EARLY IDENTIFICATION OF PROGNOSTIC BIOMARKERS IN DIAGNOSTICS OF FRAILTY SYNDROME, SARCOPENIA, AND MALNUTRITION IN OLDER ADULTS

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Scientific Public Review Session (PRS) • 2025

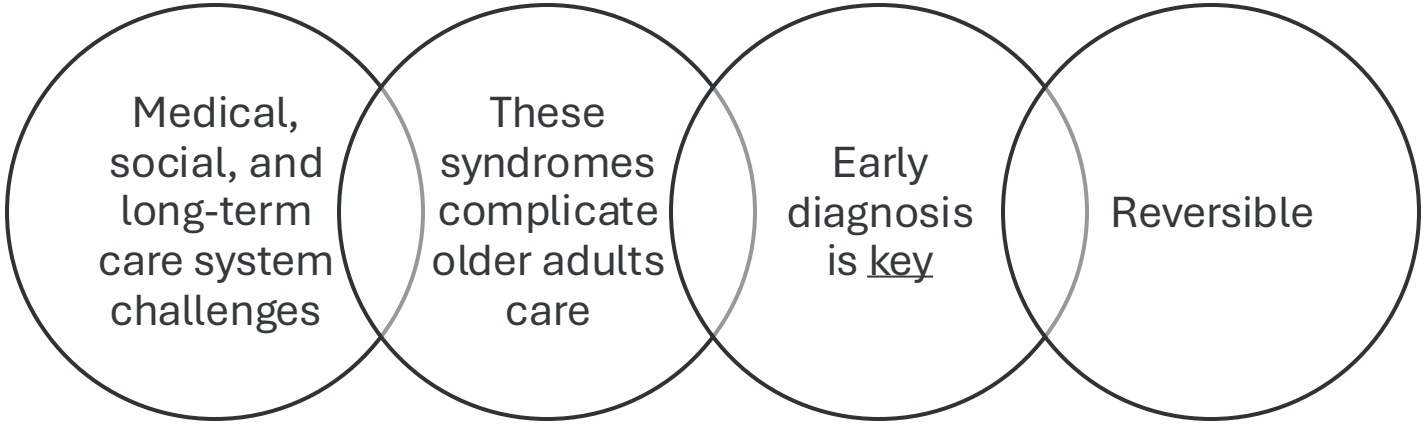
DEPARTMENT OF GERIATRICS

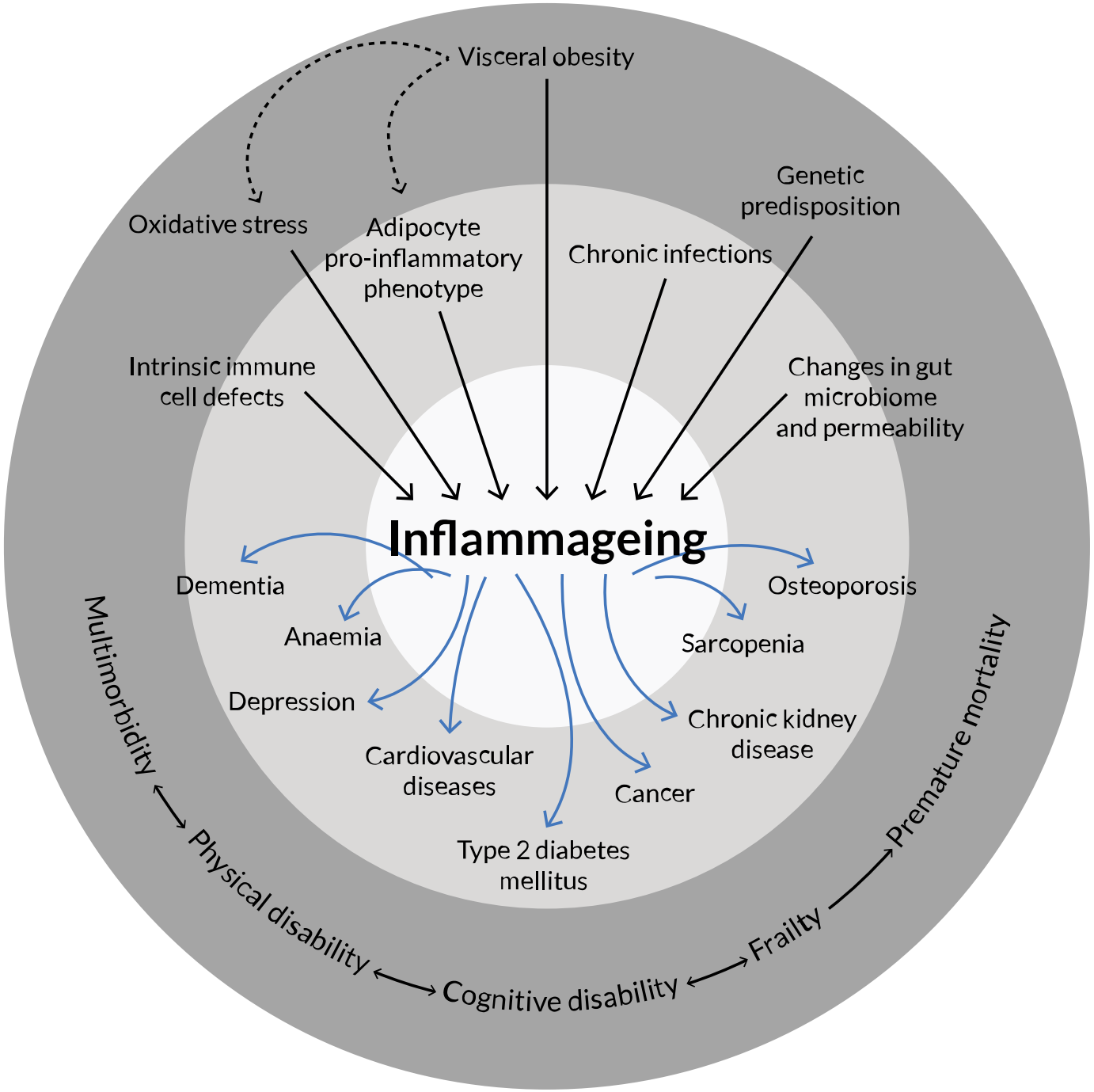
Doctoral School of Molecular Medicine
Medical University of Lodz

MEDICAL UNIVERSITY OF LODZ

2050

29.4% of the EU population will be aged 65+




Visceral obesity
Oxidative stress
Adipocyte pro-inflammatory phenotype
Chronic infections
Genetic predisposition
Intrinsic immune cell defects
Changes in gut microbiome and permeability
Inflammageing
Dementia
Anaemia
Depression
Cardiovascular diseases
Type 2 diabetes mellitus
Cancer
Chronic kidney disease
Sarcopenia
Osteoporosis
Multimorbidity
Physical disability
Cognitive disability
Frailty
Premature mortality

World Health Organization

INTRINSIC CAPACITY


Cognitive Function
Psychological Well-being
Sensory Function
INTRINSIC CAPACITY
Mobility
Vitality

PUBLICATIONS IN PROGRESS

Publication No. 1

Inflammageing in the context of body composition.

Publication No. 2

Which immunonutritional biomarkers are related to vulnerability in older women and men?

METHODS

NUTRITIONAL STATUS

ANTHROPOMETRIC METHODS
waist, hip, calf, and the non-dominant arm circumference, height, body mass
BMI, WHR, WHtR

SCREENING SCALES
Mini Nutritional Assessment (MNA)
Subjective Global Assessment (SGA)
Nutritional Risk Score (NRS)

BODY COMPOSITION ANALYSIS
bioelectrical impedance analysis (BIA) - AKERN / Bodygram Software

DIETARY ASSESSMENT
3-day dietary recall (Dieta 6.0 program)

RISK OF SARCOPENIA

SARC-F questionnaire

Hand grip strength (Jamar dynamometer)

5-times sitting test

Skeletal muscle mass and appendicular skeletal muscle mass (BIA)

Short Physical Performance Battery (SPPB)
Timed Up and Go (TUG)

MUSCLE POWER
Keiser device
Monark (cycloergometer)

FUNCTIONAL PERFORMANCE

Short Physical Performance Battery (SPPB)
Timed Up and Go (TUG)

Activities of daily living (ADL)
instrumental activities of daily living (IADL)
VES-13 (Vulnerable Elders Survey-13)

PHYSICAL ACTIVITY
Seven Day Physical Activity Recall and Stanford questionnaires

QUALITY OF LIFE
EQ-5D questionnaire

COGNITIVE PERFORMANCE
Mini Mental State Examination (MMSE)
Geriatric Depression Scale (GDS)

Publication in progress No. 1

Inflammageing in the context
of body composition.

BIOMARKERS ASSESSMENT

Potential biomarkers: Lymphocyte-to-Monocyte Ratio (LMR), Platelet-to-Lymphocyte Ratio (PLR), Neutrophil-to-Lymphocyte Ratio (NLR), Gonadoliberin (GnRH), Interleukin-10 (IL-10), Neutrophil Gelatinase-Associated Lipocalin (NGAL), Intercellular Adhesion Molecule (ICAM), Vascular Cell Adhesion Molecule (VCAM), Myeloperoxidase (MPO), Soluble Urokinase-Type Plasminogen Activator Receptor (SuPAR), Endothelin (ET), Follistatin (FST), Endoglin (ENG), Bone Morphogenetic Protein 9 (BMP-9), Agouti-Related Protein (AGRP), Ciliary Neurotrophic Factor (CNTF), Follicle-Stimulating Hormone (FSH), Luteinizing Hormone (LH), Dehydroepiandrosterone (DHEA), Growth Hormone (GH), Thyroid-Stimulating Hormone (TSH), Fibroblast Growth Factor 21 (FGF-21), Growth Differentiation Factor 11 (GDF-11), Growth Differentiation Factor 15 (GDF-15), Interleukin-18 (IL-18), Adrenocorticotropic Hormone (ACTH), Dickkopf-Related Protein 1 (DKK-1), Fibroblast Growth Factor 23 (FGF-23), Interleukin-1 Beta (IL-1β), Interleukin-6 (IL-6), Insulin (INS), Leptin (LEP), Osteocalcin (OC), Osteopontin (OPN), Osteoprotegerin (OPG), Parathyroid Hormone (PTH), Sclerostin (SOST), Tumor Necrosis Factor Alpha (TNF-α).

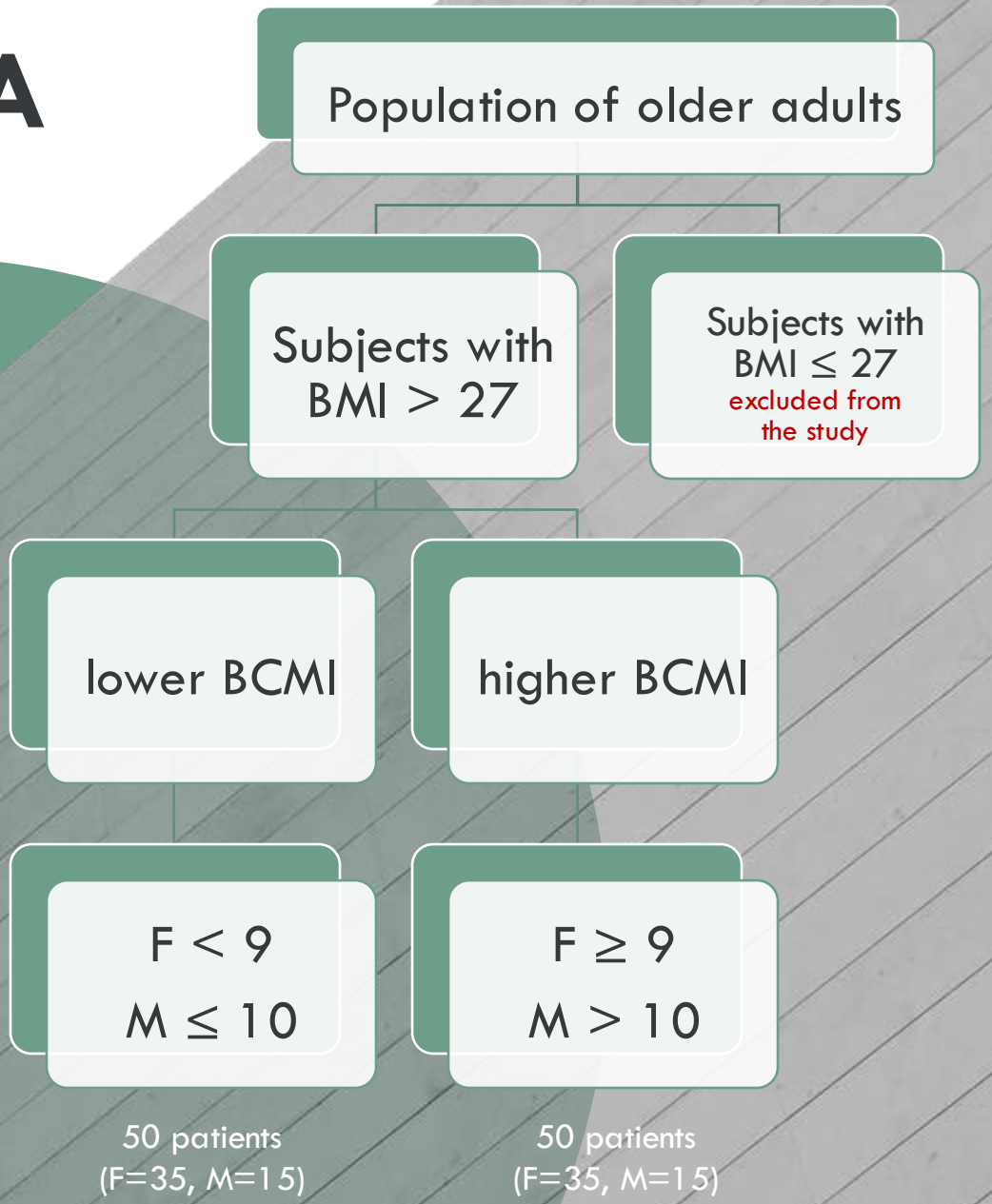
INCLUSION CRITERIA

INFLAMMAGEING IN THE CONTEXT OF BODY COMPOSITION

75+

100

patients from outpatient geriatric clinic

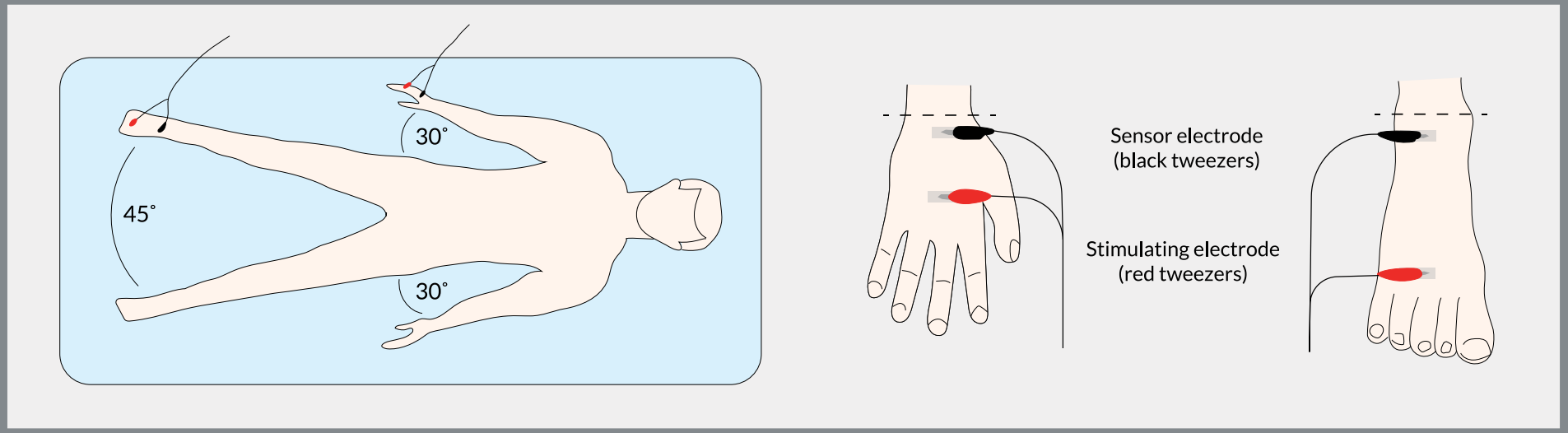


BCMI

Body Cell Mass Index

$$BCMI = \frac{BCM\ [kg]}{height\ [m]^2}$$

Body Cell Mass (BCM) – metabolically active ingredient in lean mass.
Recognized to be one of the best predictors for assessment of the nutritional status of a patient.



PLATELET
LYMPHOCYTES
MONOCYTES
NEUTROPHILS

INFLAMMATION MARKERS

PLR, NLR, LMR

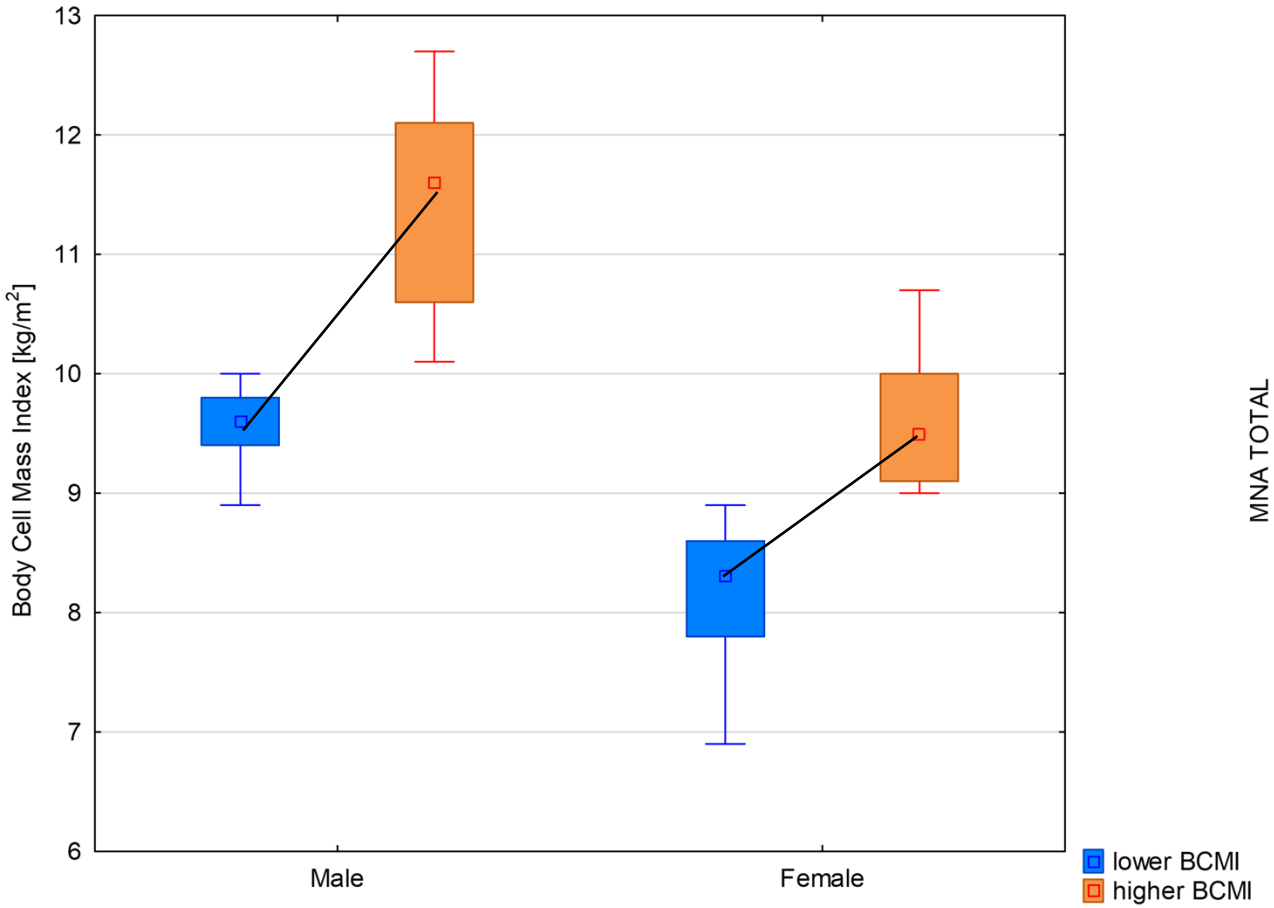
Biomarker	Clinical Meaning	Malnutrition Association
NLR	Reflects systemic inflammation	↑NLR linked with poor nutritional status
PLR	Platelets increase with inflammation	Elevated PLR suggests immune-nutritional imbalance
LMR	Immune suppression marker	↓LMR often seen in malnourished patients

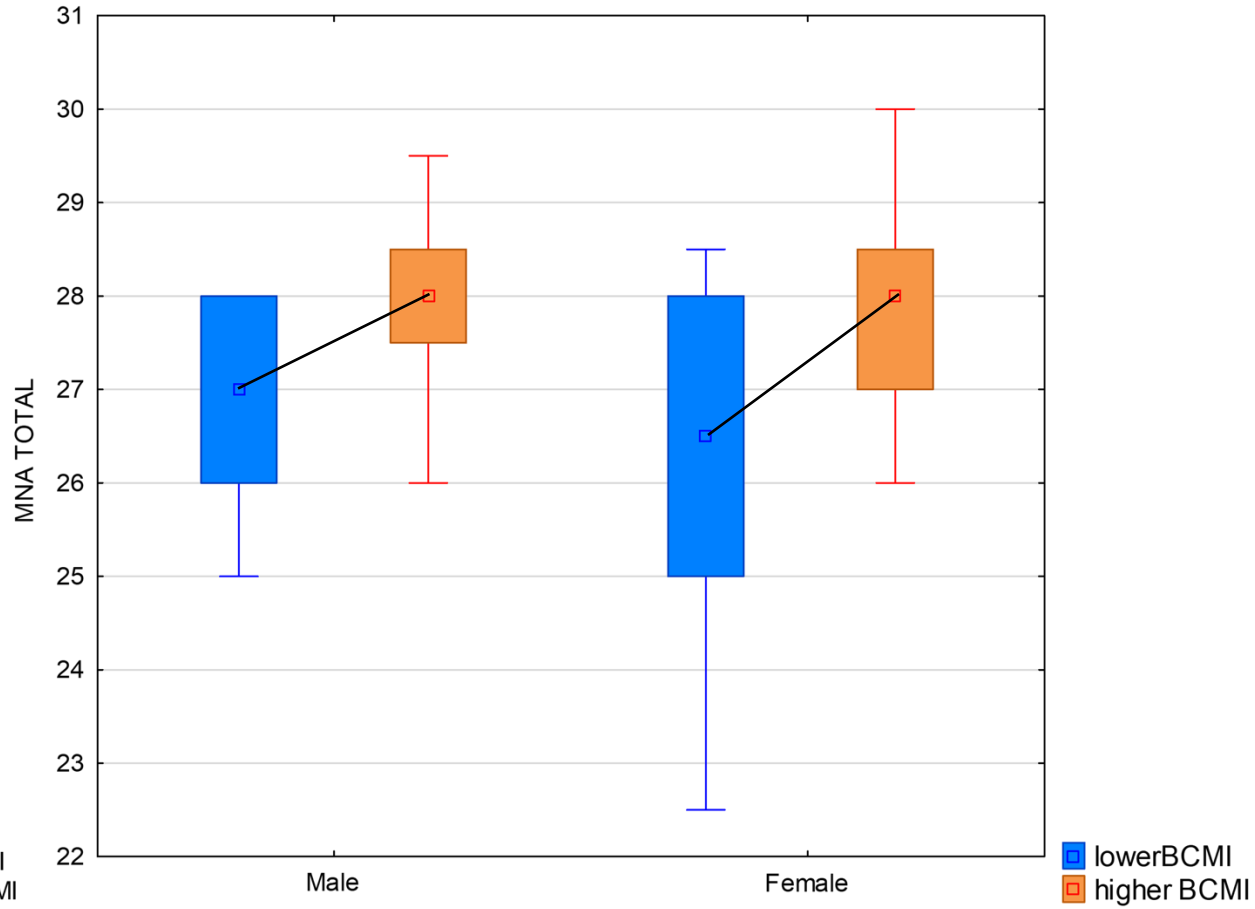
Clinical Relevance:

- Routinely available from CBC
- Cost-effective & non-invasive
- Useful for screening in primary care or geriatric settings

Laboratory Complex of the University Clinical Hospital No. 2 of the Medical University of Lodz

Values of BCMI and MNA in groups with lower and higher BCMI





Characteristics of Male and Female subjects in groups with lower and higher BCMI

	Male			Female		
	lower BCMI	**higher BCMI**	**p-value**	**lower BCMI**	**higher BCMI**	**p-value**
AGE [years]	78±2.7	78±2.7	ns	79 ± 3.5	78.91±2.8	ns
BODY MASS [kg]	81±6	89.8±15.9	ns	73.4±8.1	76.6±9.16	ns
BMI [kg/m^2]	28.5±1.2	32±5.3	0.028	29.9 ± 1.9	31.6 ± 3.4	0.038
WHtR	0.60±0.05	0.65±0.07	0.049	0.62±0.05	0.63±0.05	ns
WHR	0.99±0.06	1.02±0.07	ns	0.89±0.06	0.90±0.05	ns
BODY CELL MASS INDEX (BCMI) [kg/m^2]	9.47±0.6	11.86±1.7	<0.0001	8.09±0.9	9.74±0.9	0.000
MNA SCREENING	13.1±1.28	13.5±0.8	ns	12.8±1.64	13.6±1	0.043
MNA TOTAL	26.6±1.6	28±0.81	0.003	26.27±1.9	27.6±1.9	0.002

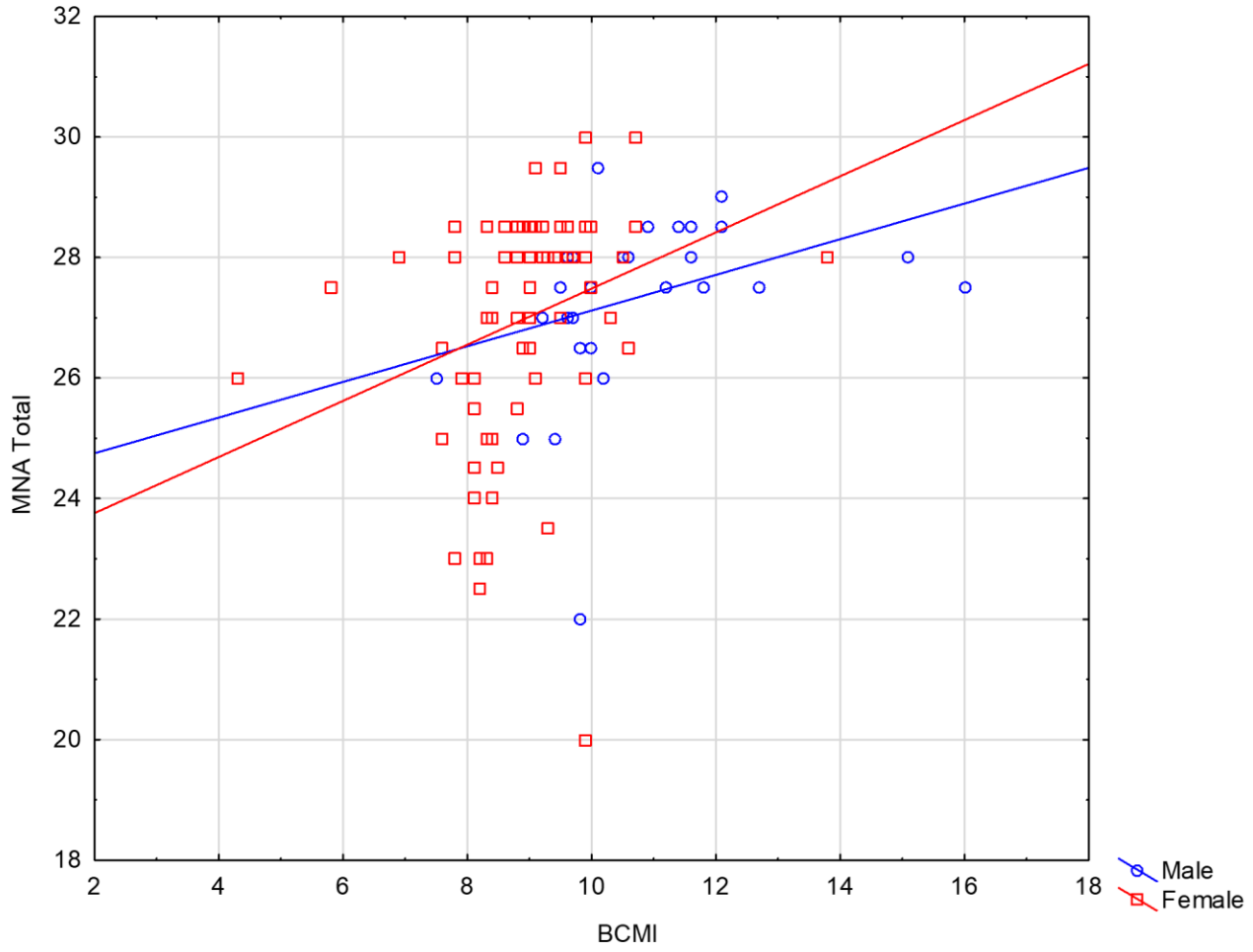
Inflammation markers in males and females in groups with lower and higher BCMI

	Male			Female		
	lower BCMI	**higher BCMI**	**p-value**	**lower BCMI**	**higher BCMI**	**p-value**
CRP [mg/L]	5.66±5.7	3.1±3.84	ns	3.82±5.72	3.05±4.65	ns
LMR	3.21±0.88	2.98±0.52	ns	3.54±1.4	4.21±1.3	0.011
PLR	142.04±57.17	113.56±34.84	ns	135.7±48.97	116.94±43.62	ns
NLR	2.43±1	2.1±0.65	ns	2.48±1.37	1.67±0.65	0.001

Spearman's Rank

	Males rho	**Females** rho
WIEK [years]	-0.135	-0.064
MASA CIAŁA [kg]	0.318	0.123
BMI [kg/m^2]	0.539*	0.264*
MNA TOTAL	0.517*	0.442*
MNA SCREENING	0.235	0.305*
CRP [mg/L]	-0.200	-0.059
LMR	-0.201	0.289*
PLR	-0.202	-0.170
NLR	-0.040	-0.370*

*statistically significant correlation ($p<0.05$)



Male: rho = 0.517, p<0.05 Female: rho = 0.442, p<0.05

Dispersion of MNA values in relation with BCMI

CONCLUSIONS

- In group of older people with BMI ≥ 27 kg/m^2 there is a statistically significant relationship between the level of the BCMI and the result of the MNA test. This suggests the existence of a relationship between the state of nutrition and the BCMI value.
- The BCMI was higher in older males than in older females (10.66±1.74 vs. 8.91±1.21).
- There is a relationship between BCMI and selected markers of inflammation (NLR and LMR) in the female group,
  no such relationship was observed in the male group.
- BCMI should be included as a supplement to the classic assessment of nutritional status in the elderly.

Kolegium Lekarzy Specjalistów Geriatrii w Polsce

XII Conference of the Council of Physicians Geriatrics Specialists in Poland

April 25-26

ICE Congress Centre
in Krakow

The presentation received
an award

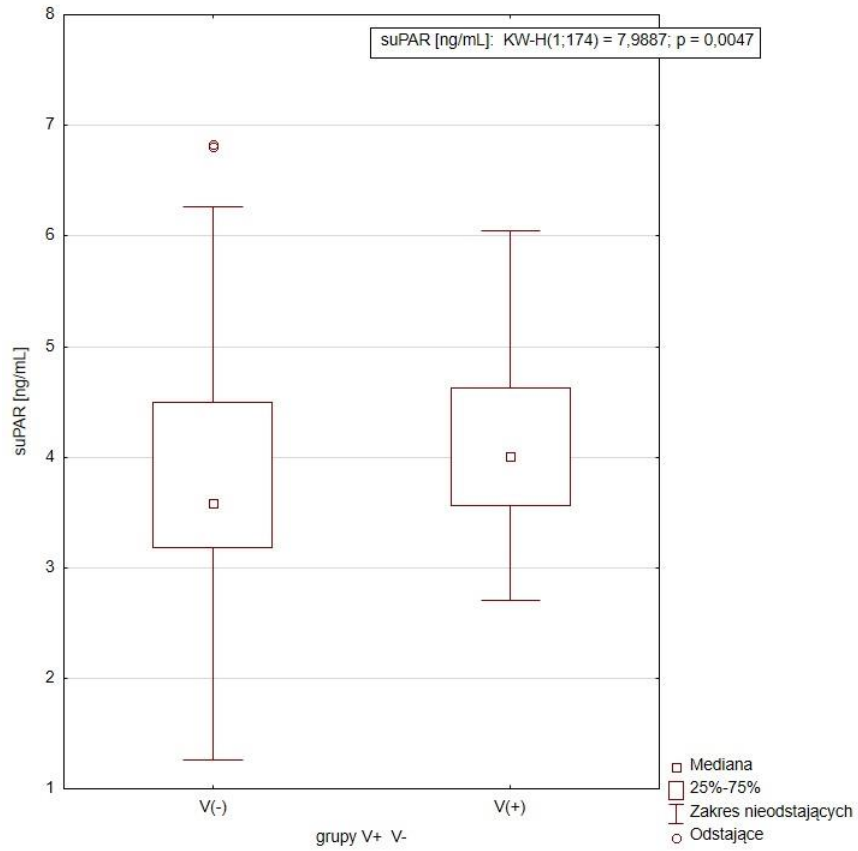
Evaluation committee:
Prof. Karolina Piotrowicz
Prof. Małgorzata Sobieszczańska
Hanna Kujawska-Danecka, MD

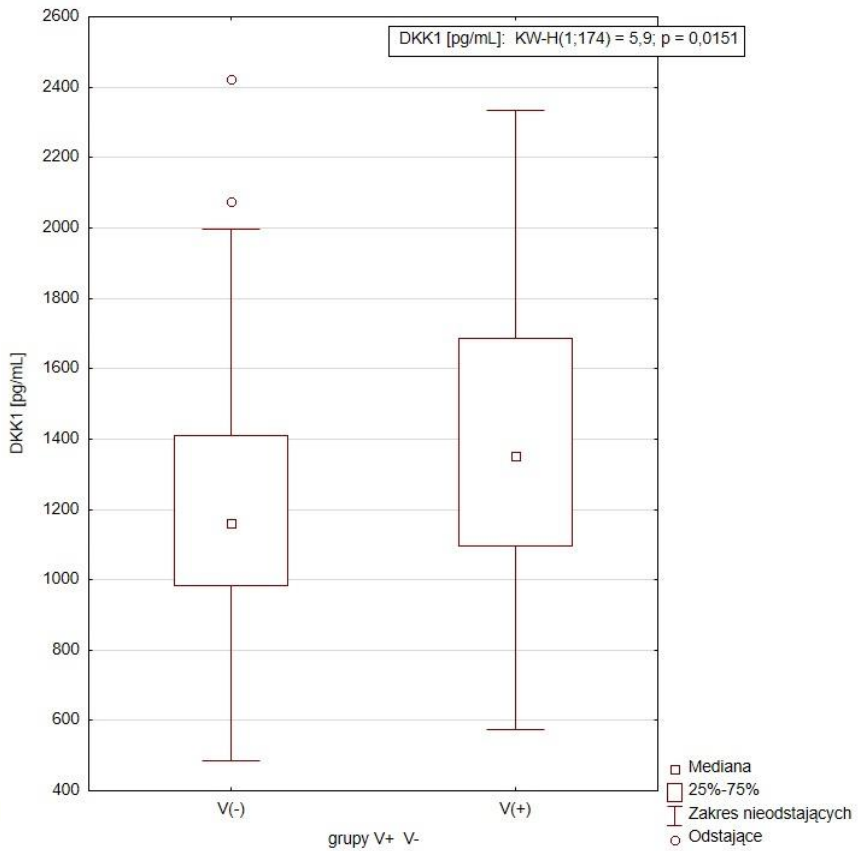
Publication in progress No. 2

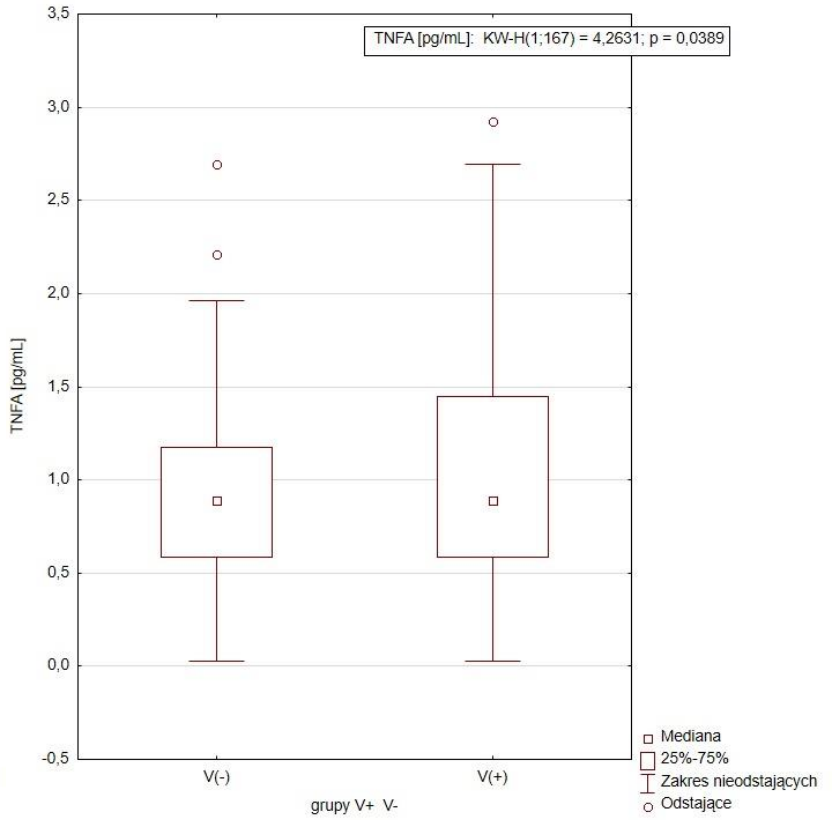
Which immunonutritional biomarkers are related to vulnerability in older women and men?

BIOMARKERS ASSESSMENT

Potential biomarkers: Lymphocyte-to-Monocyte Ratio (LMR), Platelet-to-Lymphocyte Ratio (PLR), Neutrophil-to-Lymphocyte Ratio (NLR), Gonadoliberin (GnRH), Interleukin-10 (IL-10), Neutrophil Gelatinase-Associated Lipocalin (NGAL), Intercellular Adhesion Molecule (ICAM), Vascular Cell Adhesion Molecule (VCAM), Myeloperoxidase (MPO), Soluble Urokinase-Type Plasminogen Activator Receptor (SuPAR), Endothelin (ET), Follistatin (FST), Endoglin (ENG), Bone Morphogenetic Protein 9 (BMP-9), Agouti-Related Protein (AGRP), Ciliary Neurotrophic Factor (CNTF), Follicle-Stimulating Hormone (FSH), Luteinizing Hormone (LH), Dehydroepiandrosterone (DHEA), Growth Hormone (GH), Thyroid-Stimulating Hormone (TSH), Fibroblast Growth Factor 21 (FGF-21), Growth Differentiation Factor 11 (GDF-11), Growth Differentiation Factor 15 (GDF-15), Interleukin-18 (IL-18), Adrenocorticotropic Hormone (ACTH), Dickkopf-Related Protein 1 (DKK-1), Fibroblast Growth Factor 23 (FGF-23), Interleukin-1 Beta (IL-1β), Interleukin-6 (IL-6), Insulin (INS), Leptin (LEP), Osteocalcin (OC), Osteopontin (OPN), Osteoprotegerin (OPG), Parathyroid Hormone (PTH), Sclerostin (SOST), Tumor Necrosis Factor Alpha (TNF-α).

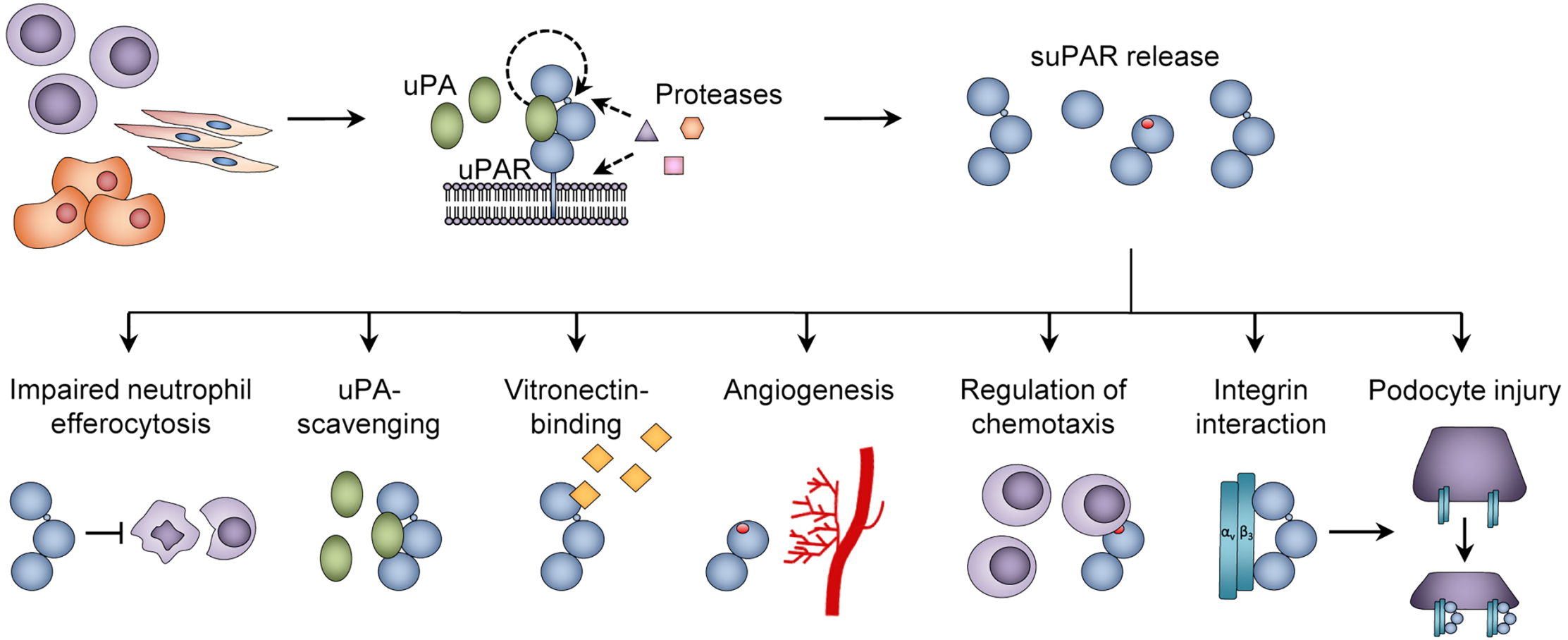


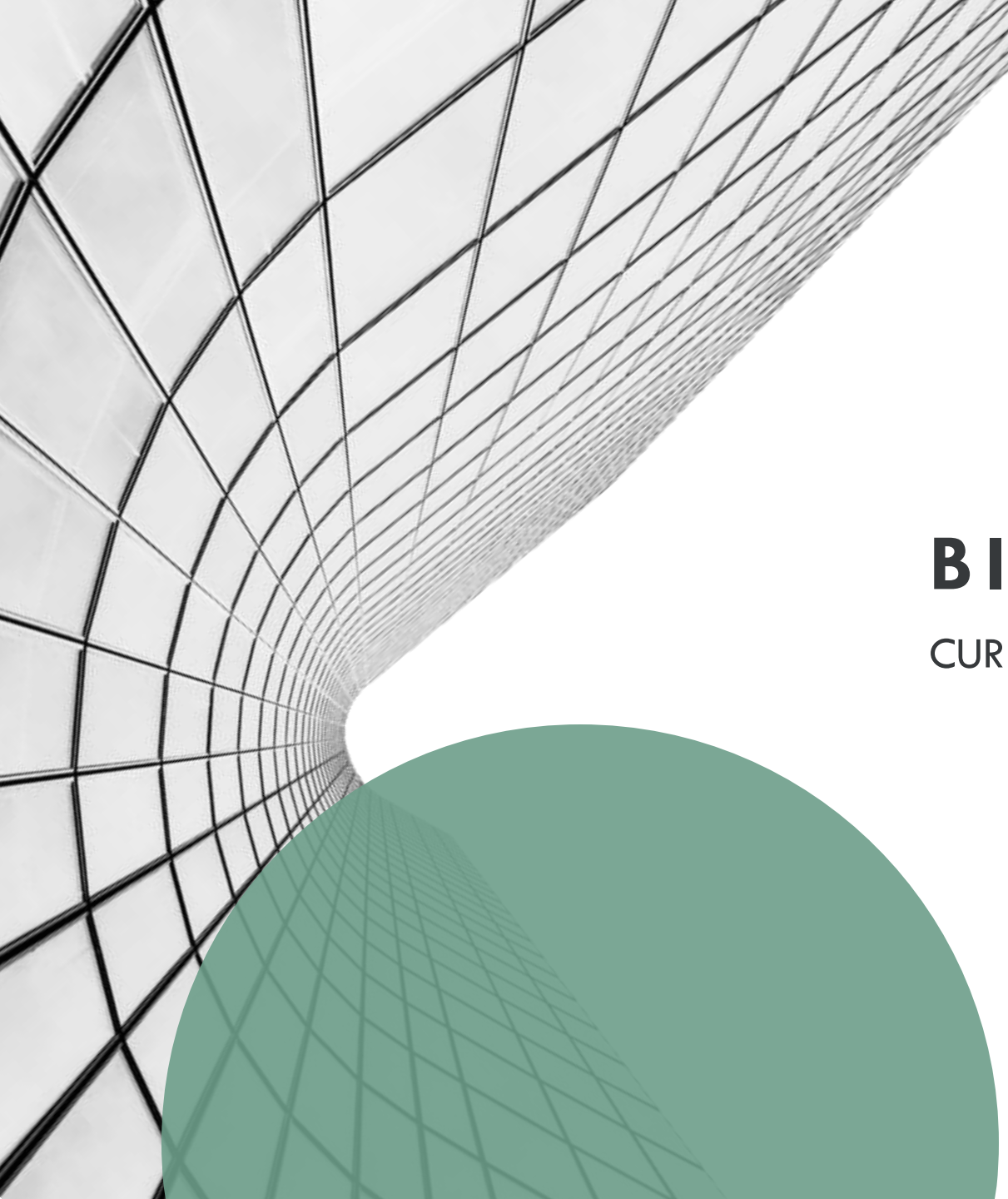




Comparison of suPAR, DKK-1, TNF α in vulnerable and non-vulnerable groups of older adults

suPAR · Soluble Urokinase Plasminogen Activator Receptor





BIOETHICS' COMMITTEE

CURRENTLY AWAITING THE APPROVAL OF THE HOSPITAL

SUBMITTED PROJECT PREPROPOSALS

GRACE

Geriatric Resilience And Care Excellence in primary and community care

THCS JTC 2025:
"Better care closer to home: Enhancing primary and community care"

TOTAL: 1 950 000 EUR

MUL: 400 000 EUR

ROSE

Recognise, Observe, Support & Empower when functional decline or malnutrition appears in patients with advanced neurodegenerative disease

EU Joint Programme – Neurodegenerative Disease Research (JPND) - 2025 Research Call on Health and Social Care Research with a Focus on The Moderate and Late Stages of Neurodegenerative Diseases.

TOTAL: 722 442 EUR

MUL: 256 200 EUR

ADDITIONAL ACTIVITIES

1 COST PROGRAMMING

PROGRAMMING • COST ACTION CA21122

23-24 Jan 2025

PROmoting GeRiAtric Medicine in countries where it is still eMergING

2 **PRO-Ageing** Student Scientific Circle

3 2025 **EUA-CDE** Thematic Workshop

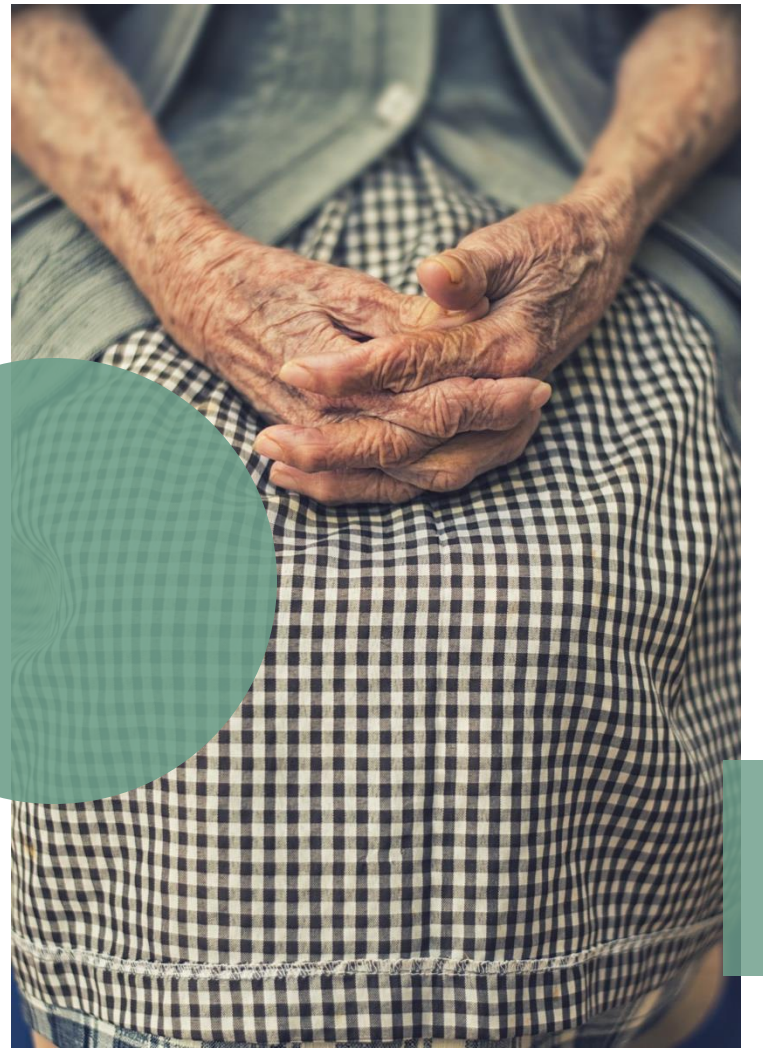
16-17 Jan 2025 | University of Minho, Braga, Portugal

4 Support for Master's Thesis of 5th-year physiotherapy student

"Assessment of the relationship between nutritional status and functional fitness and the occurrence of inflammation in older adults"

5 **OPEN LECTURES**

„Gene therapy for epidermolysis bullosa" · M. Peter Marinkovich, MD
„DNA repair and cell cycle with implications in cancer biology" · Dipanjan Chowdhury, PhD



ILSI EUROPE

In collaboration with: MNS Mediterranean Neuroscience Society

10TH Mediterranean Neuroscience Society Conference

5th Symposium on Nutrition for the Ageing Brain

6 & 7 June **2025** | Chania Crete, Grece

Session 1 🥗🛡️ Nutrition, Diet and Immune Function

Session 2 🧬🔍 Biomarkers of Cognitive Ageing and Nutrition: Current Advances and Future Directions

Session 3 🥦💪 Nutritional Interventions for Frailty, Sarcopenia, and Cognitive Function

Session 4 🦷🫐 Nutrition, Dental Health, Oral Microbiome, and Cognition: Exploring the Connections

Session 5 💰⚖️ The Intersection of Sex, Nutrition, and Socioeconomic Inequalities: Implications for Health in Old Age

Session 6 🧠🌿 Nutrition for Mental Health in Old Age: Addressing Depression & Anxiety


PRELUDIUM
OPUS
WWW.NCN.GOV.PL

POTENTIAL BENEFITS
OF THE PROJECT

- The implementation of rapid diagnostic and preventive measures helps **inhibit the development** of geriatric syndromes, promoting preventive actions

- **Increased awareness** among patients, caregivers, and specialists in the field enhances proactive healthcare practices

- Identification of **new markers or new applications of existing markers** expands the scope of laboratory activities

- Identification of **dietary patterns** related to more favorable biomarkers and functional profile of older subjects

DEPARTMENT OF
GERIATRICS