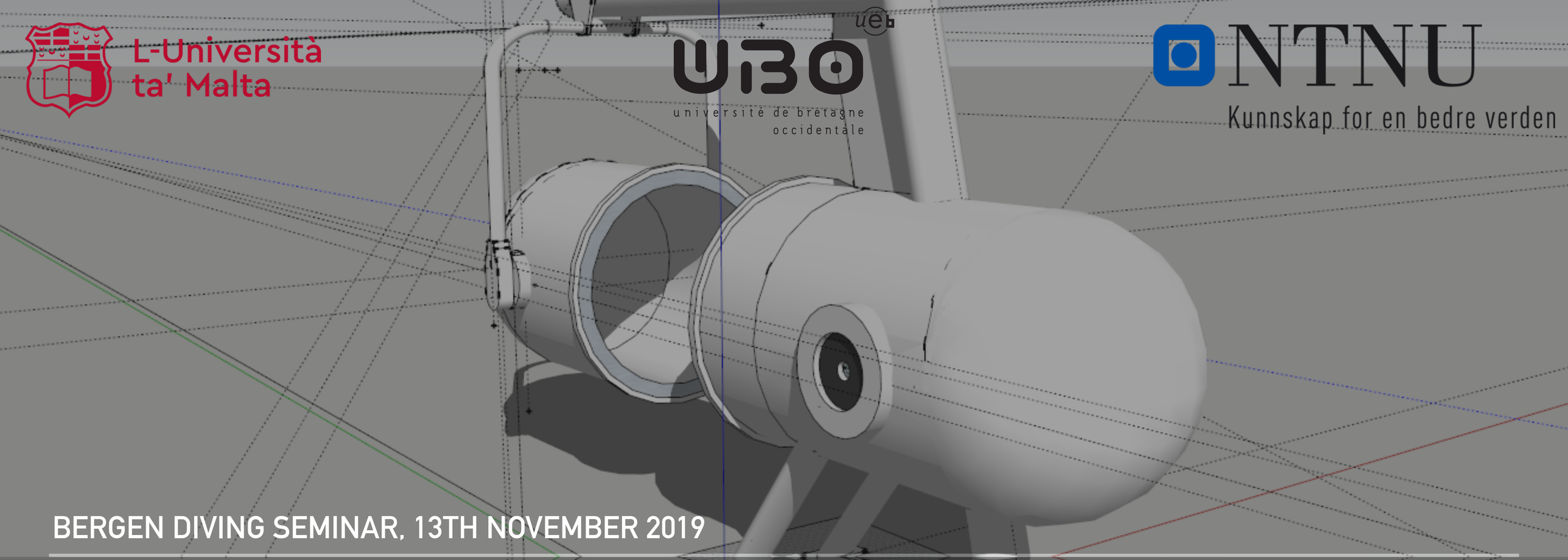
L-Università ta' Malta

UBO université de bretagne occidentale

NTNU
Kunnskap for en bedre verden



BERGEN DIVING SEMINAR, 13TH NOVEMBER 2019

# PROTEOMICS APPLIED TO DECOMPRESSION SICKNESS

J. LAUTRIDOU

# A SYSTEMIC PATHOLOGY

A wide set of symptoms...

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And a wide set of hypothetical exogenous and endogenous factors

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A wide set of symptoms...

And a wide set of hypothetical exogenous and endogenous factors

**INFLAMMATION**

**ROS PRODUCTION**

**THROMBOSIS**

**VASCULAR DYSFUNCTION**

**HYDRATION**

**MICROPARTICLES...**

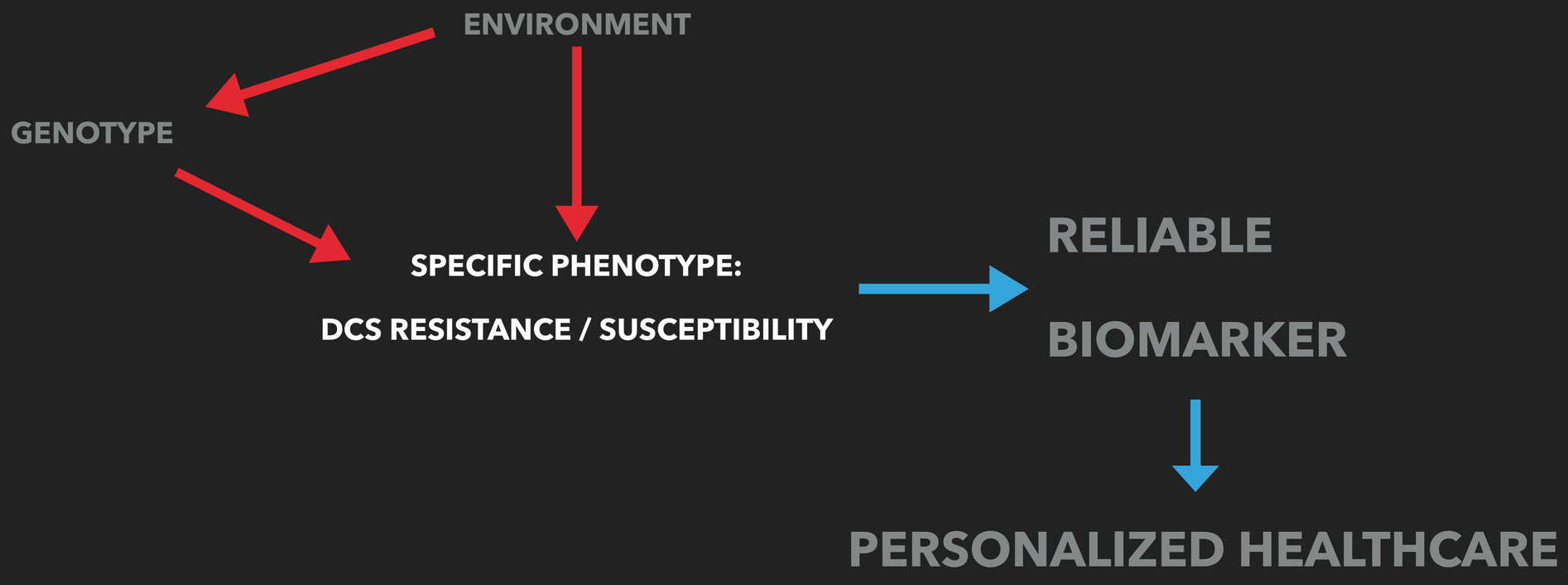
# A SYSTEMIC PATHOLOGY

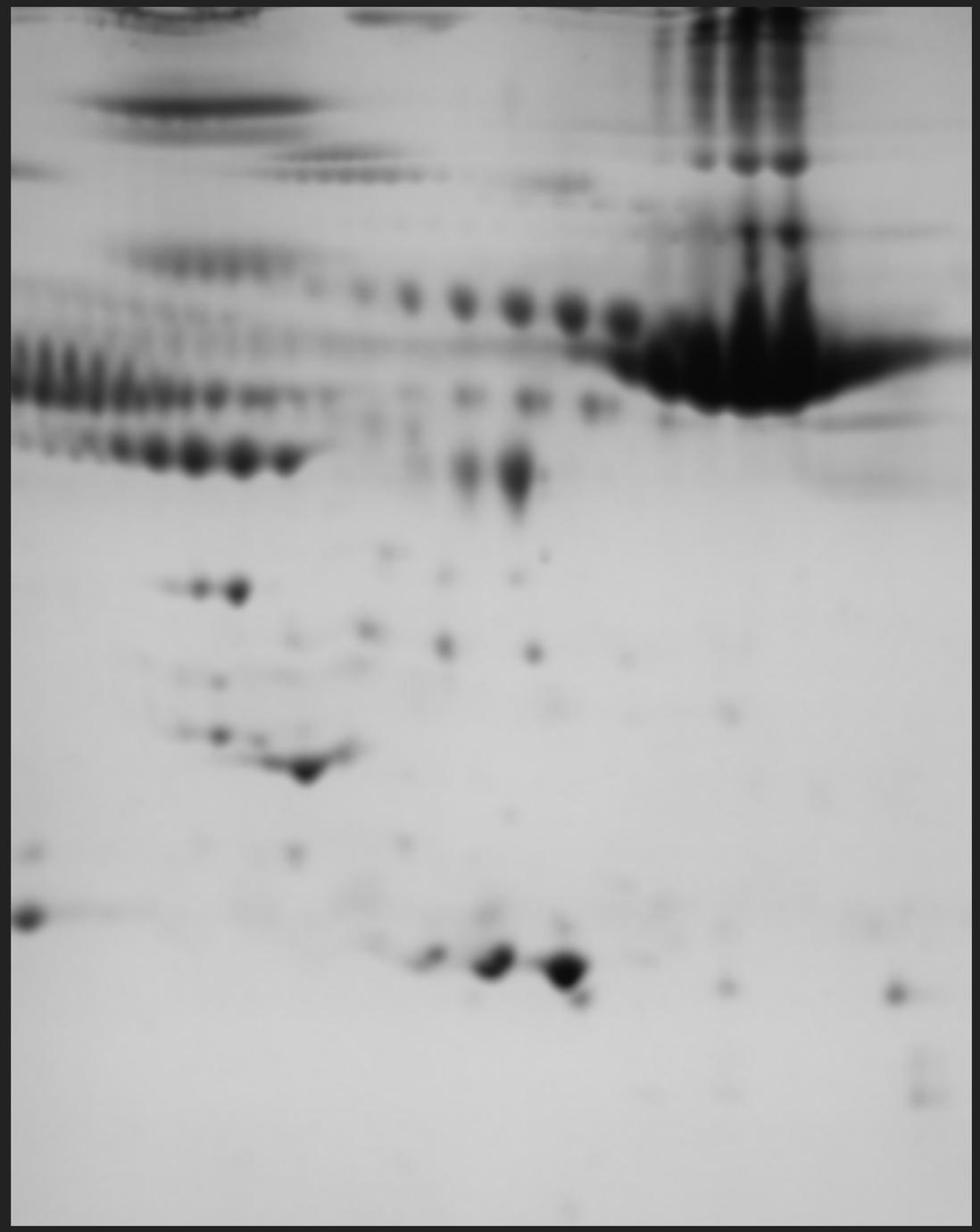
A wide set of symptoms...

And a wide set of hypothetical exogenous and endogenous factors

**LACK OF INTEGRATIVE DATA**

# A NEW SET OF TOOLS:





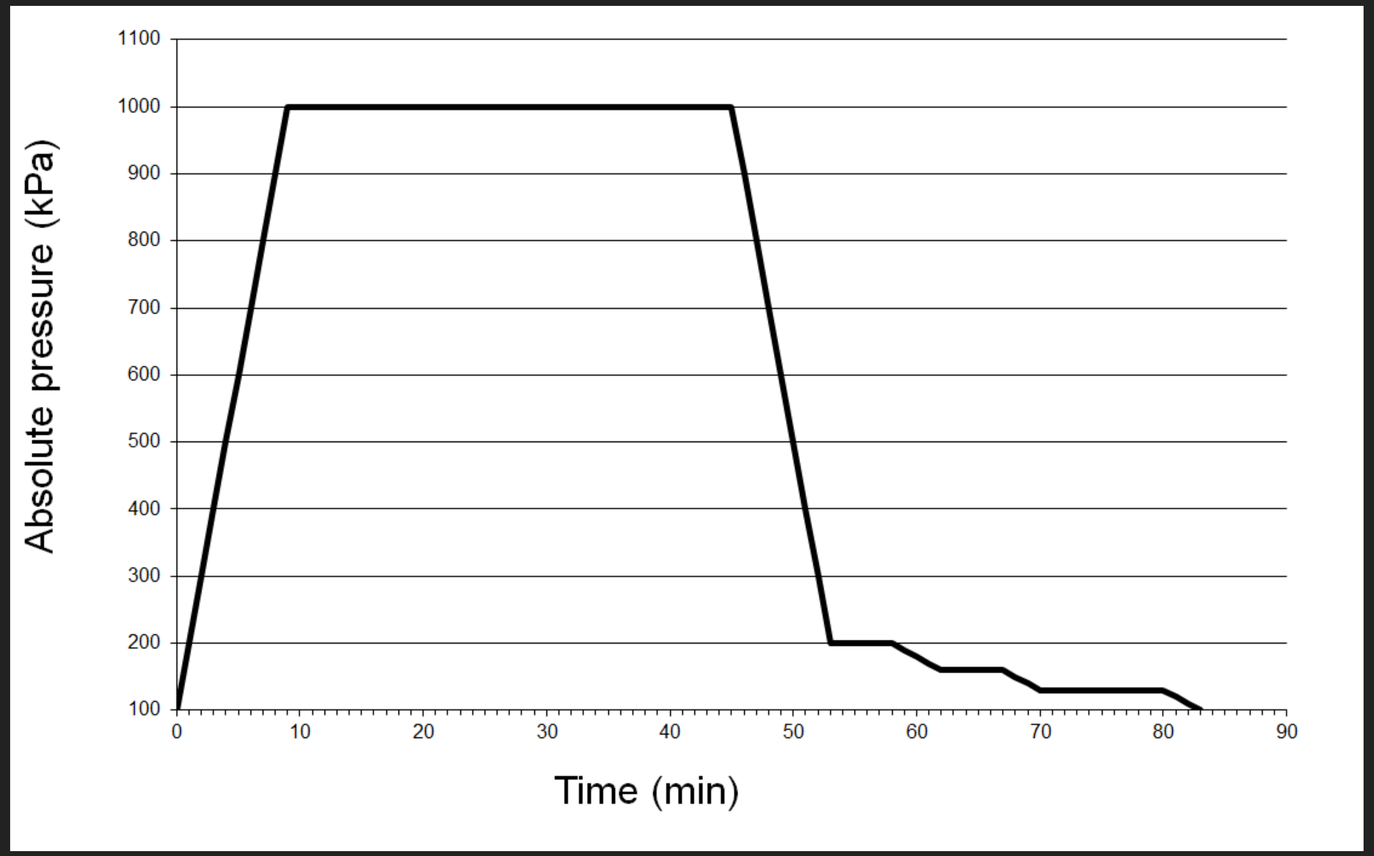
A NEW BIO MARKER?

# EFFECT OF SIMULATED AIR DIVE AND DCS ON THE PLASMA PROTEOME OF RATS

Lautridou et. al., Proteomics: Clinical Applications, 2016

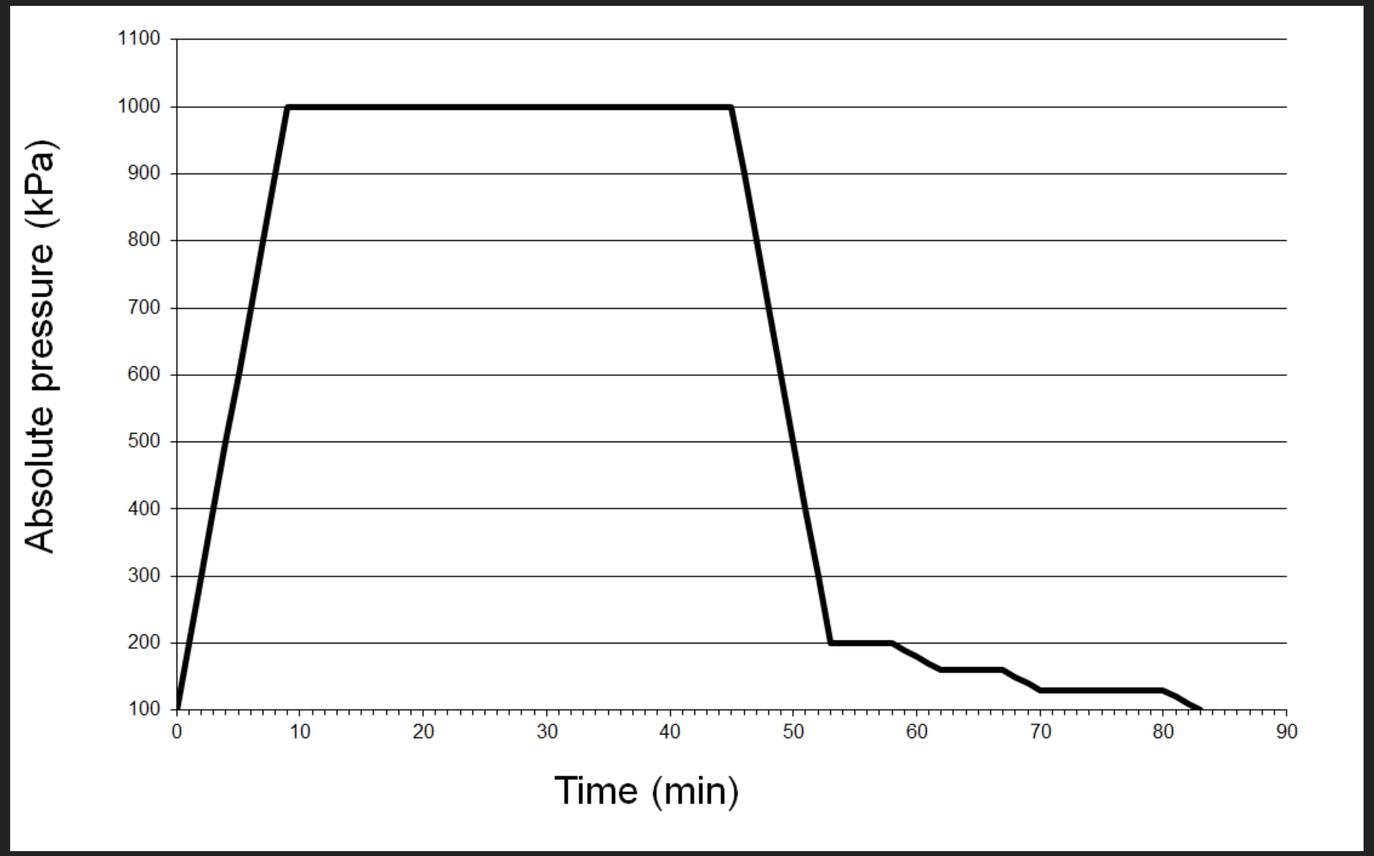
# A NEW BIO MARKER?

- 18 male rats
- Simulated air dive: control vs diving

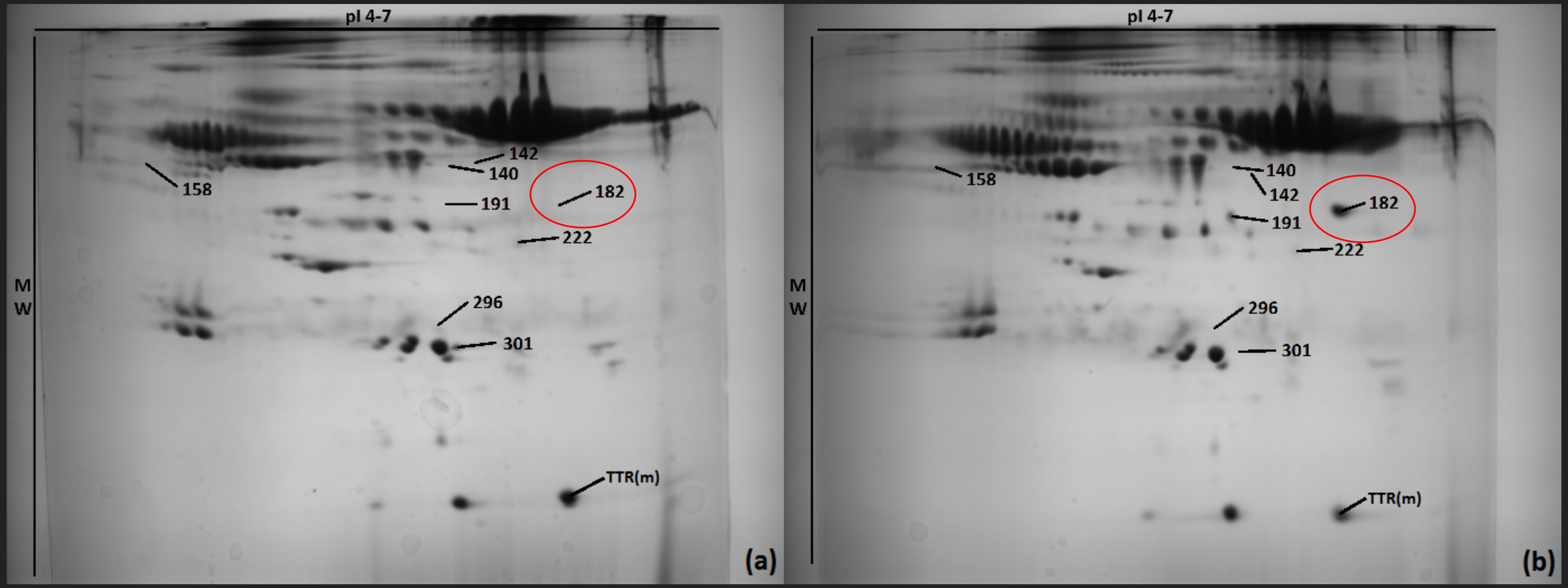


# A NEW BIO MARKER?

- 18 male rats
- Simulated air dive: control vs diving
- Bi-dimensional electrophoresis
- Mass Spectrometry



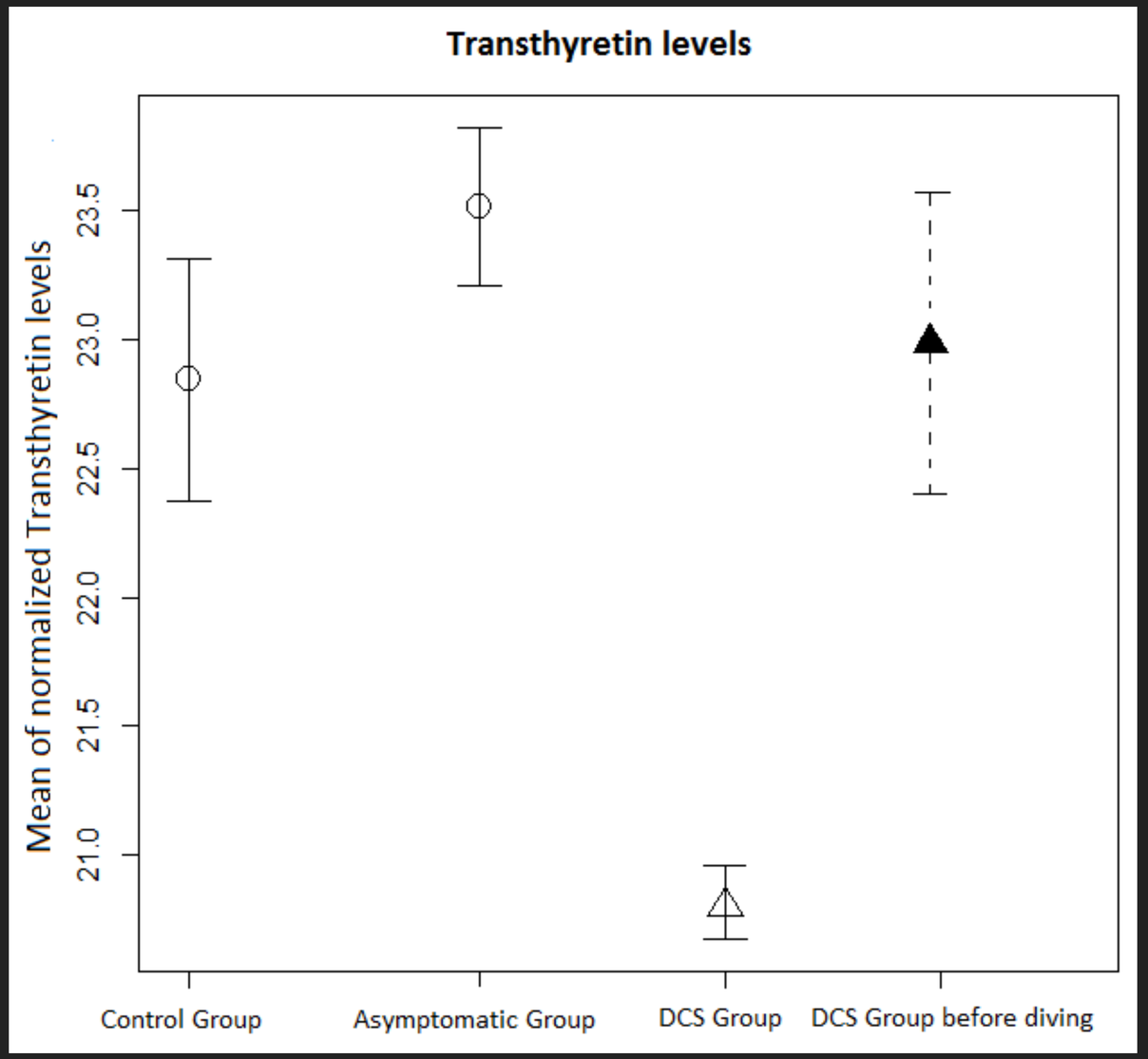
# A NEW BIOMARKER?




**DCS**

**ASYMPTOMATIC**

# A NEW BIO MARKER?

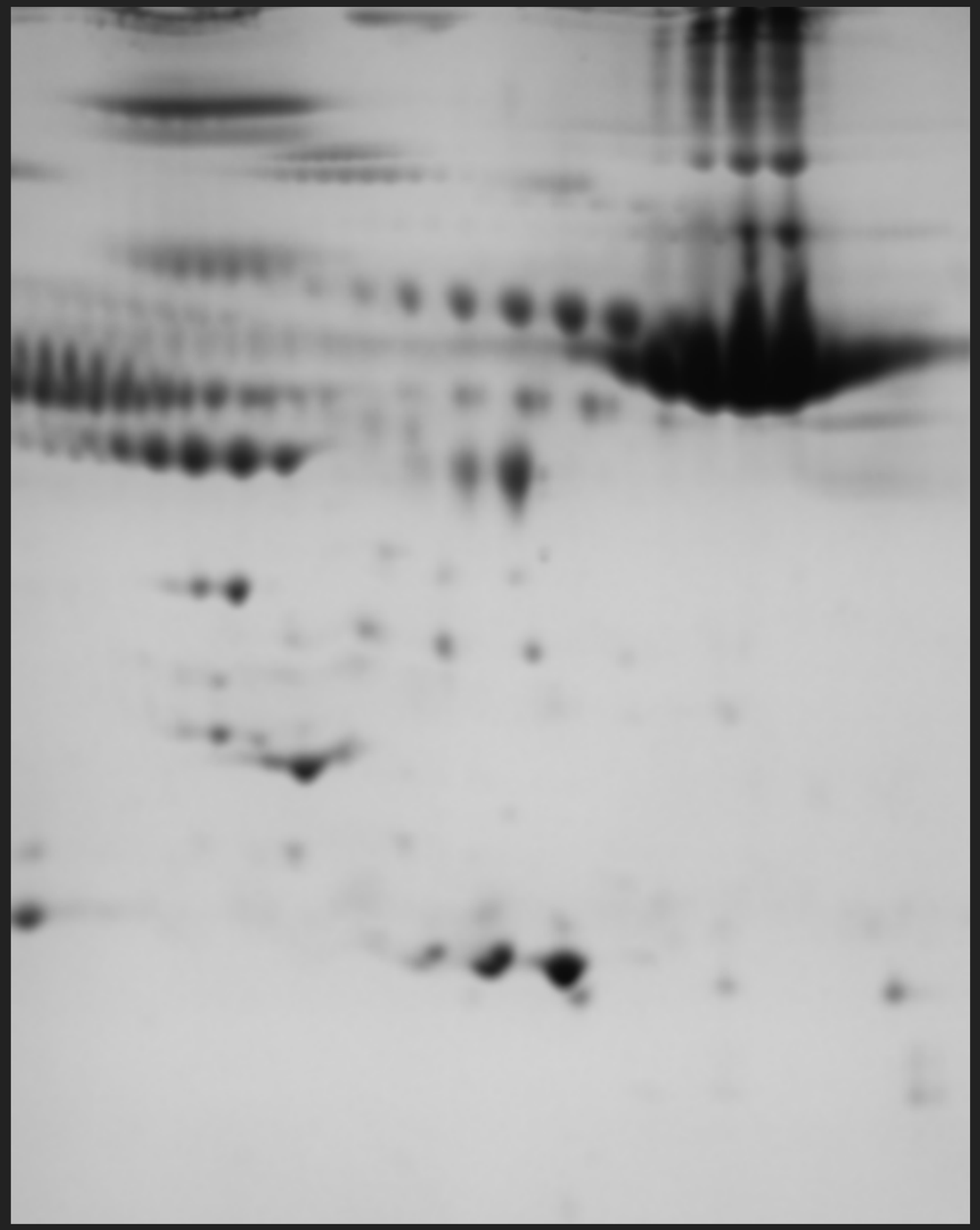



n=4 n=4 n=4

# A NEW BIO MARKER?

| Description | | MASCOT score | Mass (kDa) | Coverage (%) | #Peptides (specific + duplicates) | Fold (asymptomatic/DCS) |
|---|---|---|---|---|---|---|
| 140 | Alpha-1-antiproteinase | 57,55 | 46 106 | 7,40 | 3 + 0 | 0, 57 |
| 142 | Alpha-1-antiproteinase | 97,13 | 46 106 | 9,31 | 4 + 2 | 0, 70 |
| 158 | Serine protease inhibitor A3K | 174,81 | 46 532 | 12,77 | 4 + 2 | 2, 34 |
| 182 | TTR OS = *Rattus norvegicus* | 826,91 | 15 709 | 67,35 | 8 + 7 | 6, 18 |
| 191 | Alpha-1-macroglobulin | 580,99 | 167 019 | 8,83 | 10 + 7 | 1, 93 |
| 222 | Alpha-1-macroglobulin | 369,63 | 167 019 | 6,13 | 8 + 3 | 0, 7 |
| 296 | Apolipoprotein A-I | 505,28 | 30 043 | 40,66 | 9 + 5 | 0, 68 |
| 301 | Apolipoprotein A-I | 463,06 | 30 043 | 39,93 | 8 + 5 | 0, 28 |

**INFLAMMATION?**



DCS VERSUS DECOMPRESSION STRESS

# EVOLUTION OF THE PLASMA PROTEOME OF DIVERS BEFORE AND AFTER A SINGLE SCUBA DIVE

Lautridou et. al., Proteomics: Clinical Applications, 2017

# DCS VERSUS DECOMPRESSION STRESS

- 12 male divers
- Single dive: 18 msw, 47-mn bottom time, direct ascent (9 msw/mn)
- 3 venous blood sampling times:
  - Before diving
  - 30 mn after diving
  - 2 h after diving
- 4 individuals with different VGE scores, ranging from 1 to 4B
- Bi-dimensional electrophoresis

| Parameter | Mean ± SD |
|---|---|
| Age, years | 39.3 ± 9.2 |
| Height, cm | 186 ± 6.0 |
| Weight, kg | 88.0 ± 11.6 |
| BMI | 25.3 ± 2.8 |

| Protein spot | Before diving/30 min after diving ratio | Before diving/2 h after diving ratio | 30 min after diving/2h after diving ratio | Modified *p*-value ANOVA (F-test) |
|---|---|---|---|---|
| 92 | 3.63 | 1,90 | 0.52 | 0.13 |
| 349 | 1.94 | 1.47 | 0.75 | 0.13 |
| 125 | 0.42 | 1.81 | 4.33 | 0.15 |
| 27 | 0.80 | 2.38 | 2.98 | 0.21 |
| 88 | 0.76 | 0.55 | 0.73 | 0.22 |
| 117 | 1.44 | 1.58 | 1.10 | 0.22 |
| 463 | 0.68 | 1.27 | 1.86 | 0.22 |

# DCS VERSUS DECOMPRESSION STRESS

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| 463 | 0.68 | 1.27 | 1.86 | 0.22 |

**NO SIGNIFICANT CHANGES WITH DECOMPRESSION STRESS ONLY**

**PROTEOMICS SEEMS TO DISCRIMINATE BETWEEN DECOMPRESSION STRESS AND DECOMPRESSION SICKNESS**

# WHY NOT DIVERS IN DCS?

- Decompression stress vs decompression sickness: is proteomics discriminant enough?

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# WHY NOT DIVERS IN DCS?

- Decompression stress vs decompression sickness: is proteomics discriminant enough?
- We did not find enough divers in DCS
- We did not find any diver wanting to develop DCS symptoms…

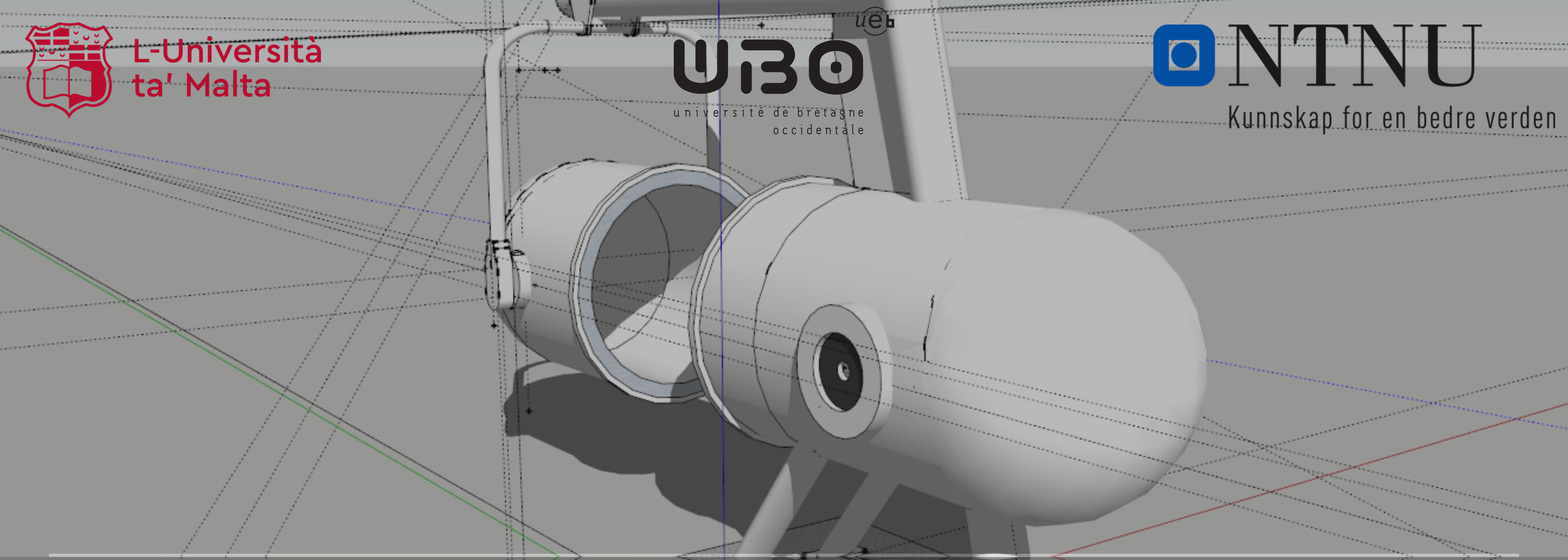
# ONGOING FOLLOW UP STUDY

- Collaboration with Malta: a DCS goldmine
- Third and last proteomic study: DCS vs Control among humans

**SIGNIFICANT CHANGES OF THE PLASMA PROTEOME?**

**SIGNIFICANT VARIATIONS OF TRANSTHYRETIN?**

**INFLAMMATION PROCESSES?**




# THANK YOU FOR YOUR ATTENTION

# TRANSTHYRETIN

- Plasmatic protein
- **Trans**port of **thy**roxin and **retin**ol
- Significant amount  200mg/L (albumin : 40g/L)
- Involved in neuro and cardiopathies
- Insoluble Fibers
- Sensitive to pH changes : depolymerization
- Resistant to SDS (Sodium Dodecyl Sulfate)
- Sensitive to heating: thick fibrils at 55°C