

# MANNANOSE-BINDING LECTIN DETECTION ASSAY USING GOLD NANORODS

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## Introduction

### Importance of Mannose-Binding Lectin (MBL)

**Role:** MBL activates the complement system lectin pathway and the subsequent inflammatory mechanisms.

**Blood levels:** ~1 µg/mL in healthy adults.

The incidence and outcome of many human diseases are associated with and influenced by MBL activity and serum concentrations.

**Why is it important to measure MBL?**

- investigation of recurrent infections;
- monitoring patients at increased risk of developing diabetes complications and cardiovascular disease;
- elucidation of suspected immune system deficiencies;
- evaluation of medication therapies in immunosuppressed patients.

**How can we quantify MBL?**

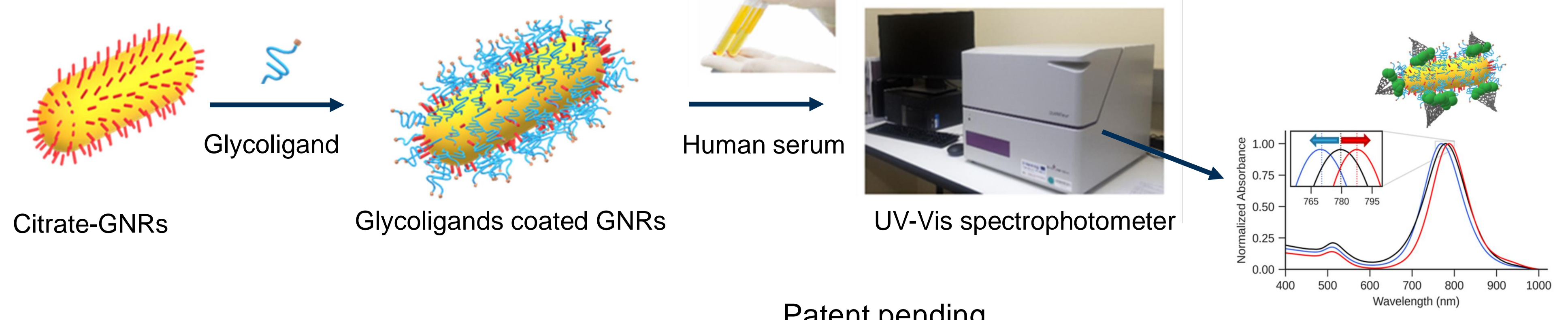
ELISA

**Problem:**

several incubation and washing steps; lengthy turnaround times.

**Aim:**

fast, non-invasive, one-step, wash-free nanoplasmonic-based assay for MBL detection with no dilutions required



Patent pending

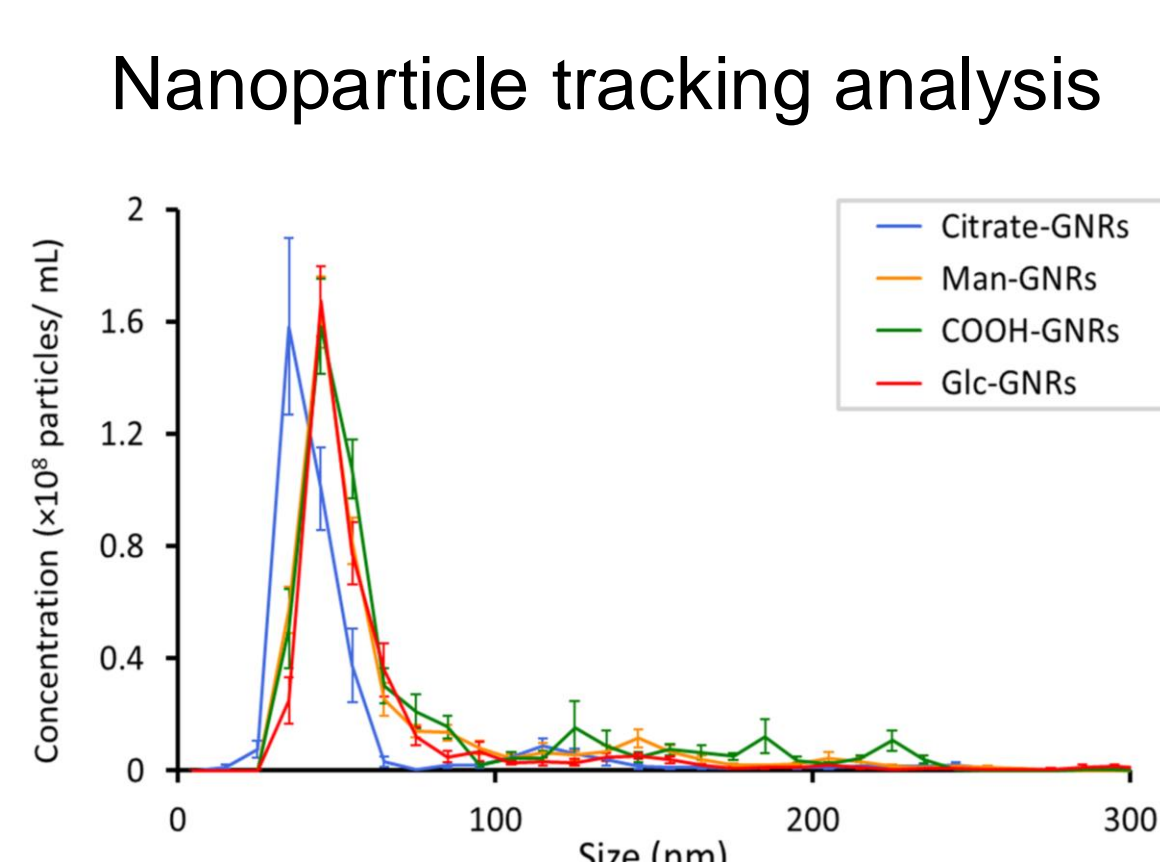
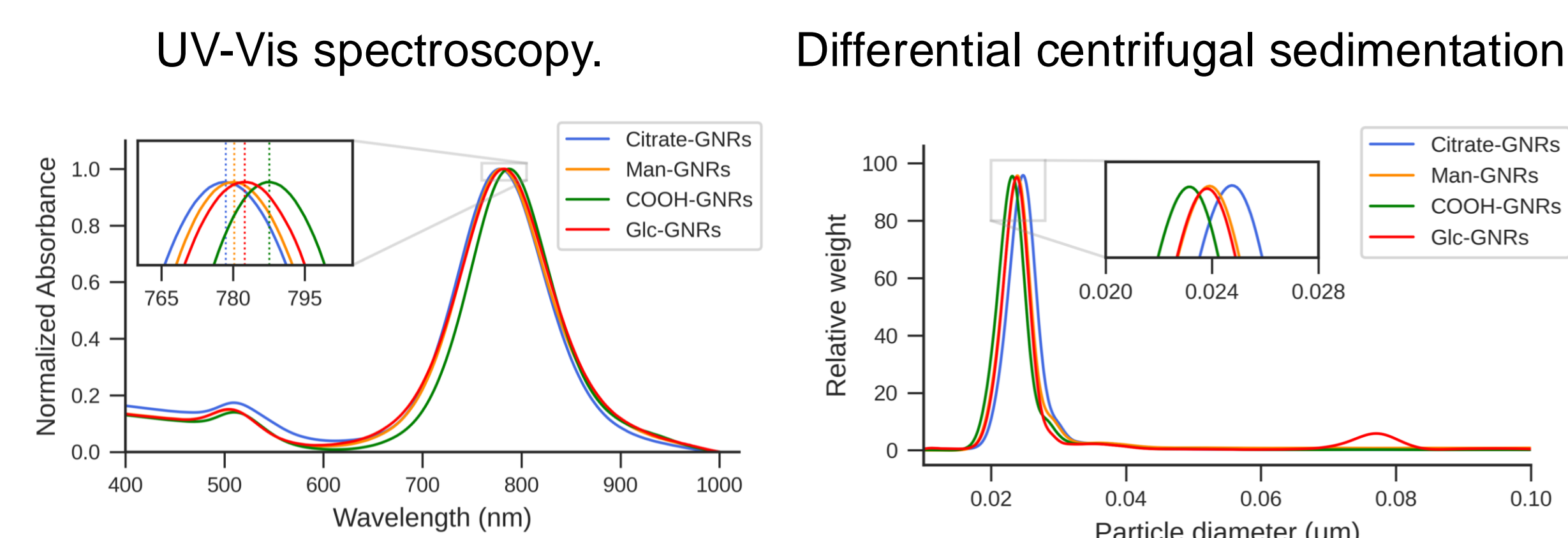
## Our Assay

### Assay specifications

- ✓ Label-free system based on the localised surface plasmon resonance (LSPR) of gold nanorods (GNRs)
- ✓ One-step reaction
- ✓ Performed directly in human serum without dilutions
- ✓ Read-out using simple microplate reader
- ✓ LoD ~ 160 ng/mL MBL
- ✓ Fast (15 min)
- ✓ Easy-to-use

## Assay characteristics

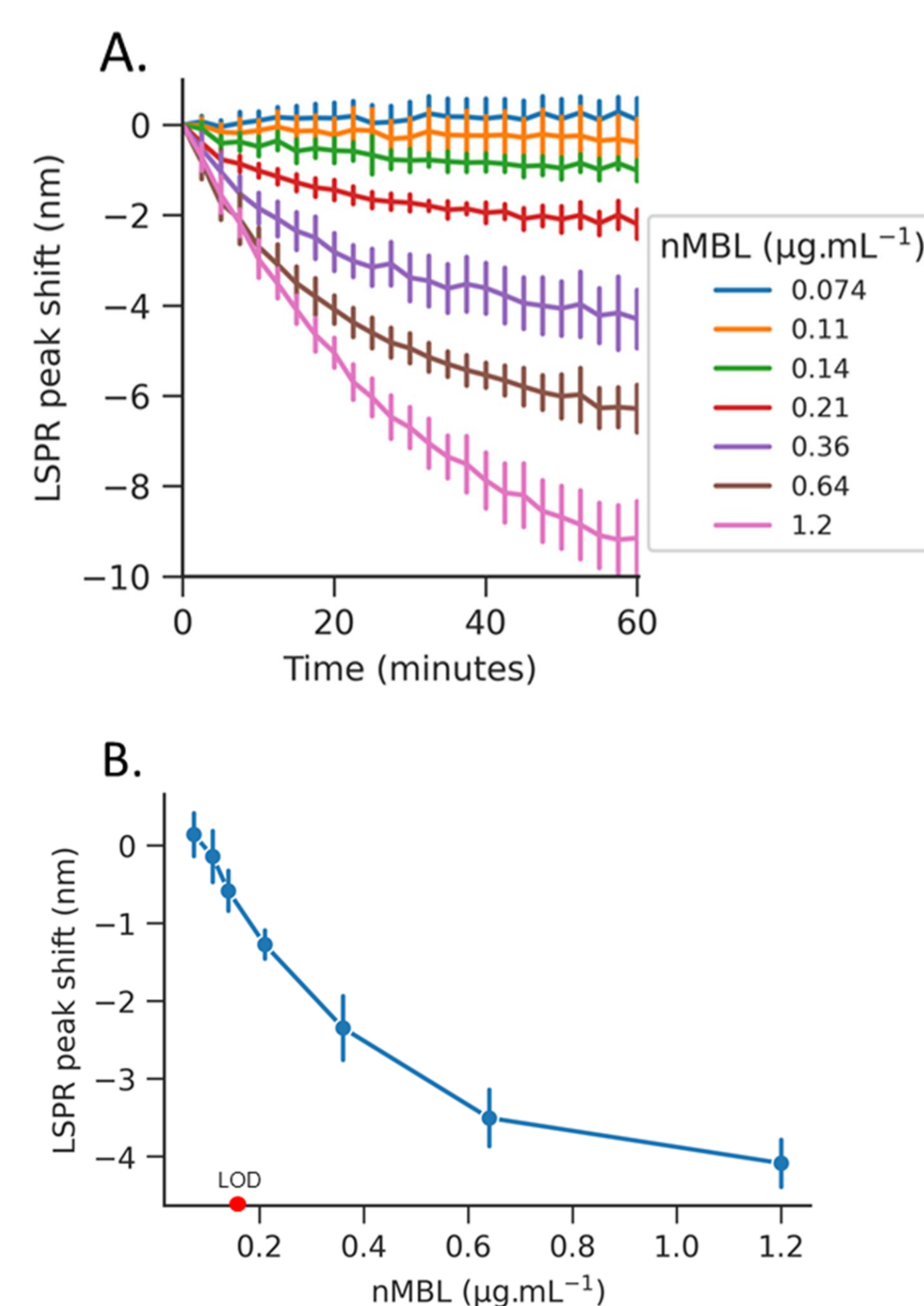
### Gold nanorods functionalization and coating density



- ✓ High colloidal stability.
- ✓ Successful attachment of the glyco ligands to the gold particle surface.

- Approx. 4 molecules of mannose-ligand × nm<sup>2</sup> of rods
- 15 µg/mL of Man-GNRs is the best rods concentration to achieve the highest performance of MBL binding assay in human serum

### MBL binding assay in human serum



- ✓ Quantitative analysis based on concentration-dependent LSPR shift (A)
- ✓ Good sensitivity after 15 minutes (B)
- ✓ LoD: 0.16 µg/mL
- ✓ Reproducible across four different coupling reactions from 2 batches of GNRs

### Quantification of MBL binding to Man-GNRs

- ✓ MBL strongly bound on the Man-GNR surface
- ✓ 11 to 13 MBL molecules binding onto each functionalized nanorod

Man-GNRs (µg/mL)	MBL bound (ng/mL and %) by ELISA	MBL bound (ng/mL and %) by WB
15	210 ± 30 (18%)	227 ± 6 (19%)
30	430 ± 40 (36%)	370 ± 20 (31%)
60	810 ± 20 (68%)	740 ± 40 (61%)
80	955 ± 34 (80%)	890 ± 20 (74%)

## Acknowledgements

This project received funding from the European Commission under grant N° 814236 of the Marie Curie European Training Network (MC-ETN) NanoCarb. This work is furthermore supported by VITO as well as by Hasselt University.