



Aging of the immune system:  
*can we measure it and should we stop it?*

Niels Hellings

FAPESP Week Belgium, October 8<sup>th</sup> 2018

**BIOMED**  
BIOMEDISCH  
ONDERZOEKSINSTITUUT

►► **UHASSELT**

 Flanders  
vaccine

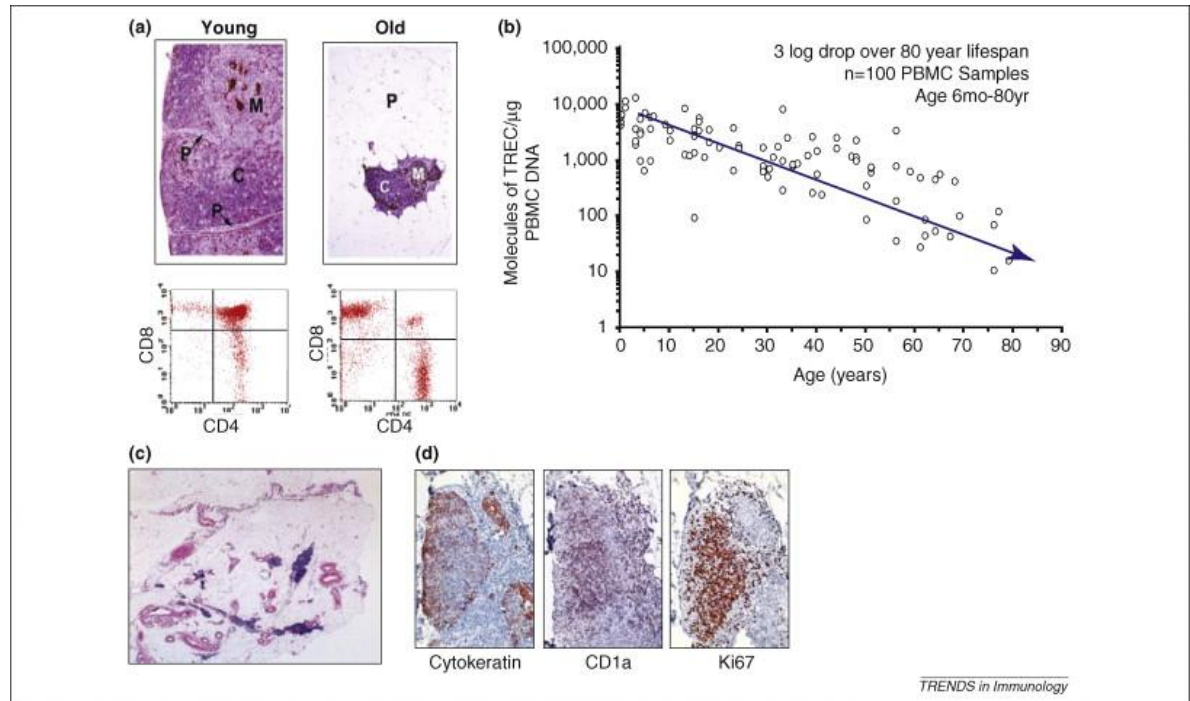
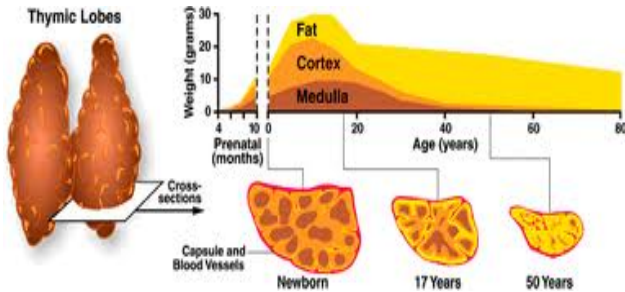
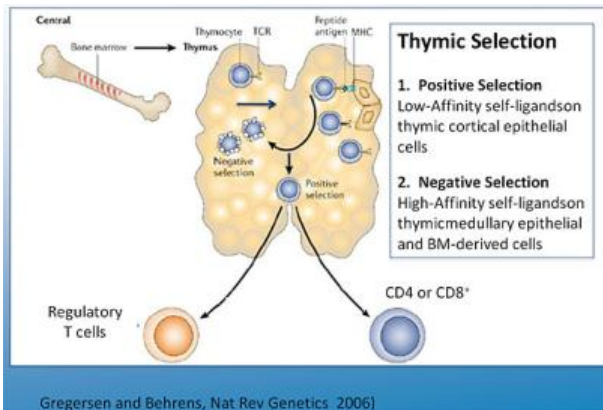
# Overview

- What is immune aging?
- Can we measure it?
- Can we stop or reverse it?

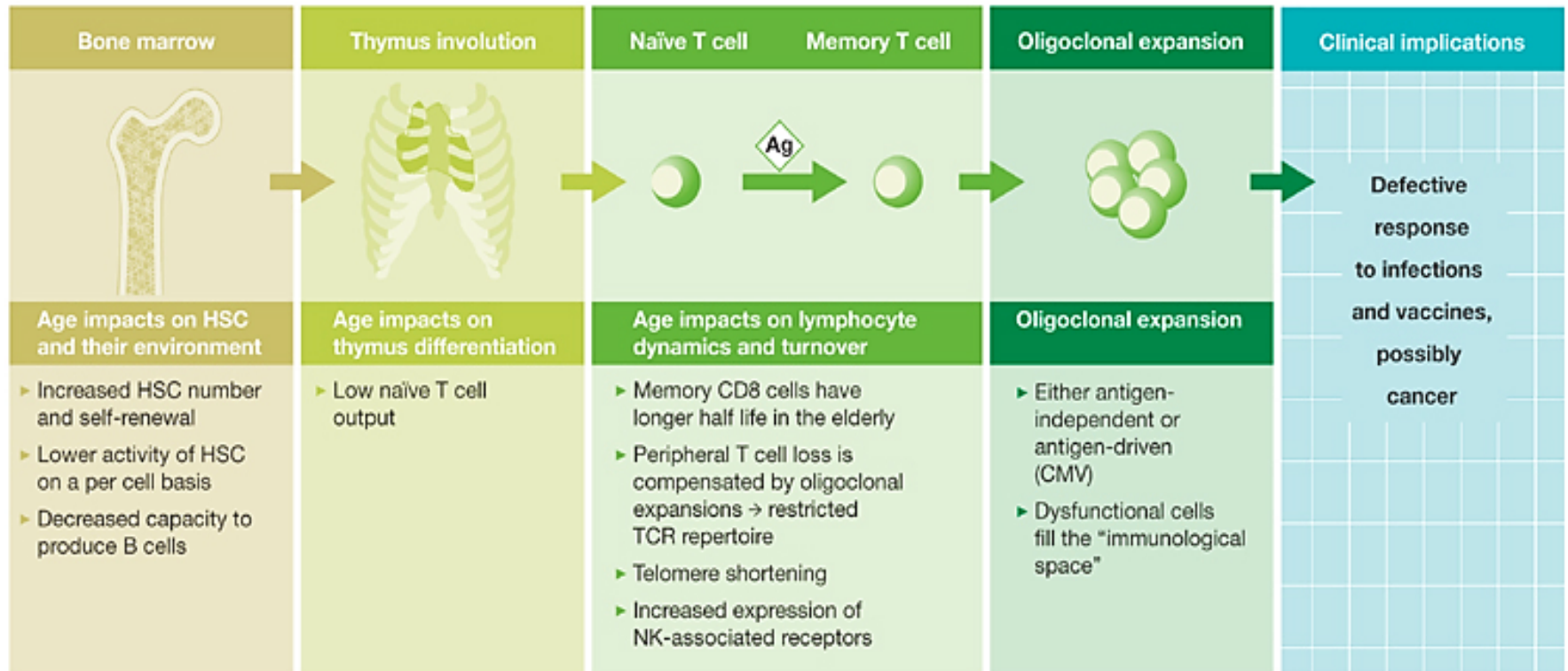


# Aging and the immune system - immunosenescence

## Thymic function decreases with age



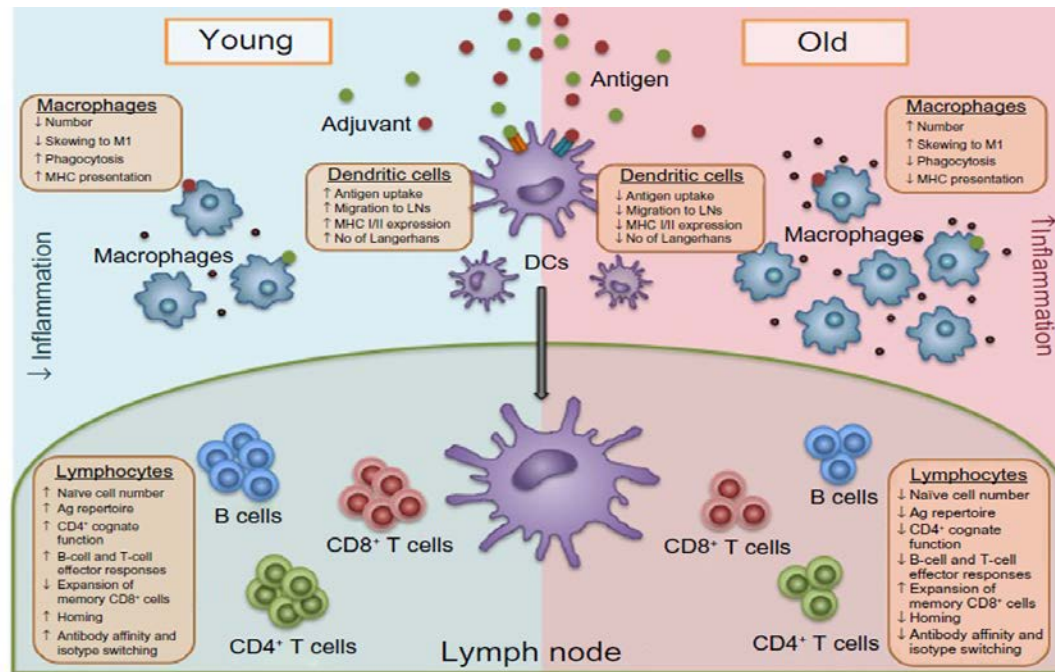
# Immune aging: different compartments





# Immune aging: what do we know?

- affects both innate and adaptive immunity
- Innate immune system is constitutively activated in elderly (“inflamm-aging”)
- Declining adaptive immune response with age

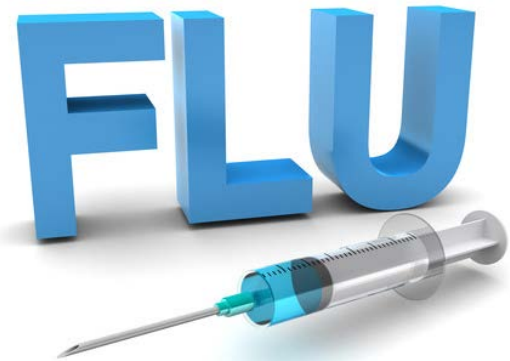


# Consequences of an 'old' immune system

- Increased susceptibility to
  - Infections, 40% deaths elderly  
e.g. pneumonia, influenza, tbc
  - Cancer: lower anti-tumor immunity



- Diminished vaccine response
  - e.g. Influenza vaccine
    - 70-90% efficacy in young adults
    - 17-53% efficacy in elderly



# Premature immunosenescence in autoimmune disease

Multiple sclerosis



Rheumatoid arthritis



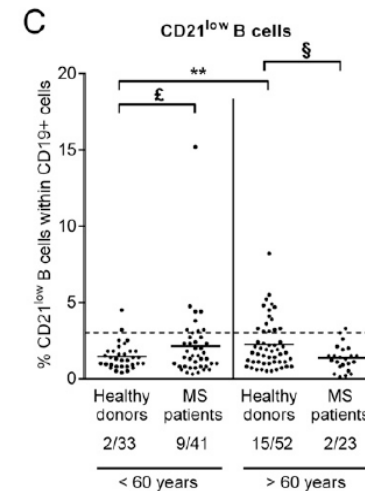
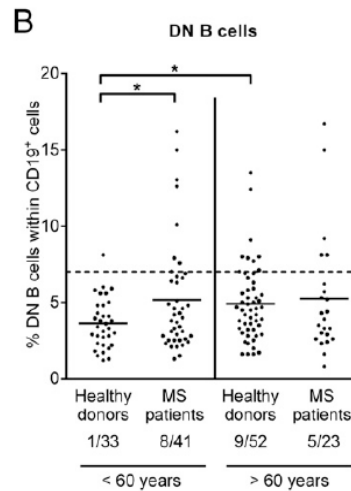
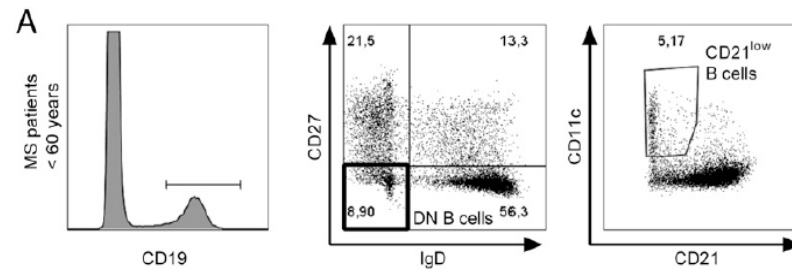
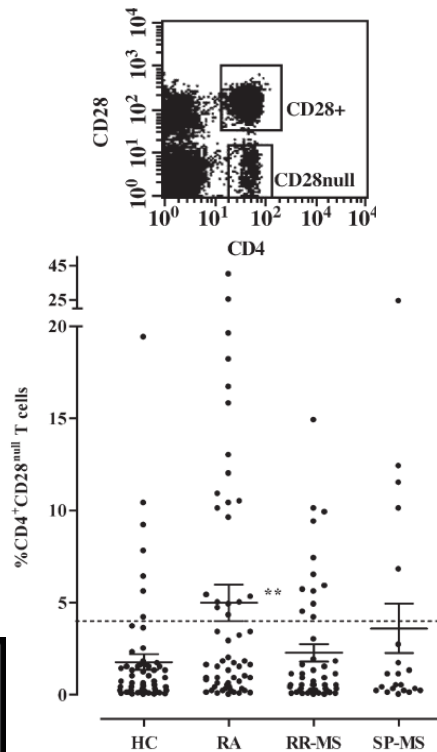
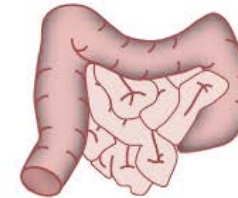
Autoimmune myopathy



Granulomatosis with polyangiitis



Inflammatory bowel disease



# Outstanding questions

- No unified biomarker panel to measure immune fitness
- No tools to discriminate normal from pathological immune aging
- No evidence that immune aging can be reversed in humans





# Interreg project Envelhecimento saudável

Niels HELLINGS & Leen SLAETS  
Hasselt University

# HEALTHY AGING



**Interreg**  
Euregio Maas-Rijn  
Europees Fonds voor Regionale Ontwikkeling



provincie limburg



Ministerium für Wirtschaft, Energie,  
Industrie, Mittelstand und Handwerk  
des Landes Nordrhein-Westfalen



Provincie Noord-Brabant



Ministerie van Economische Zaken



AGENTSCHAP  
INNOVEREN &  
ONDERNEMEN

Vlaanderen  
is ondernemen

## Why – What - How - Who?

- Increase in age-related chronic diseases
- Failing immune system – immune aging
- Therapies are often inefficient in aging population
- Lack of knowledge about individual health risks

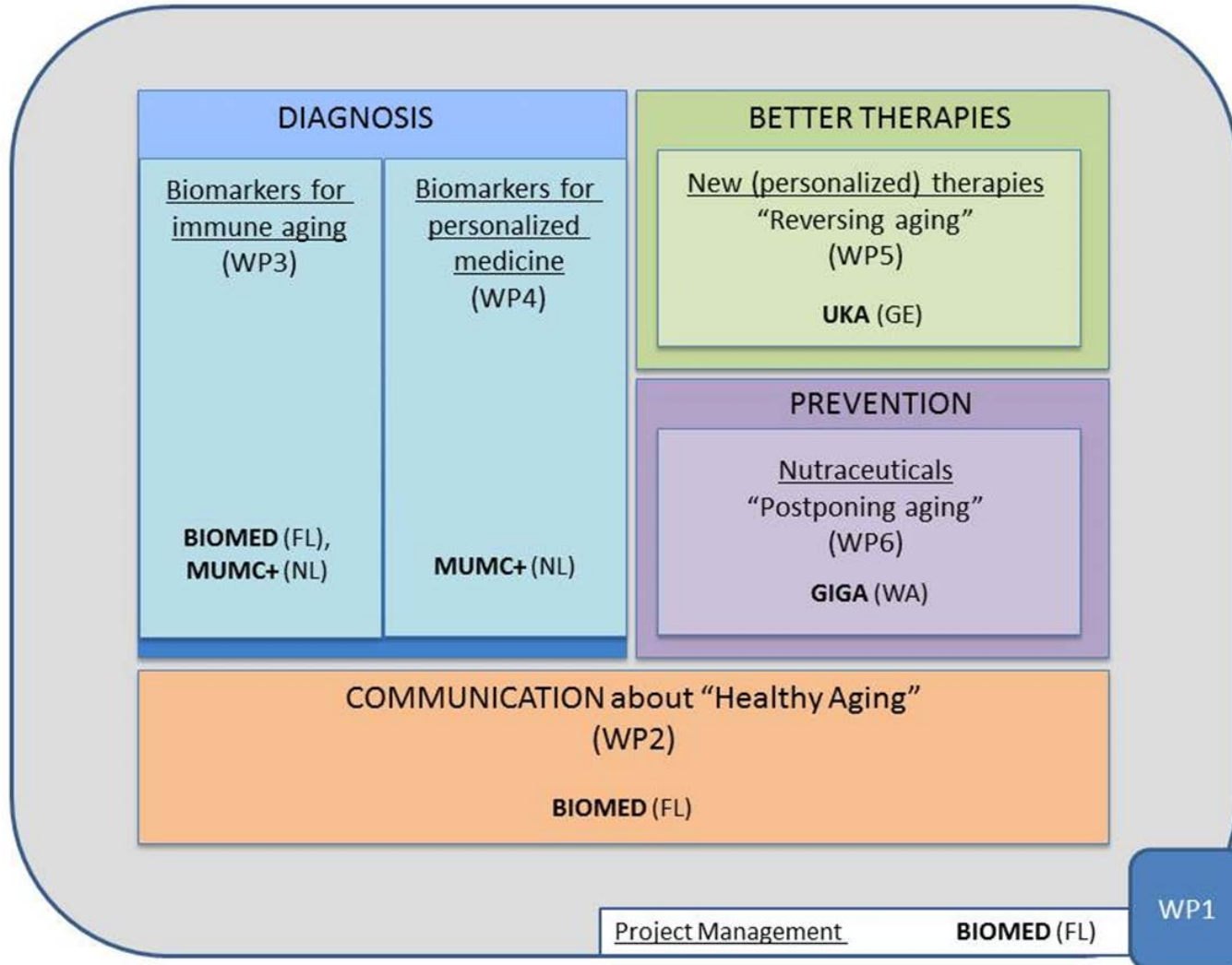


# Why – What - How - Who?

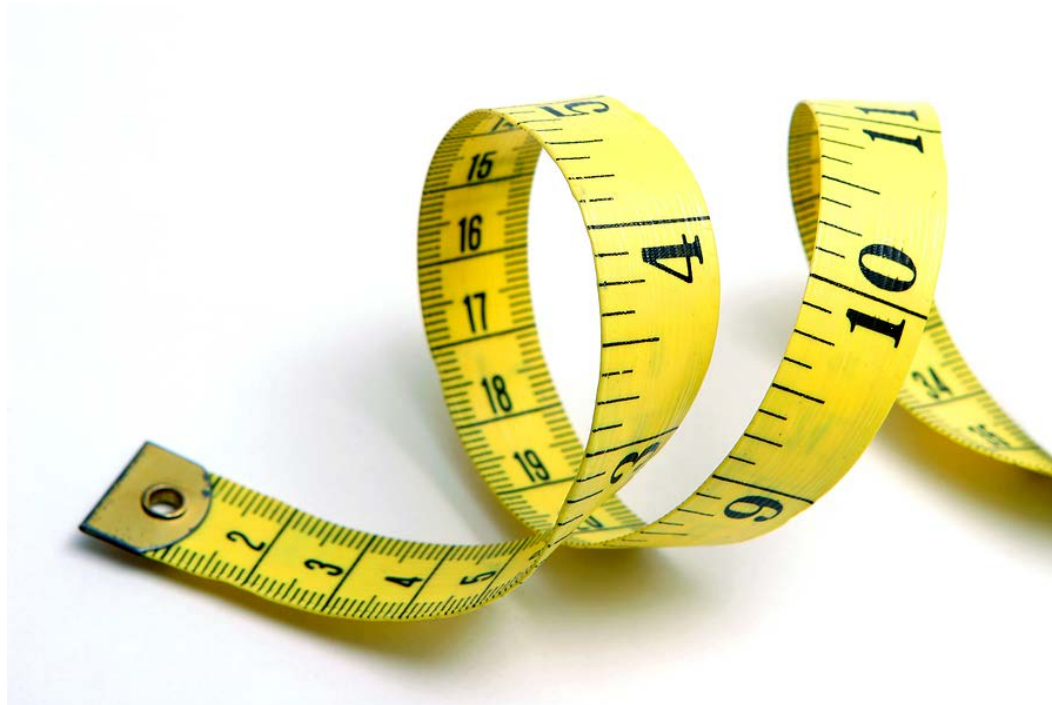
## “Early Detection and Prevention of Immune Aging in Health & Disease”



# Why – What - How - Who?



# Immunosenescence: can we measure it?





# Why – What - How - Who?

## Workpackage 3 & 4: Biomarkers for immune aging

- Cross analysis of available biomarkers
  - Multiple sclerosis, Rheumatoid arthritis
  - Cardiovascular disease
  - Chronic obstructive pulmonary disease, asthma
  - Healthy aged individuals
- Development of a **biomarker pattern/score** for the age of the immune system
- Development of **high-throughput screening** platform
- Development of **software** that helps MDs to chose personalized therapy → *Prodecis* : multifactorial decision support system

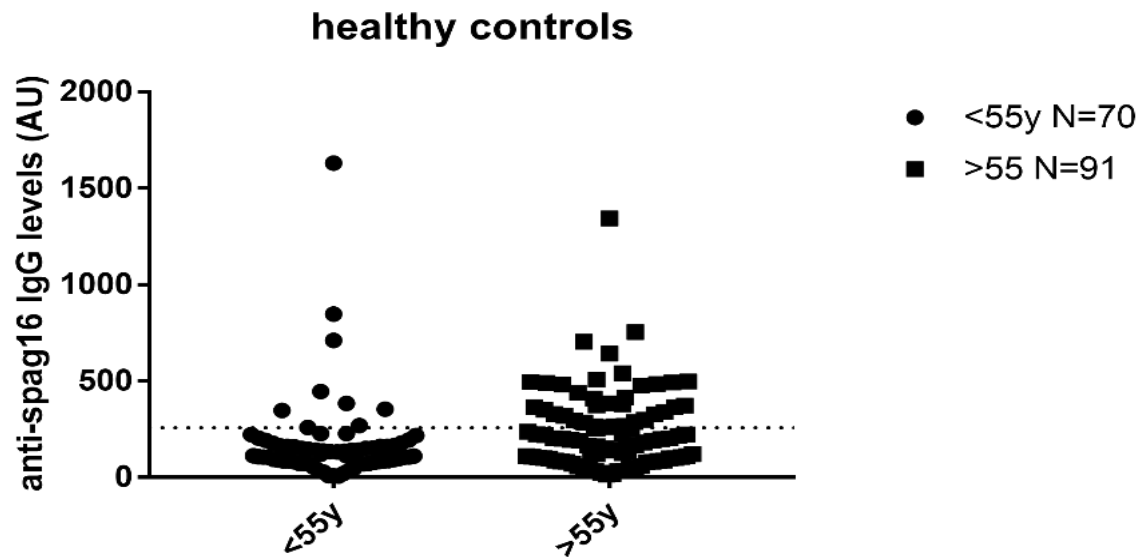
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# Biomarkers and Age: anti-SPAG16 antibodies

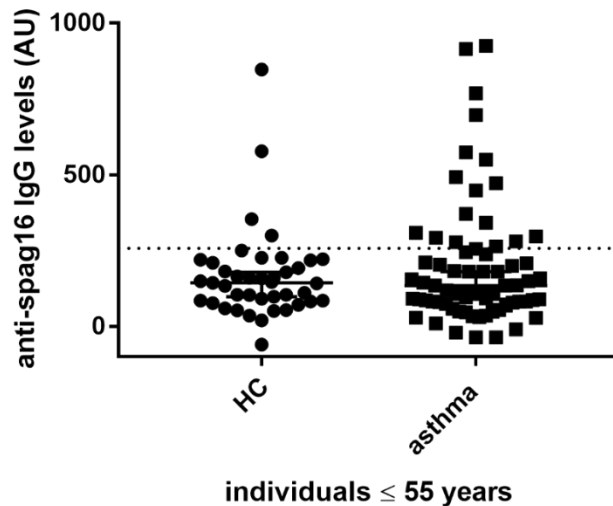
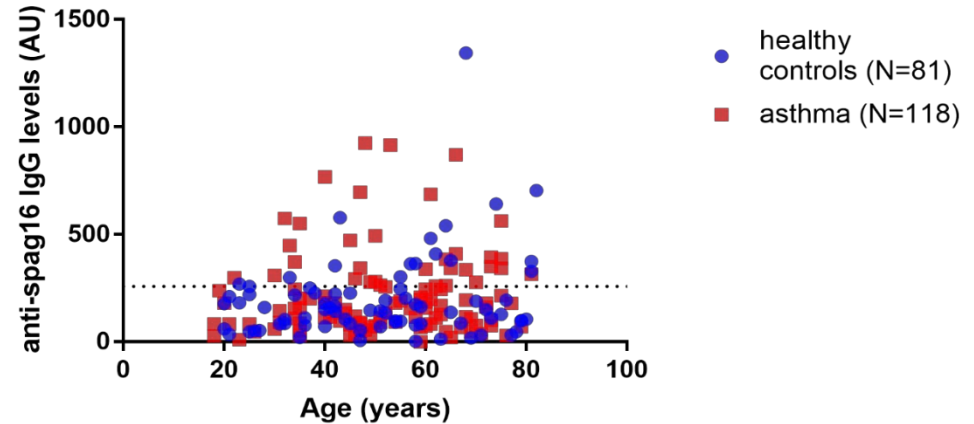
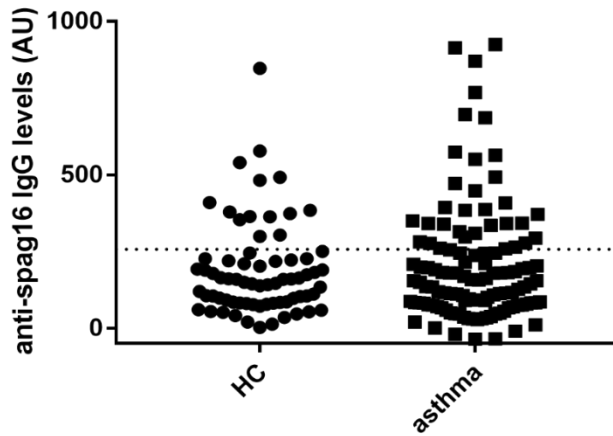
- Auto-antibodies discovered in multiple sclerosis patients
- Cross-analysis in healthy individuals: increase with age?



8.4% vs 28.6%



# Spag-16 antibodies in Asthma



Seropositivity is found in:

- **9,7 %** healthy young adults (4/41)
- **24,7 %** young adult asthma patients (17/69)

# Immunosenescence: can we stop or reverse it?



rejuvenate



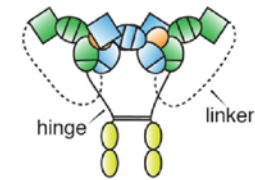


# Why – What - How - Who?

## Workpackage 5 & 6: Reverse Immune Aging

### New therapies (immune therapeutics)

- Development of **receptor fusion proteins** (RFPs = immune therapeutics) for targeting biomarkers (existing and new ones) involved in immune aging and chronic diseases
- Partners involved:  
**UKA, BIOMED, MUMC+, GIGA**

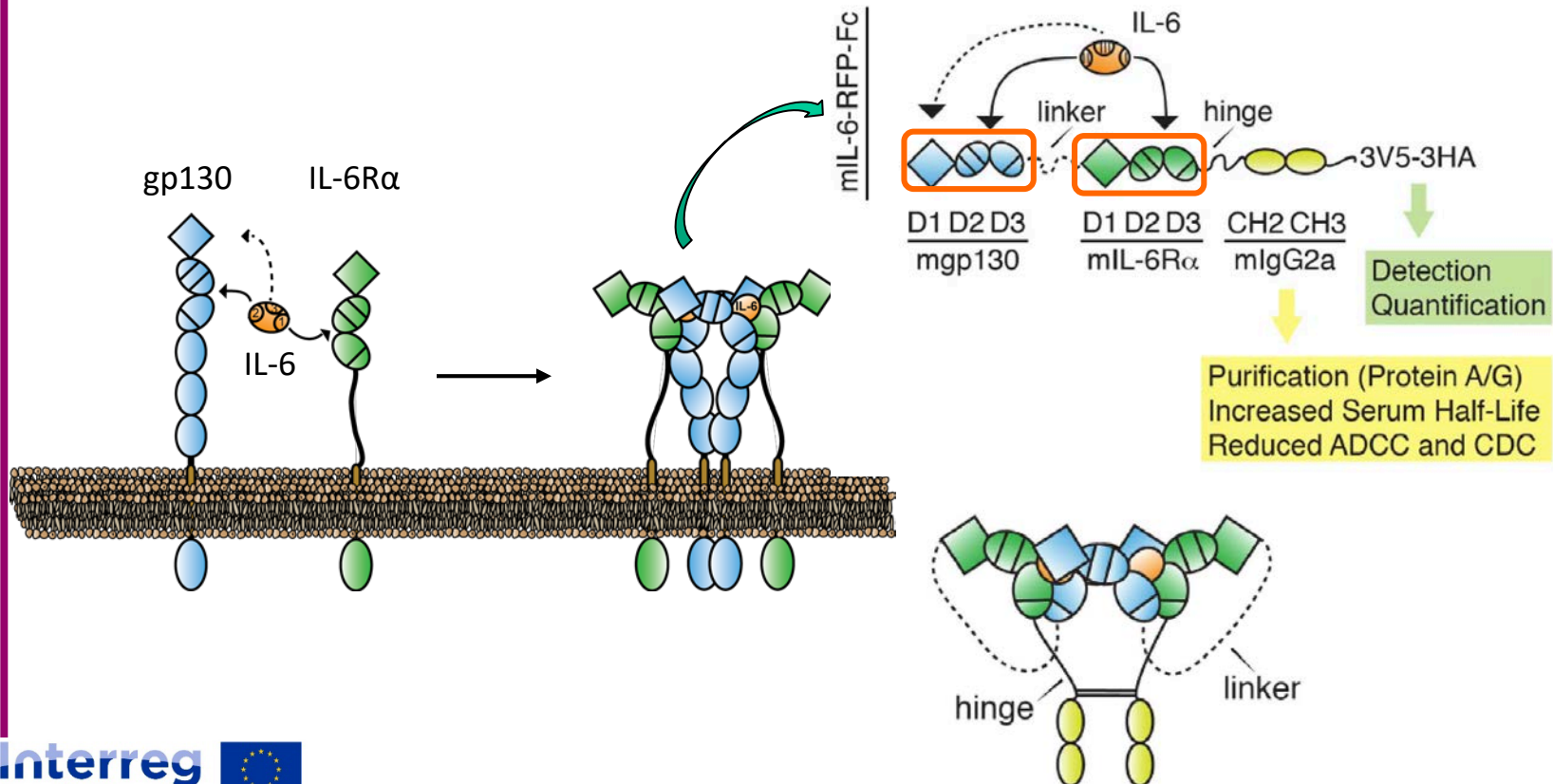


### Prevention and restoration of immune aging and aging related disease: nutraceuticals

- Selection of 10 nutraceuticals with the capacity to improve immune status
- In vitro screening of the nutraceuticals
- Developing pilot clinical study + approval by MEC
- Clinical study

# Workpackage 5: Immunotherapeutics

- Receptor fusion proteins to capture & inhibit inflammatory cytokines: IL-6 (involved in inflamm-aging)
- To be tested in animal models of aging and MS



# Why – What - How - Who?

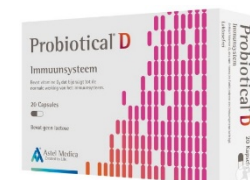
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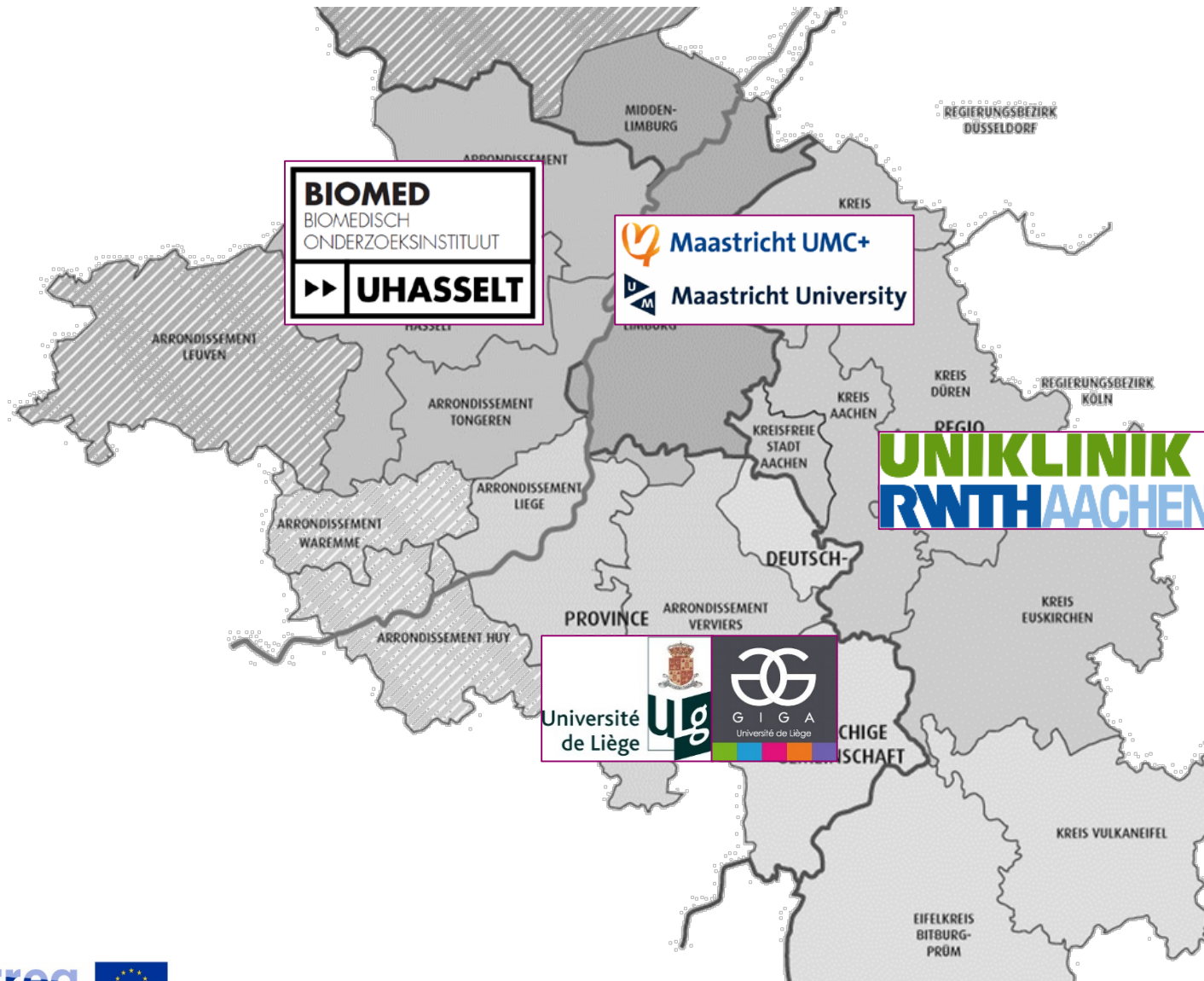
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## Why – What - How - Who?



## Why – What - How - Who?





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