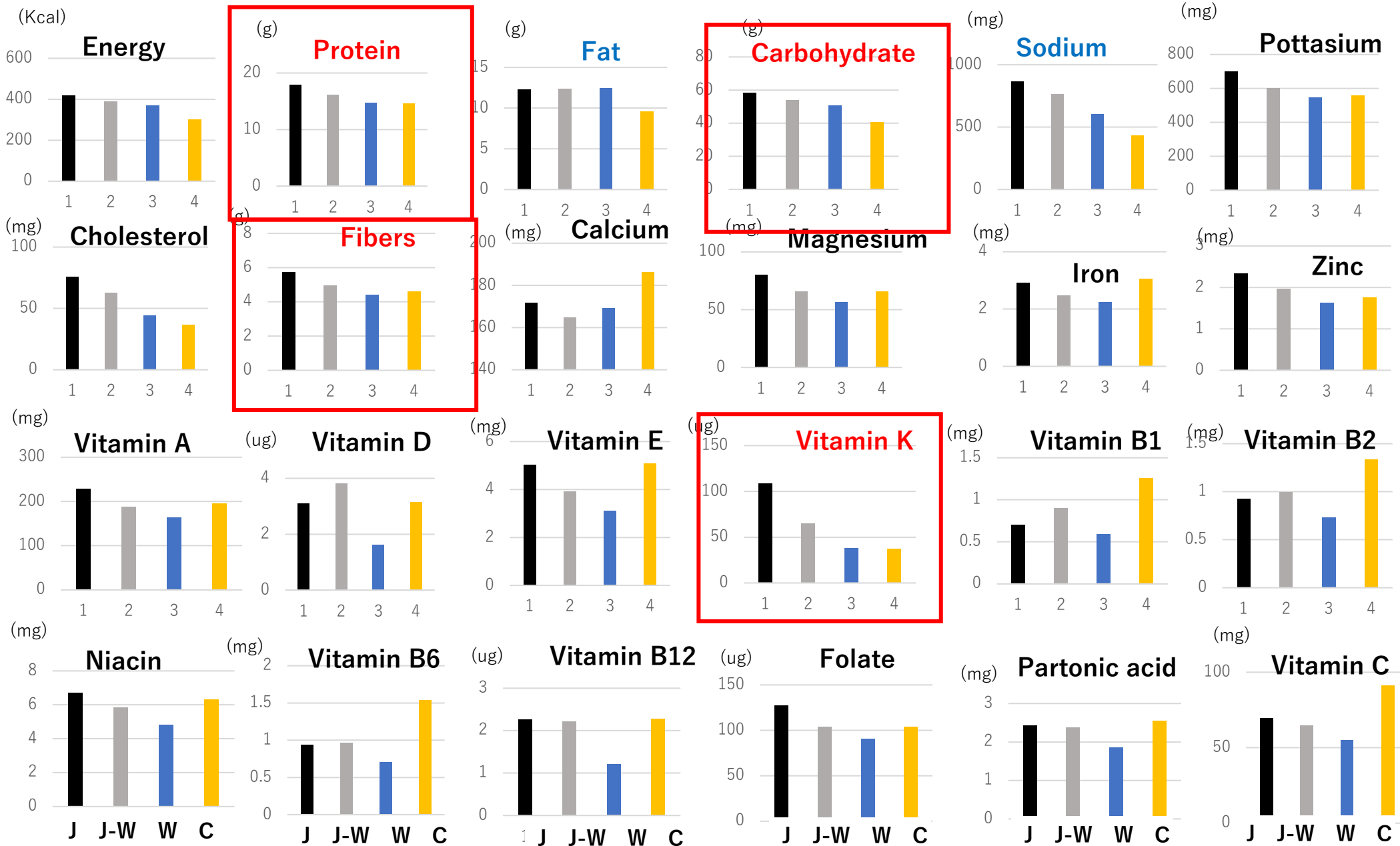
eveningness

Chronotype

Mid time of sleep



morningness



Development of chronobiology

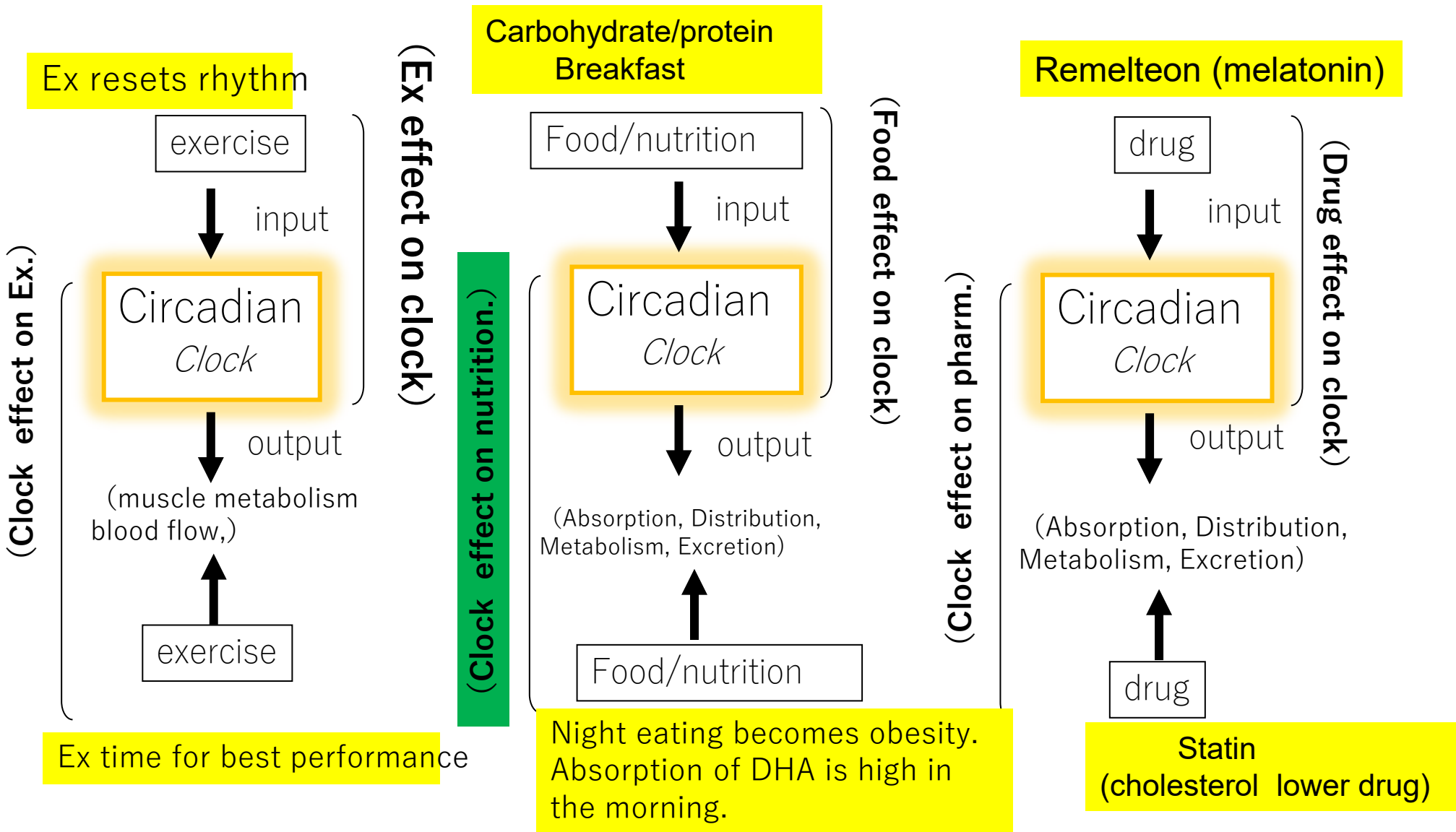
Chrono-exercise



Chrono-nutrition

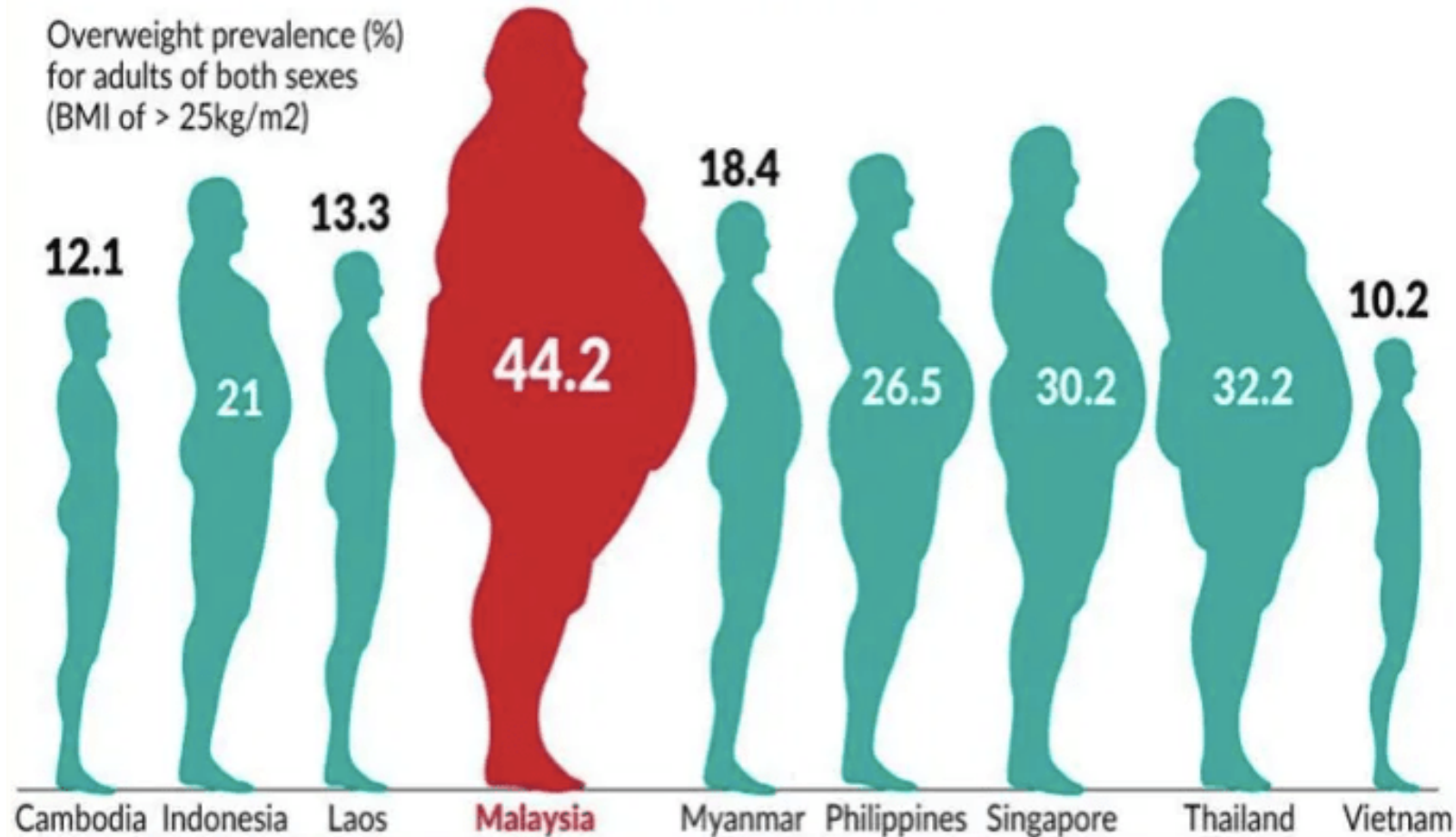


Chrono-pharmacology



Overweight populations in Southeast Asia

Overweight prevalence (%)
for adults of both sexes
(BMI of > 25kg/m²)



Japanese: under 10%

Dietary Supplementation with **Inulin** Modulates the Gut Microbiota and Improves Insulin Sensitivity in Prediabetes

International Journal of Endocrinology
Volume 2021, Article ID 5579369, 8 pages
<https://doi.org/10.1155/2021/5579369>

TYPES OF FIBER

AND WHERE TO FIND IT

VISCOUS FIBER

- oats
- barley
- eggplant
- okra
- most fruits
- sweet potato
- winter squash
- legumes
- flaxseed



FERMENTABLE FIBER

- oats
- barley
- onion
- artichokes
- legumes

INSOLUBLE FIBER

- wheat
- rye
- most vegetables
- avocado
- legumes
- nuts
- seeds

www.aicr.org



(Jerusalem artichoke) (burdock root)

(40-50%) (30-40%)

Inulin concentration

Water soluble dietary fibers

Inulin, non-digestible dextrin



Microbiota,
blockade of blood glucose increase

Water insoluble dietary fibers

Cellulose, glucomannan



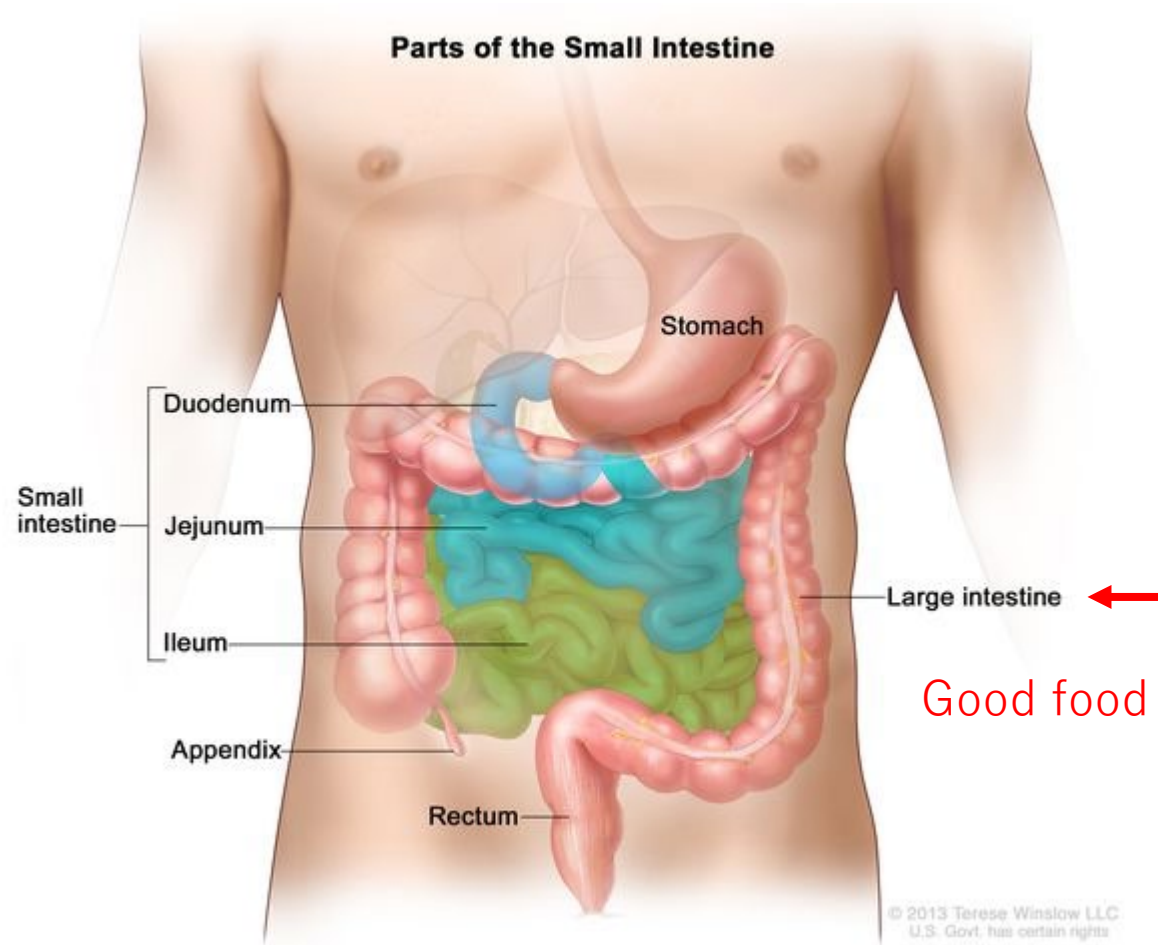
Bowel movement



(konnyaku)

Action site of water soluble dietary fiber (**inulin**)

Slows the breakdown and absorption of sugar and fat →



← Good food for intestinal bacteria

Effect of Jerusalem artichoke (菊芋) on cecal pH, SCFA and microflora in elderly human

Participants

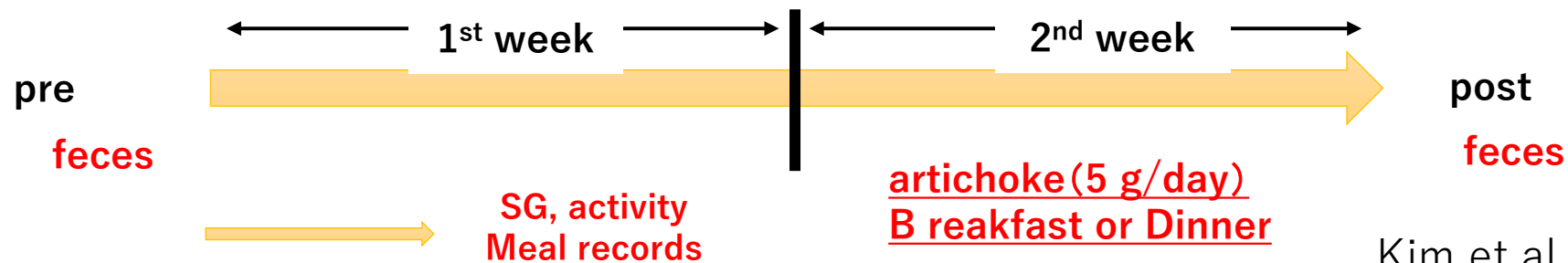
- Healthy 30 elderly persons (male : 14、 female : 16)
 - grouping : **Breakfast artichoke intake** (N=15、 male=7、 female=8)
Dinner artichoke intake (N=15、 male=7、 female=8)
- Artichoke includes 40-50 % inulin

Evaluation

- 1) physical(Hight, BW, BMI)
- 2) Records of meals(components, timing)
- 3) Daily rhythm of serum glucose (SG)
- 4) **feces : feces pH, SCFA : Short-chain fatty acid, microflora**
- 5) Questionare of bowel movement
- 6) Physical activity : 3-axis records (steps, MVPA : moderate vigorous physical activity))

Flashing continuous glucose monitoring system

15 min interval for 2 weeks

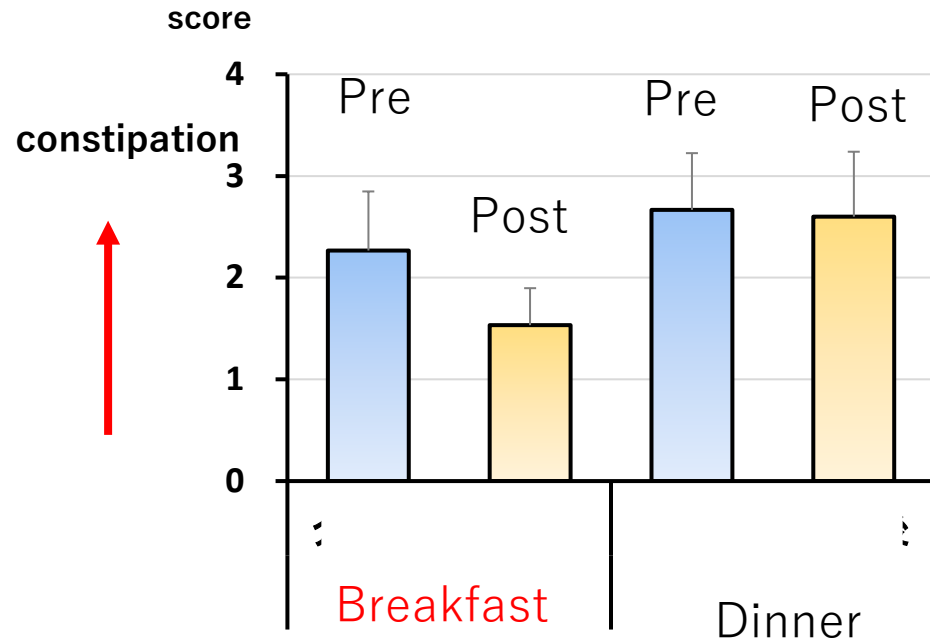


Kim et al., 2020

Effect of artichoke on bowel movement in human

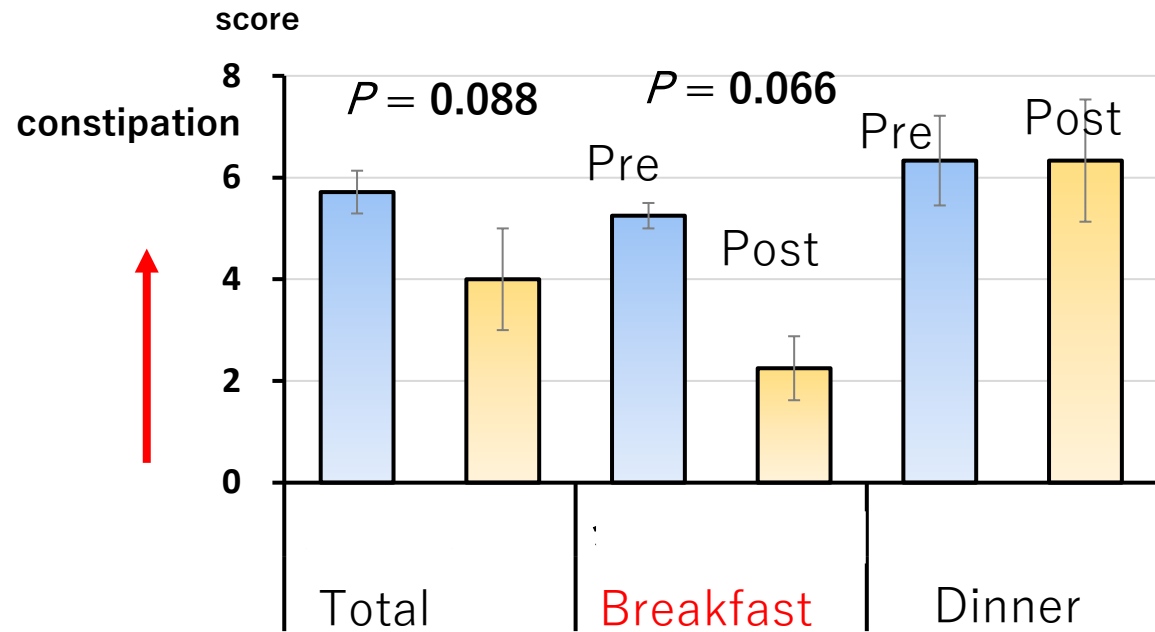
Score for bowel movement

BF (N = 15), D (N = 15)



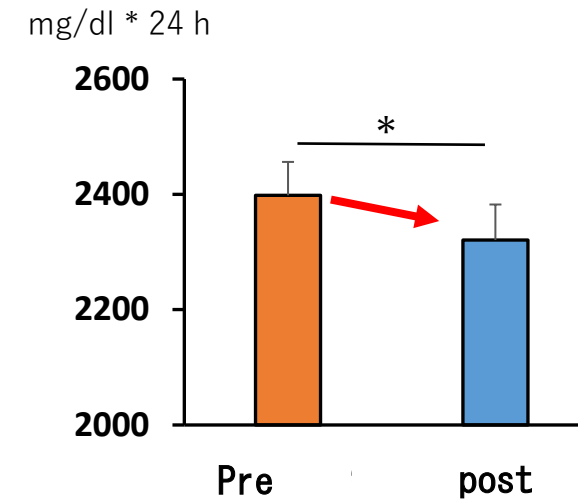
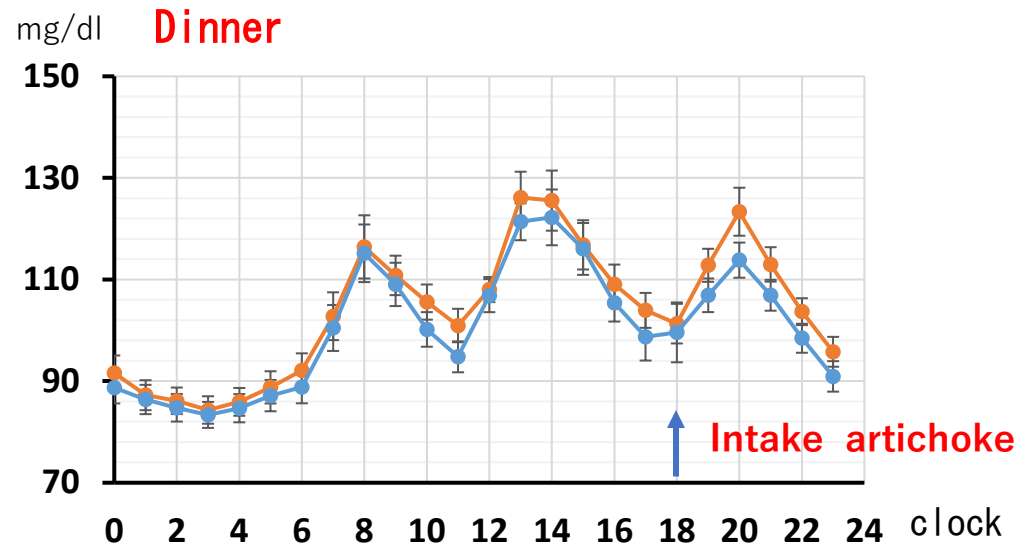
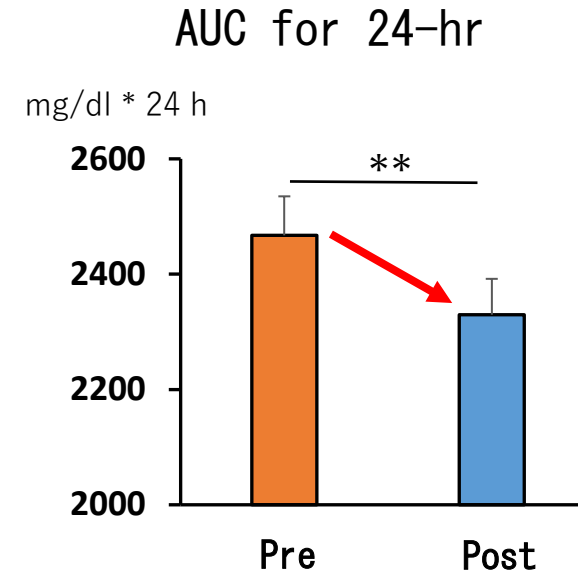
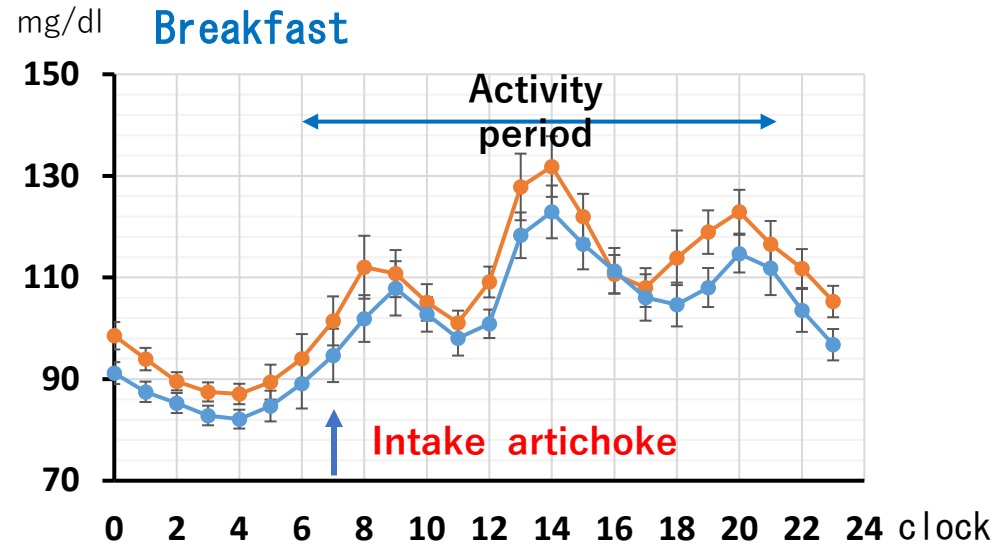
Constipation(便秘) patients(N = 7)

BF(N = 4), D(N = 3)



artichoke at breakfast improves bowel movement

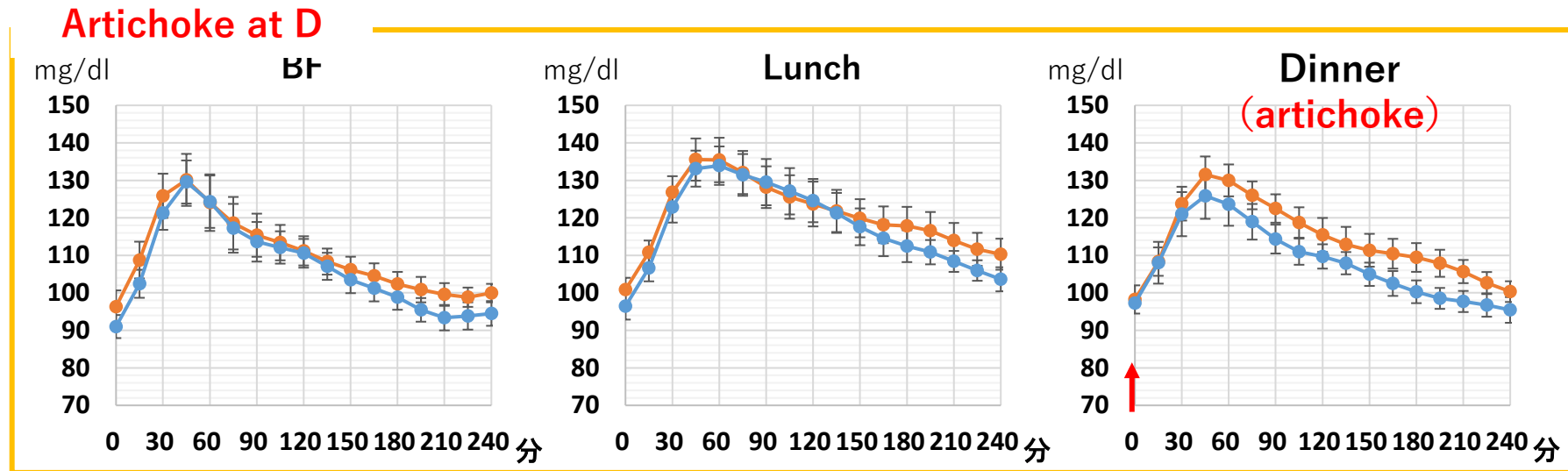
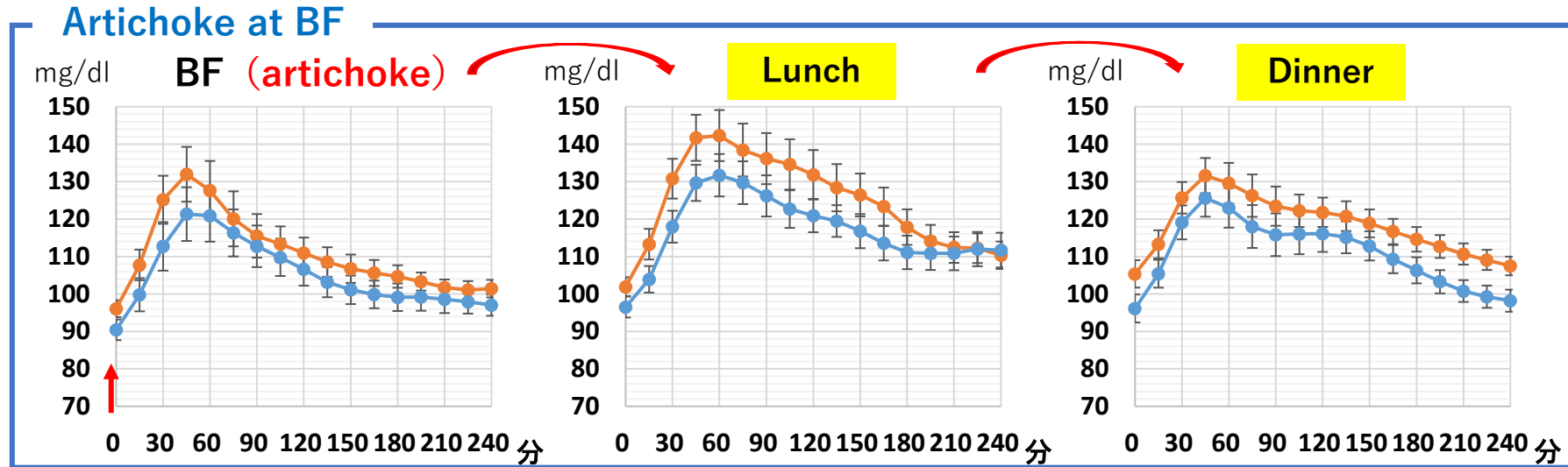
24 hr glucose level after artichoke at BF or D



** $P < 0.01$, t-Test

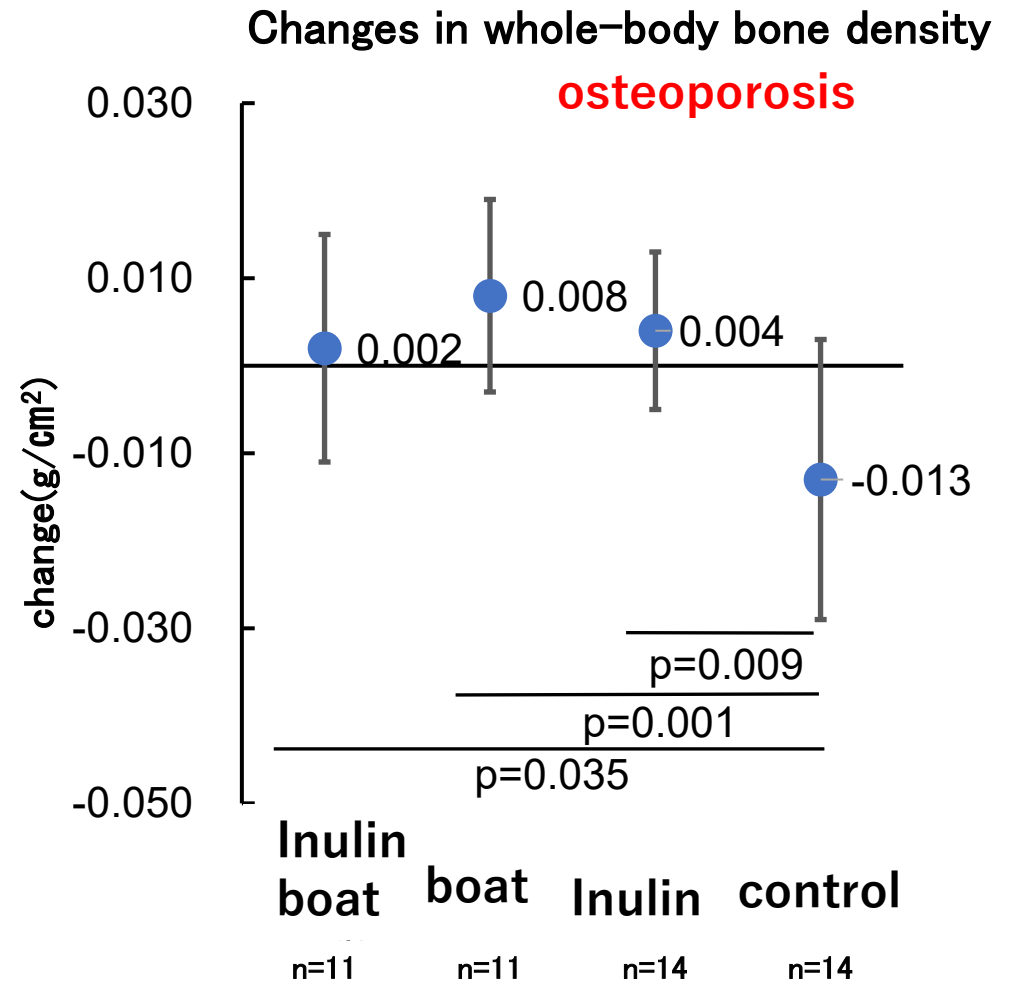
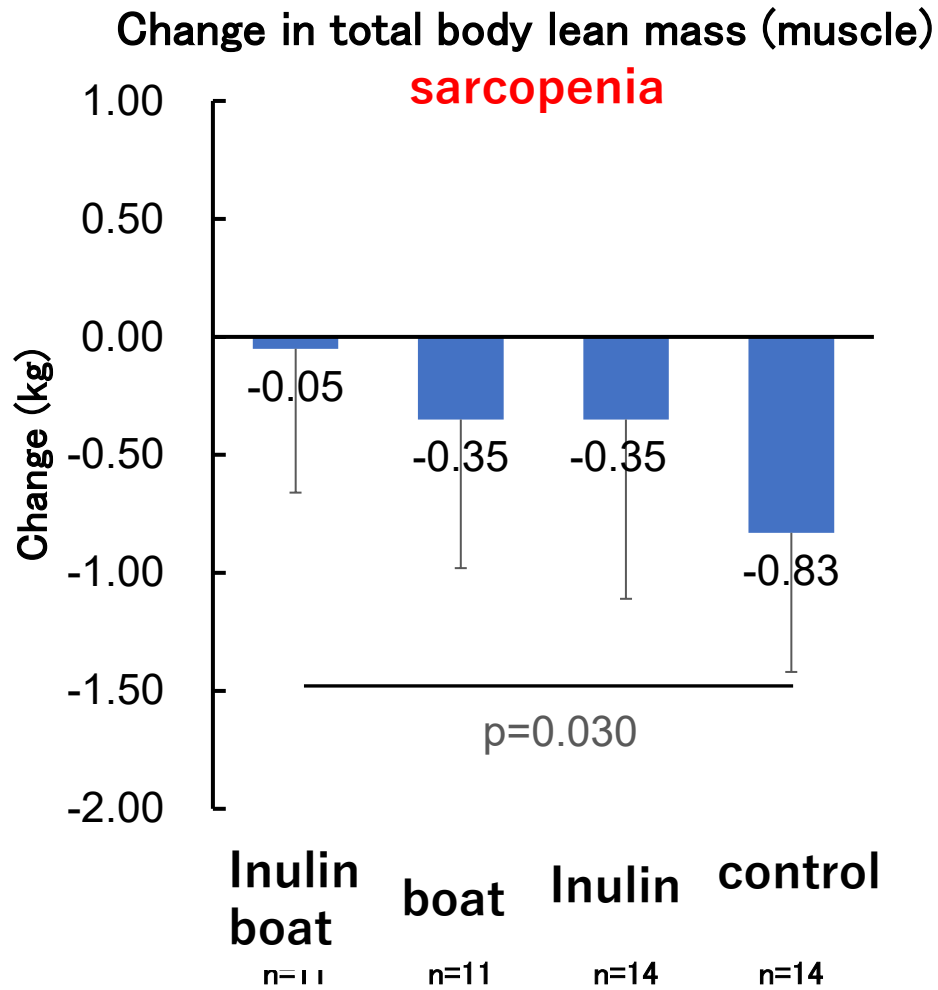
Artichoke at breakfast strongly inhibits 24-hr glucose level

Glucose level for 4hr after each meal



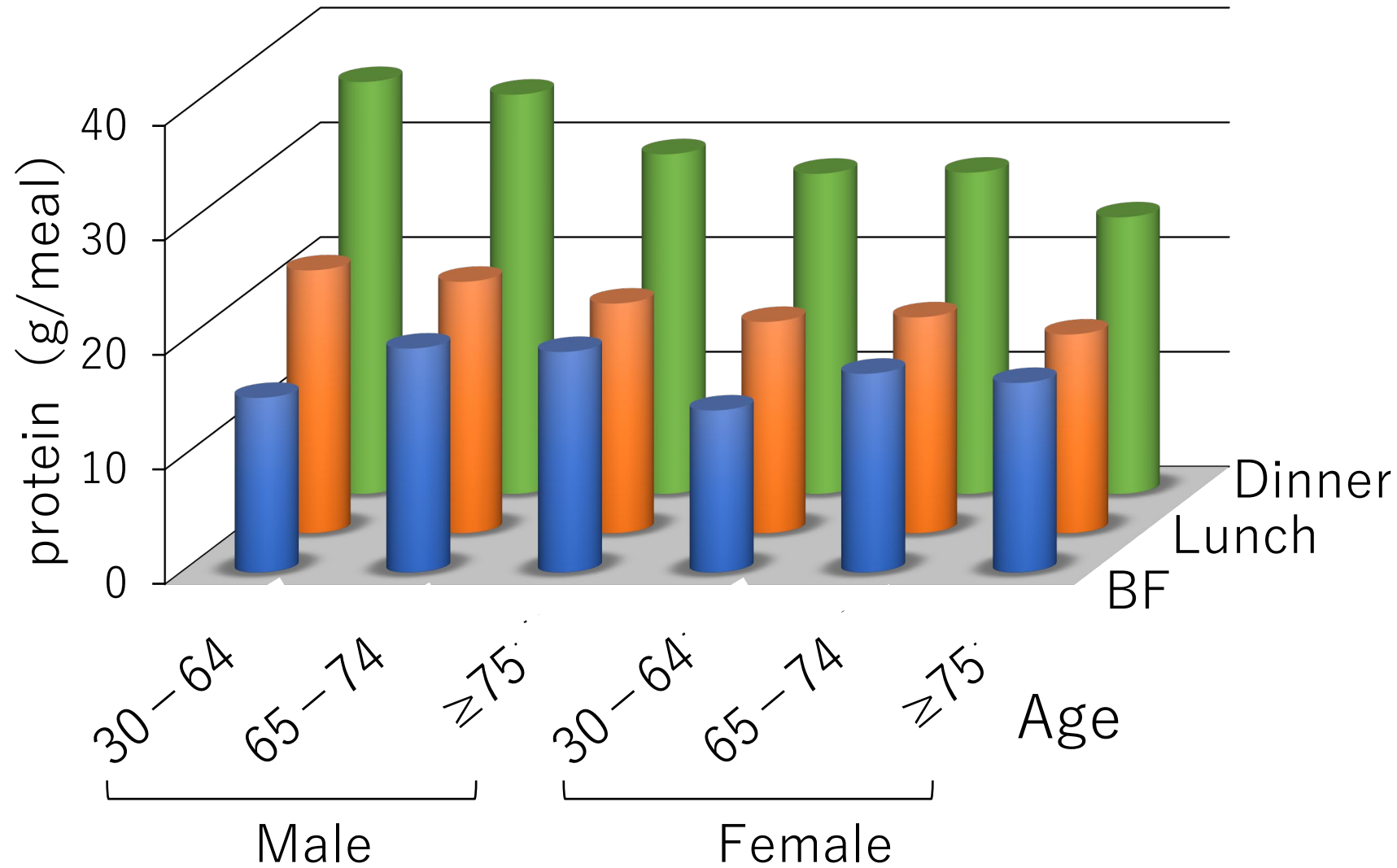
Artichoke at BF causes the “second meal” effect and protects glucose spike through 24-hrs

Changes in body composition of elderly women after a 12-week intervention of 5g of inulin and rowing (2times/week) exercise in the morning.



Inulin alone or in combination with exercise can prevent muscle loss and bone density loss

Protein intake volume difference at BF, Lunch and Dinner in Japanese



Protein intake at breakfast is small

SKEW intake impaired muscle synthesis



The Journal of Nutrition
Nutrient Requirements and Optimal Nutrition

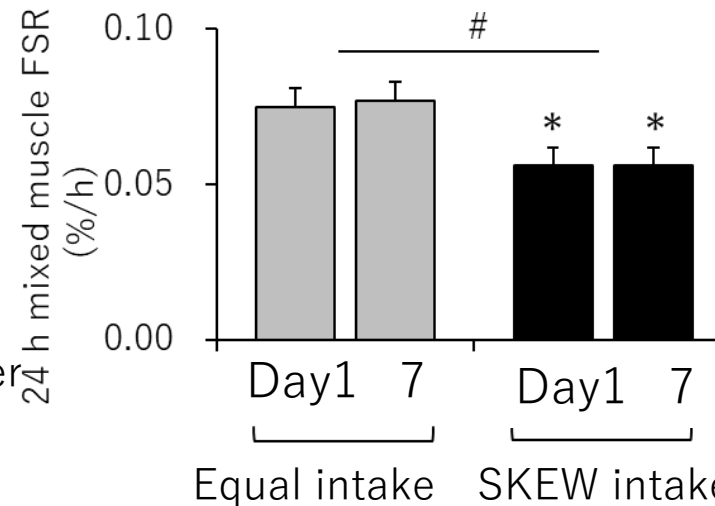
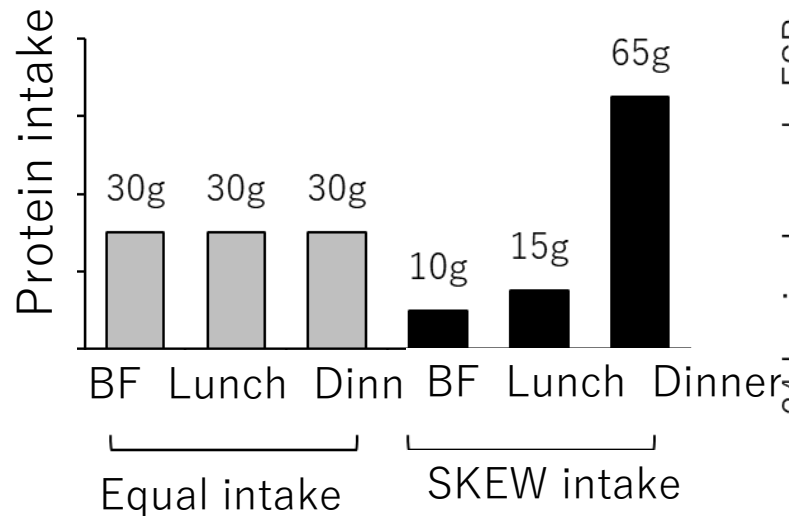
Dietary Protein Distribution Positively Influences 24-h Muscle Protein Synthesis in Healthy Adults¹⁻³

Madonna M. Mamerow,⁴ Joni A. Mettler,⁴ Kirk L. English,⁴ Shanon L. Casperson,⁶ Emily Arentson-Lantz,⁴ Melinda Sheffield-Moore,⁶ Donald K. Layman,⁷ and Douglas Paddon-Jones^{4,5*}

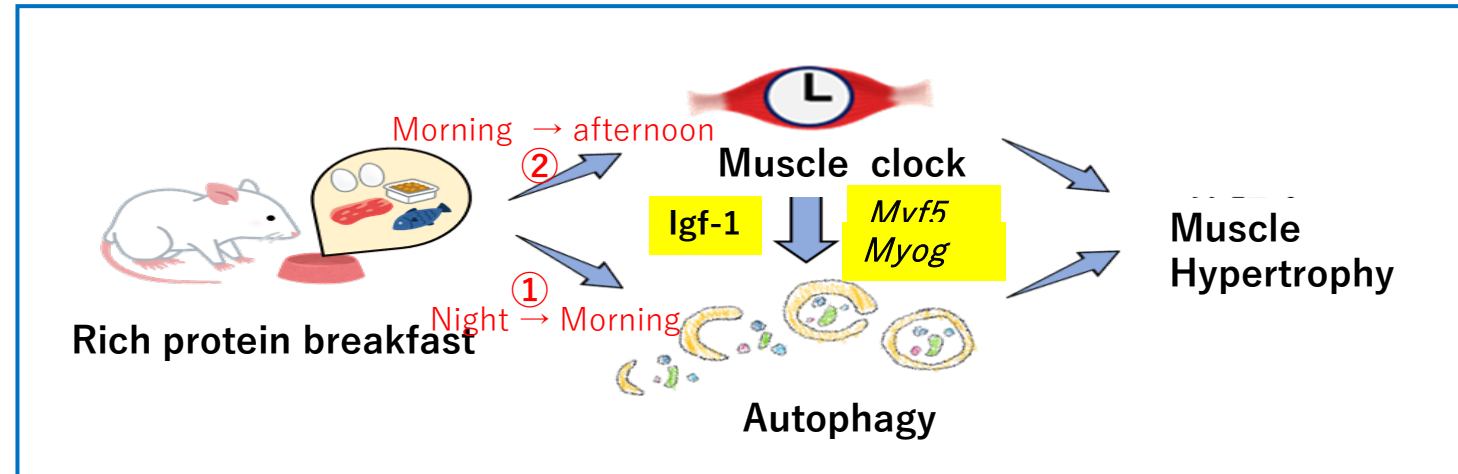
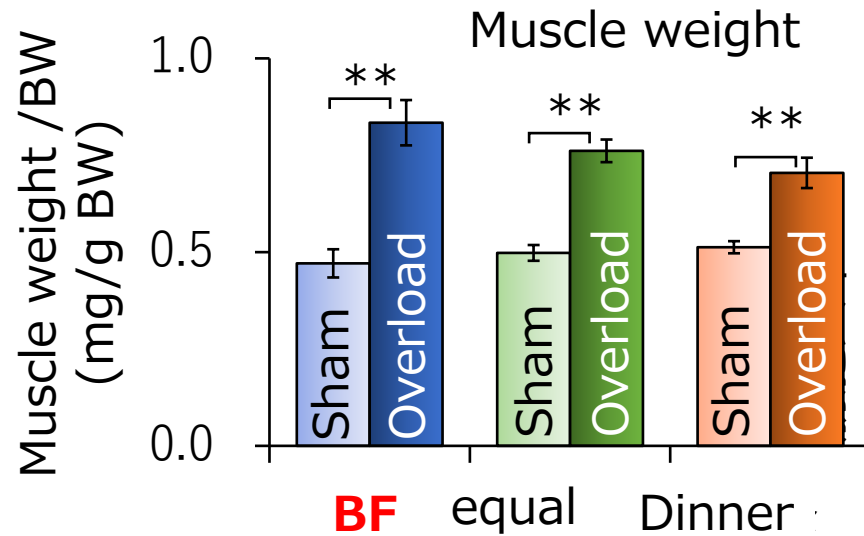
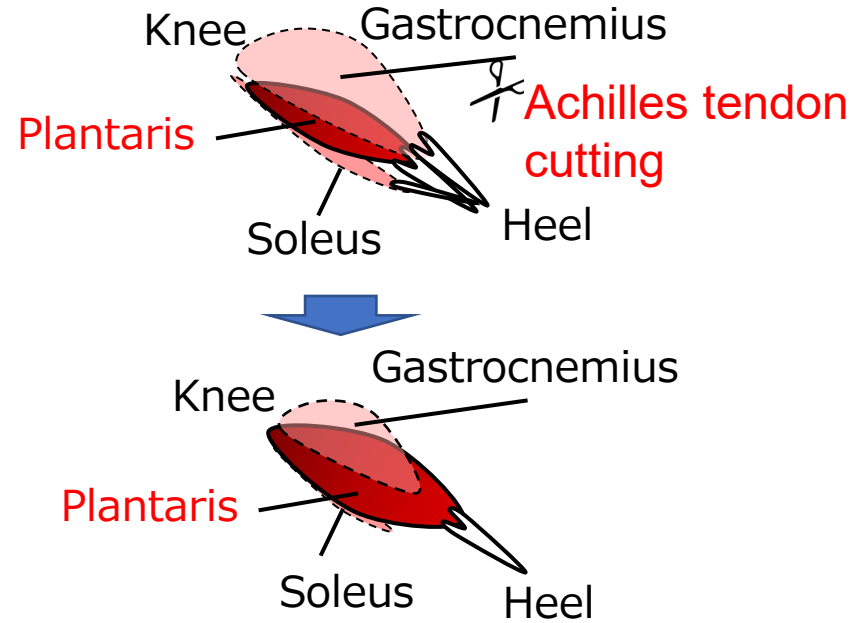
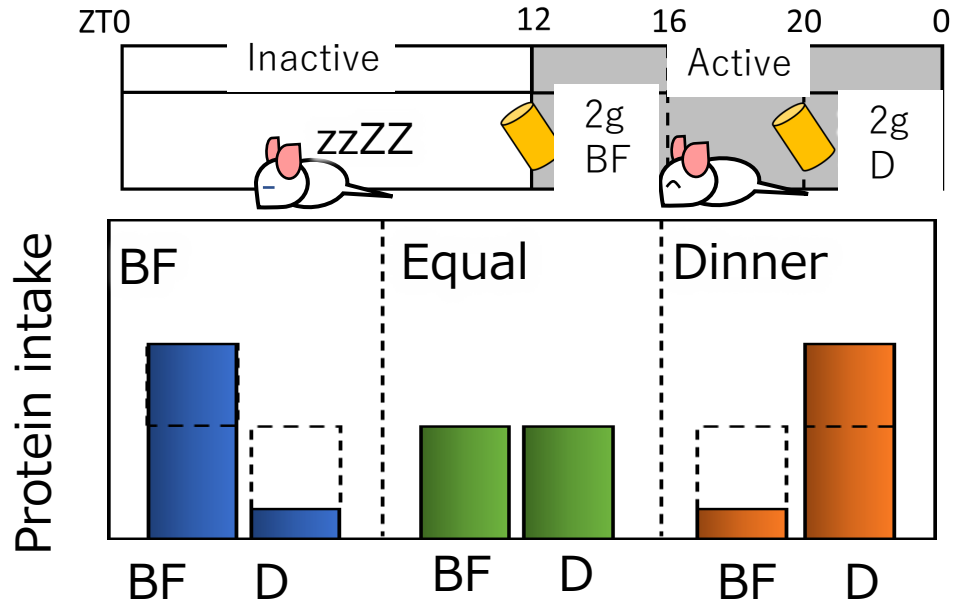


Protein intake pattern

Muscle protein synthesis

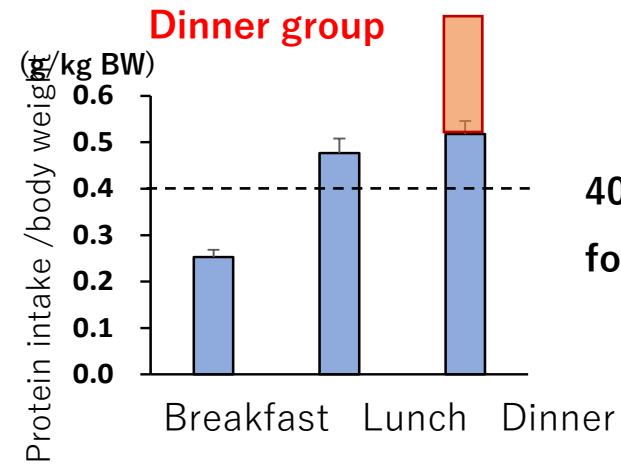
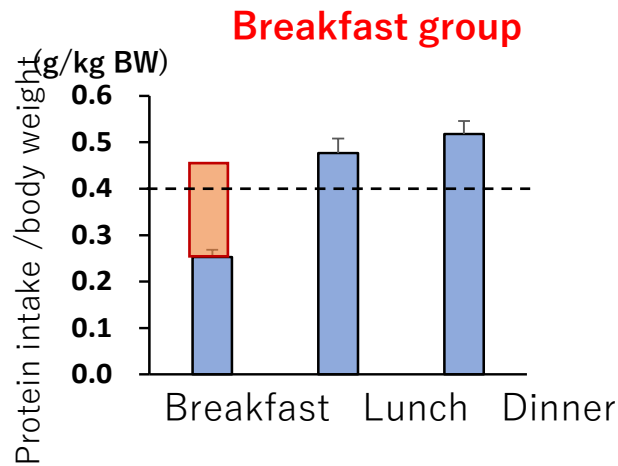


Breakfast protein is important for muscle volume increase

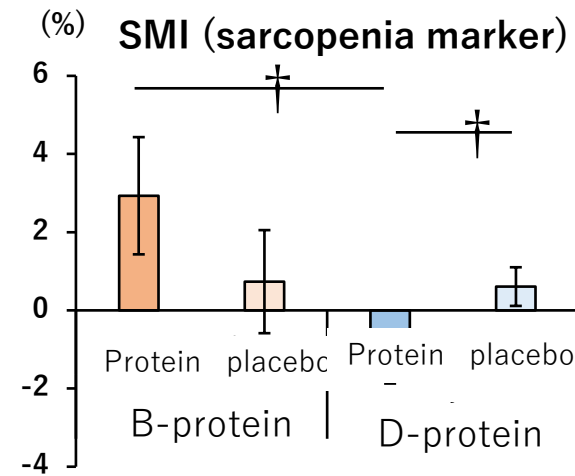
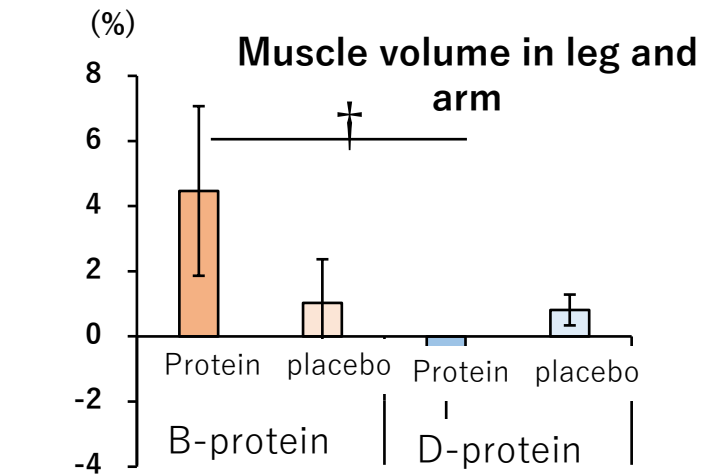


10 g milk protein intake at BF or Dinner time produced muscle volume increase

In general, there are Japanese peoples with poor protein intake at BF and rich protein intake at Dinner. Intervention of **10g milk protein** at BF or Dinner on muscle function



40 peoples (65 years old more)
for 3 month intervention



† $P < 0.05$ vs タンパク群 (Mann-Whitney). # $P < 0.05$, ## $P < 0.01$ vs タブラセボ群 (Mann-Whitney). ** $P < 0.01$ vs タンパク群 (Two-Way ANOVA).

Breakfast protein intake increases muscle volume and ASMI values

High PDCAAS protein intake at breakfast protect decrease of grip strength



ELSEVIER

J Am Med Dir Assoc. 2022

journal homepage: www.jamda.com

Original Study

Breakfast Protein Quality and Muscle Strength in Japanese Older Adults: A Community-Based Longitudinal Study

Kaori Kinoshita RD, PhD^a, Rei Otsuka PhD^{b,*}, Yukiko Nishita PhD^b, Chikako Tange PhD^b, Makiko Tomida CP, PhD^b, Shu Zhang PhD^b, Fujiko Ando MD, PhD^{b,c}, Hiroshi Shimokata MD, PhD^{b,d}, Hidenori Arai MD, PhD^e

PDCAAS

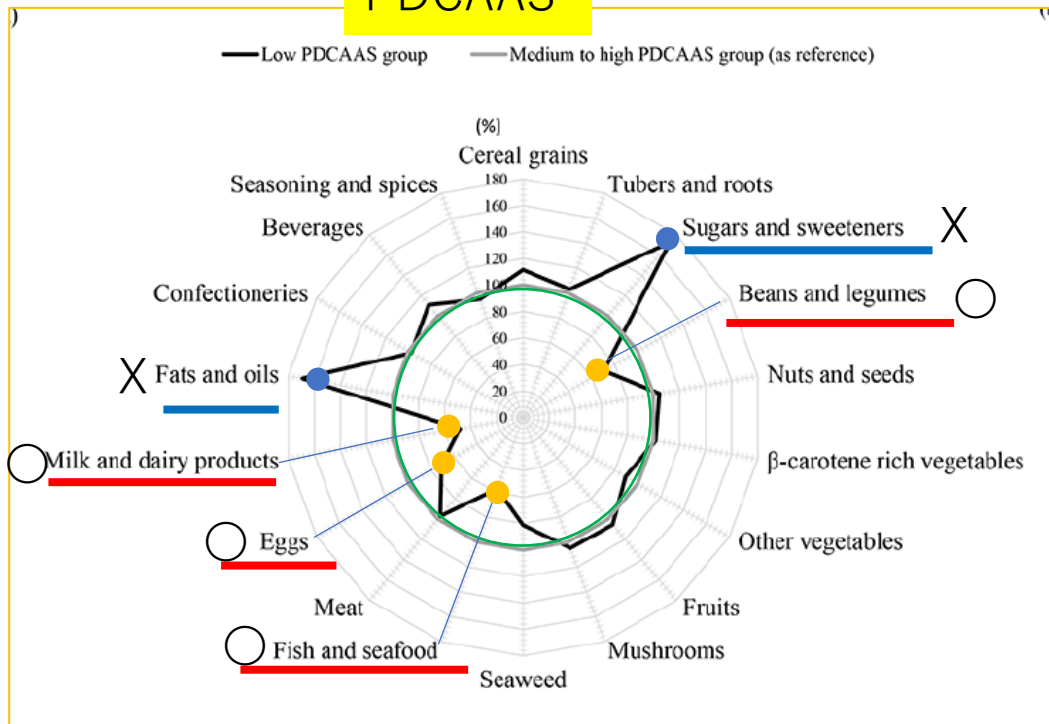


Table 1

Number of Participants at Each Survey from Baseline to Follow-Up

	Total n	%	Low Grip Strength*	
			n at Each Survey	% [†]
Third survey (baseline)	701	100	0	0
Fourth survey	684	97.6	57	8.3
Fifth survey	611	87.2	63	10.3
Sixth survey	543	77.5	83	15.3
Seventh survey	480	68.5	79	16.5
Cumulative number of participants	3019	-	282	-

8 year cohort prospective study



Low grip strength

Multivariable-Adjusted Association between Breakfast PDCAAS and Low Grip Strength over 8 Years

PDCAAS	Model 1			Model 2			Model 3		
	OR	95% CI	P Value	OR	95% CI	P Value	OR	95% CI	P Value
Low	Ref			Ref			Ref		
Middle	0.71	0.45–1.12	.143	0.74	0.46–1.19	.213	0.71	0.43–1.18	.182
High	0.57	0.35–0.93	.026	0.56	0.34–0.94	.028	0.50	0.29–0.86	.012

BMI, body mass index; MET, metabolic equivalents; MMSE, Mini-Mental State Examination; Ref, reference.

ORs and 95% CIs were estimated using the generalized estimating equations.

Model 1: adjusted for sex, age (y), follow-up period (y), and grip strength (kg) at baseline.

Model 2: adjusted for BMI (kg/m²), total physical activity (MET-min/d), MMSE (score), education (y), smoking status (current or not), household annual income (<3.50 million yen/3.50–6.49 million yen/≥6.50 million yen), history of hypertension, dyslipidemia, diabetes mellitus, and ischemic heart disease, and PDCAAS for lunch and dinner (low/middle/high, respectively) in addition to the variables in model 1.

Model 3: adjusted for energy (kcal/meal) and protein (g/meal) intake at 3 regular meals in addition to the variables in model 2.

Good association between breakfast protein and grip strength maintenance

No association between lunch or dinner protein and grip strength maintenance



Please take good protein at breakfast time to protect **sarcopenia**

Does old people take milk at breakfast for sarcopenia protection and/or at dinner for osteoporosis protection ?



Bifidobacterium bifidum

2 times higher protein contents(15g/200ml)

Drink in the morning prevents **sarcopenia**, and helps you sleep at night (tryptophan→serotonin→melatonin)



Calcium , vitamin D

Drinking at night is good for better absorption of calcium and prevention of **osteoporosis**

Low fat milk is better