

# New bio-tribo-mineralogical expertise protocol for joint implant wear particles. Application: Medical diagnostic and articular implants optimization

V. Massardier<sup>1,2</sup>, M. Vincent<sup>2</sup>, C. Batailler<sup>3</sup>, S. Lustig<sup>3</sup>, J. Geringer<sup>4</sup>, E. Renault<sup>5</sup>, M. Guichardant<sup>6</sup>, A.M. Trunfio-Sfarghiu<sup>1</sup>

<sup>1</sup>Univ Lyon, INSA-Lyon, CNRS UMR5259, LaMCoS, F-69621, France

<sup>2</sup>MINAPATH Development, Villeurbanne, France

<sup>3</sup>Orthopedic Surgery Department, Croix-Rousse Hospital, Lyon, France

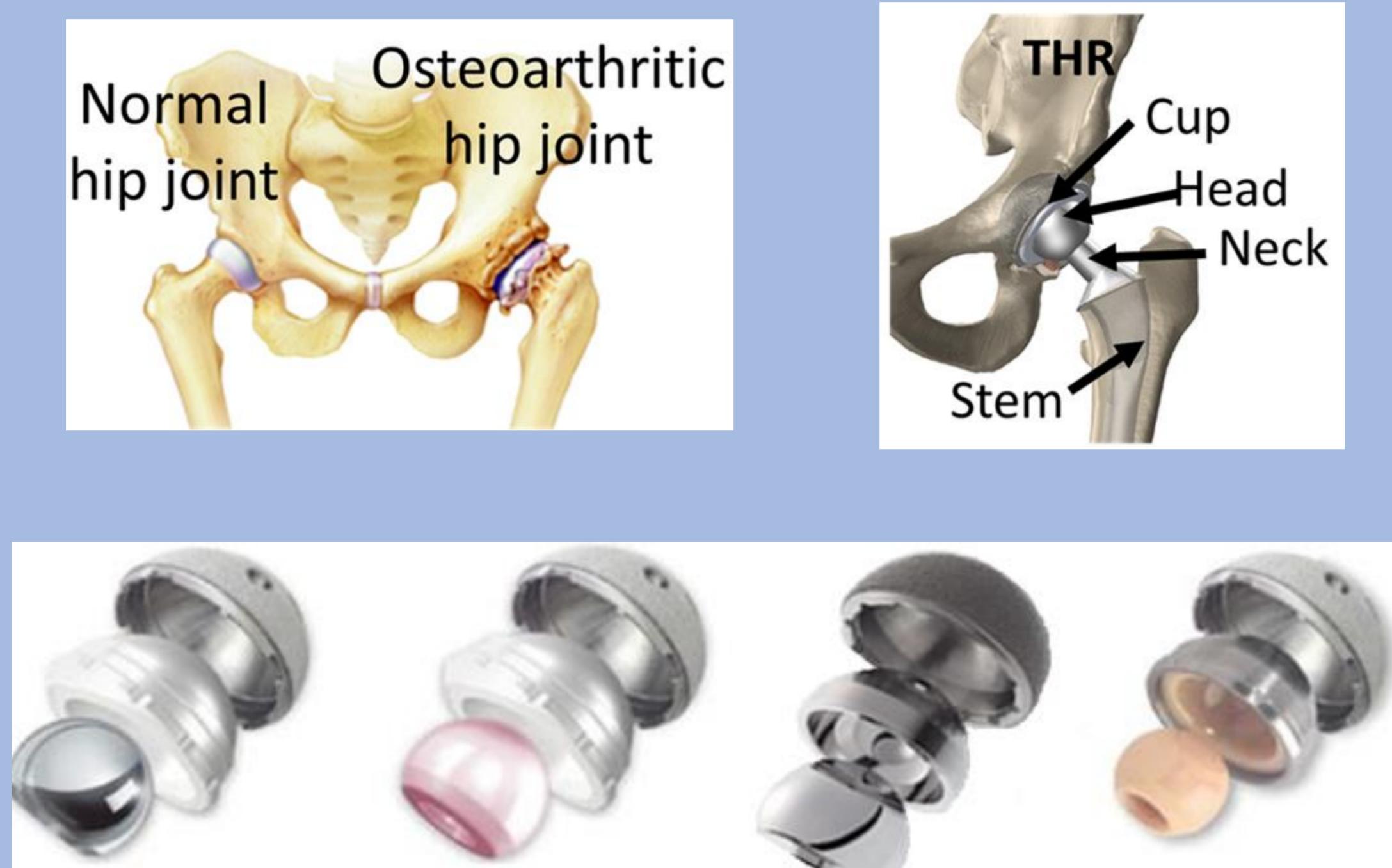
<sup>4</sup>CIS-EMSE, SAINBIOSE, INSERM U1059, F-42023

<sup>5</sup>Corin France SAS, Montbonnot-Saint-Martin, France

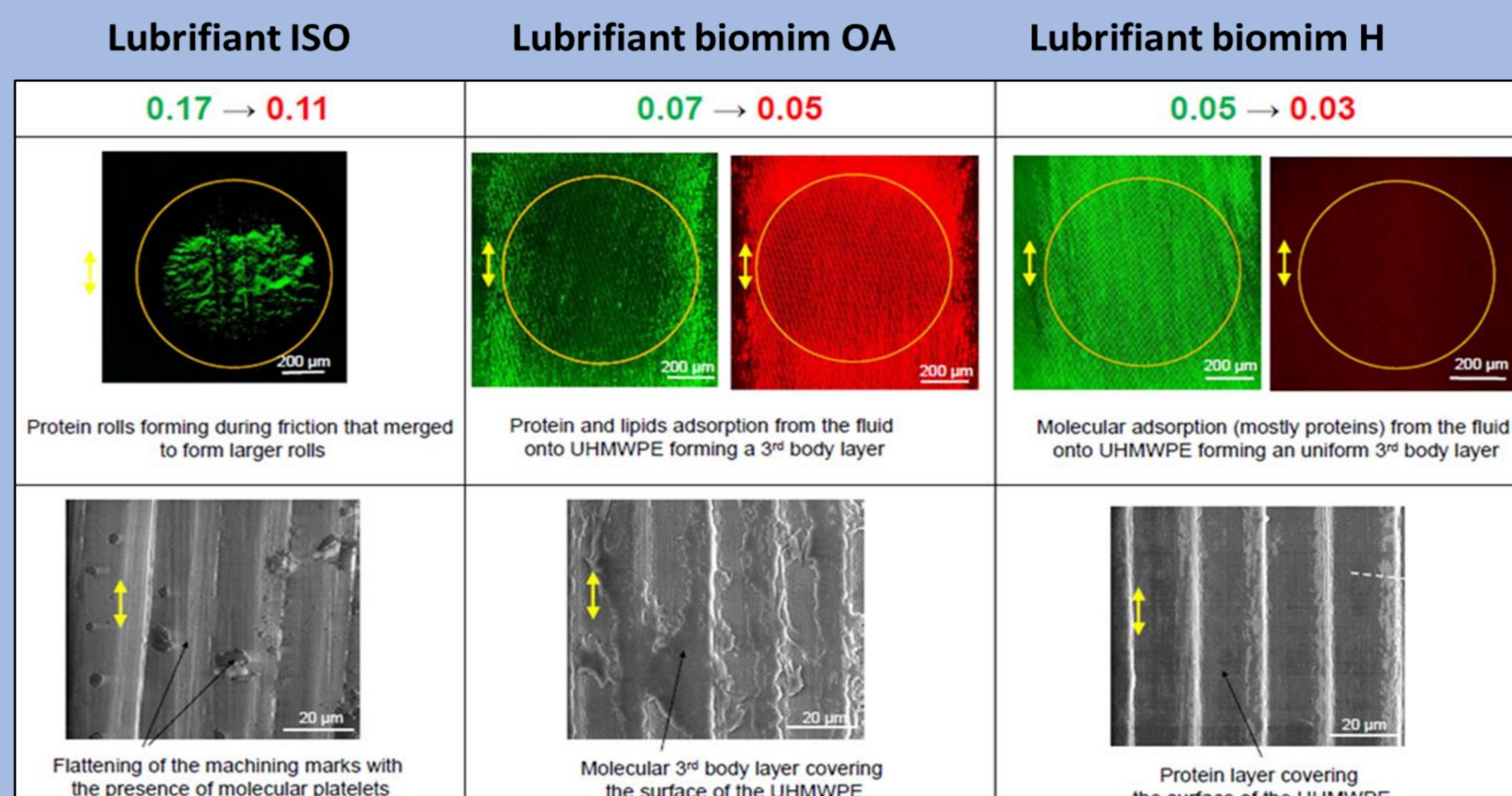
<sup>6</sup>Univ-Lyon, Inserm UMR 1060, Inra UMR 1397 (CarMeN Laboratory), IMBL INSA-Lyon



## In vitro context



The four principal materials couples and  
*in vitro* ISO tests wear rates

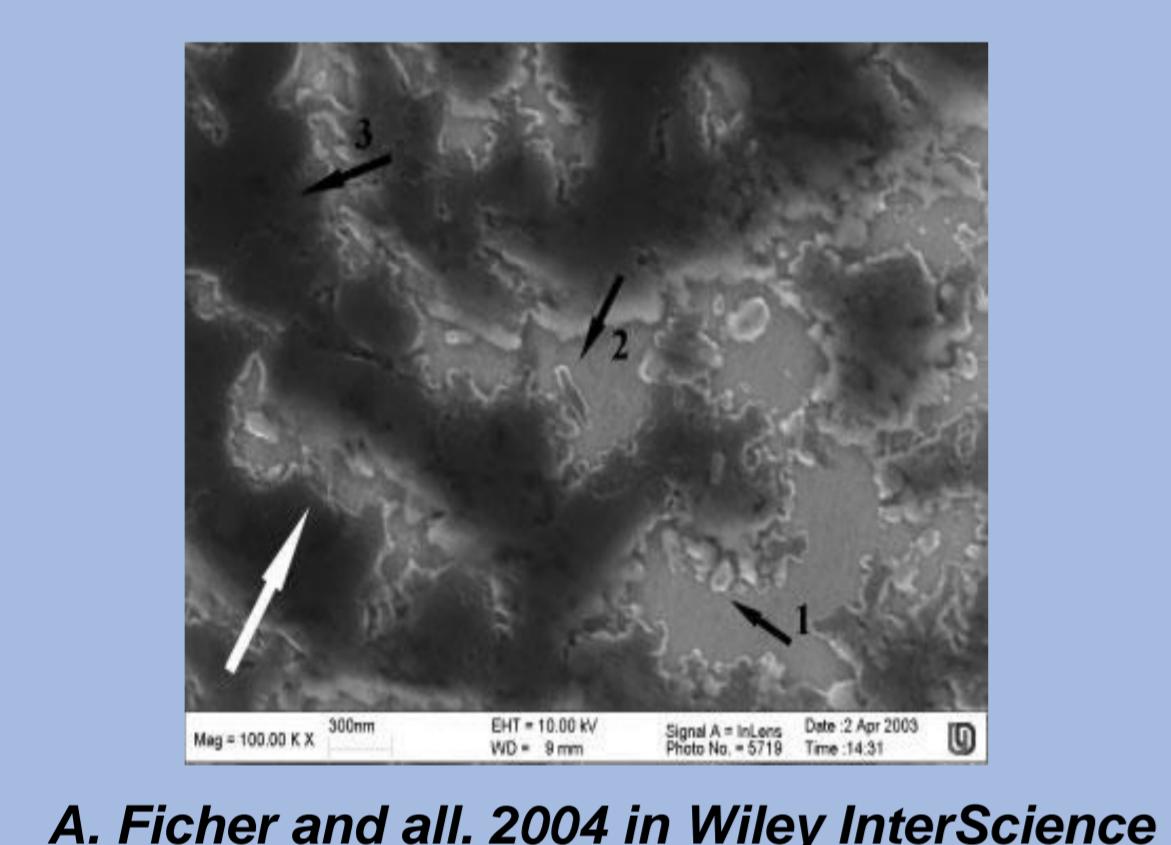


Wear diminution / biological molecules adsorption augmentation

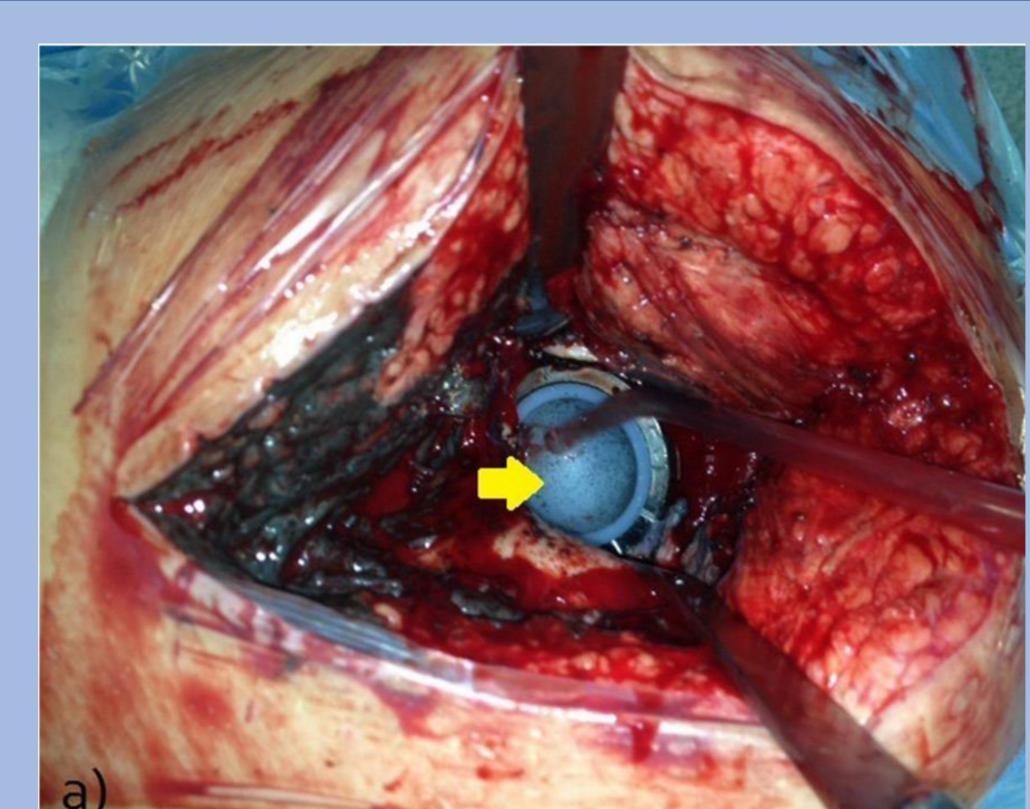
Sava, <https://doi.org/10.1016/j.biorti.2017.11.001>

*in vitro* test with biomimetic lubricant

## In vivo reality

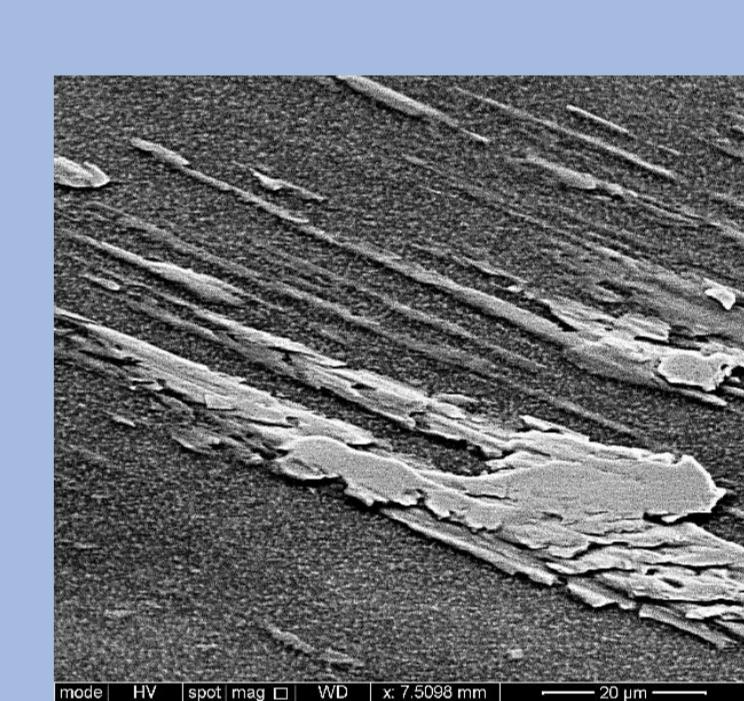
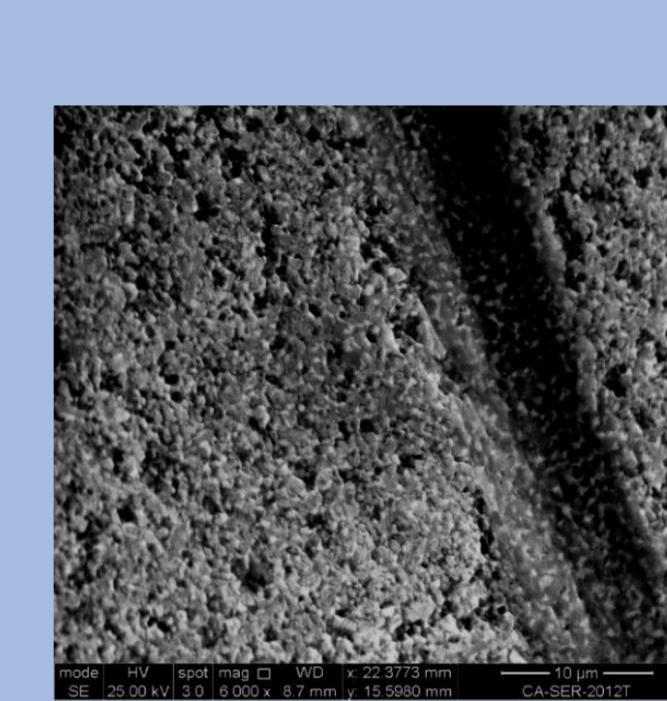
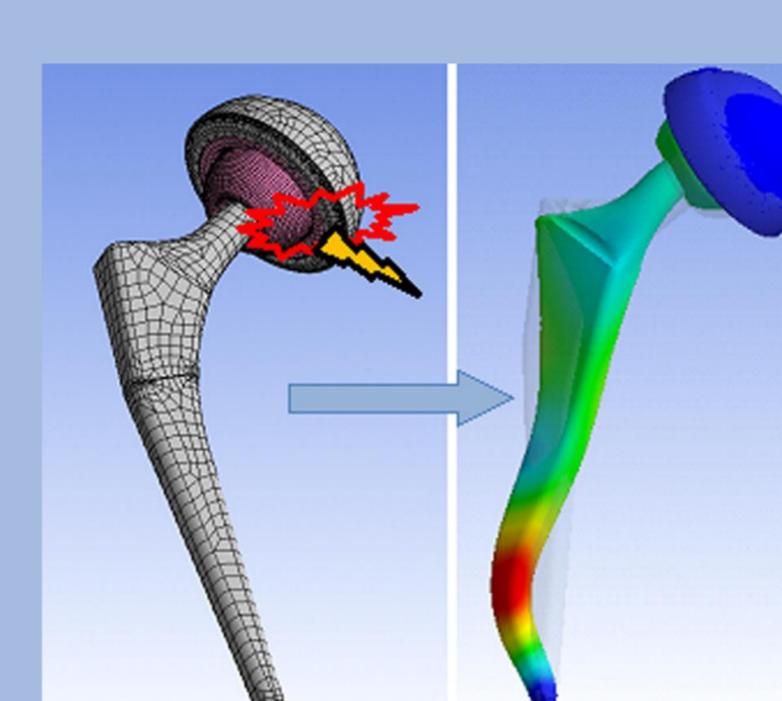


A. Fischer and all. 2004 in Wiley InterScience



European Journal of Radiology Open 2 (2015) 3–6

Metal/metal *in vivo* reality : the metallosis

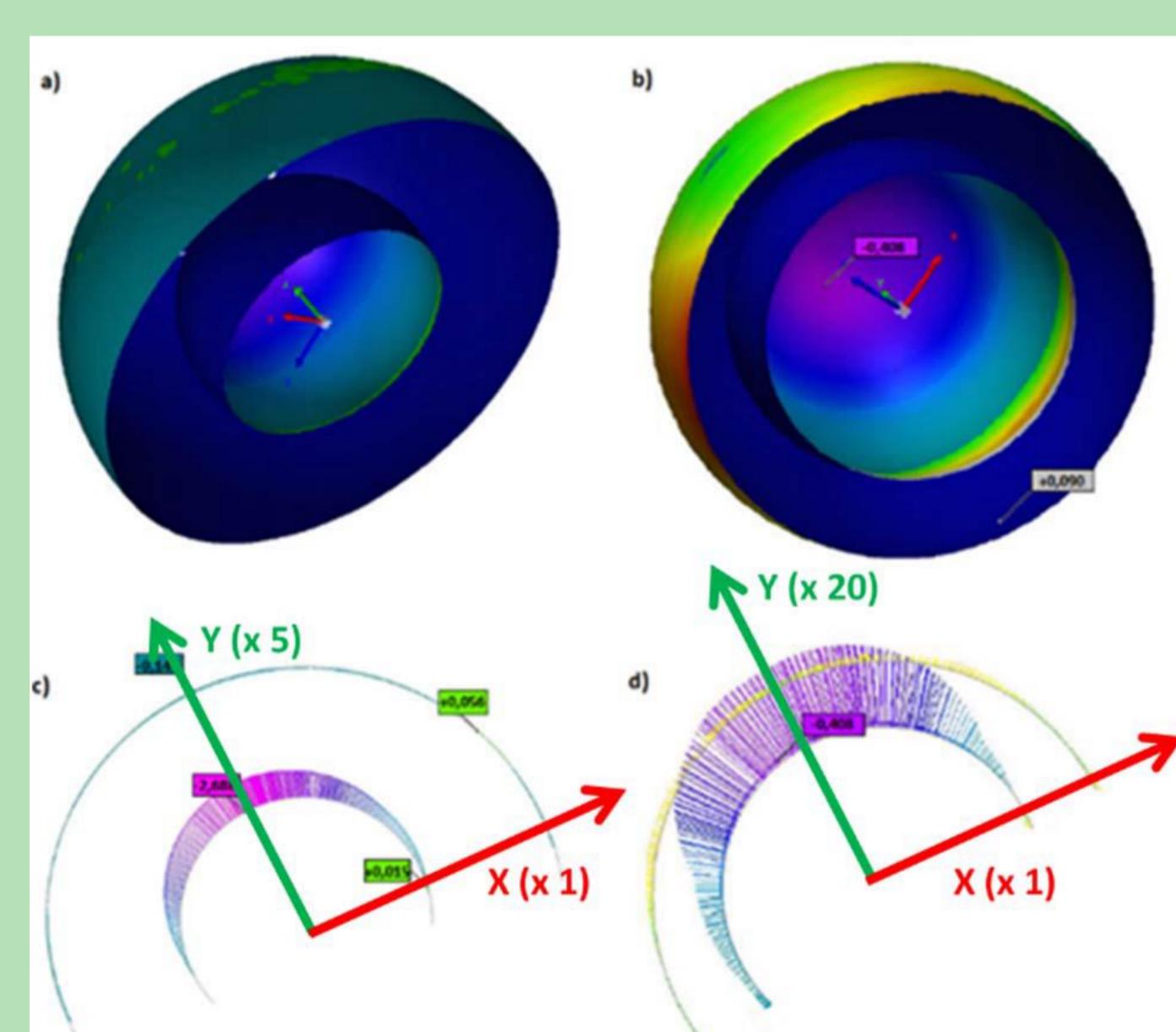


Ben Braham, <https://cfm2017.sciencesconf.org/130194/document>

Orthopedics & Traumatology: Surgery & Research 102S (2016) S229–S234

Squeaking and hight reactive wear particles of ceramic/ceramic prosthesis

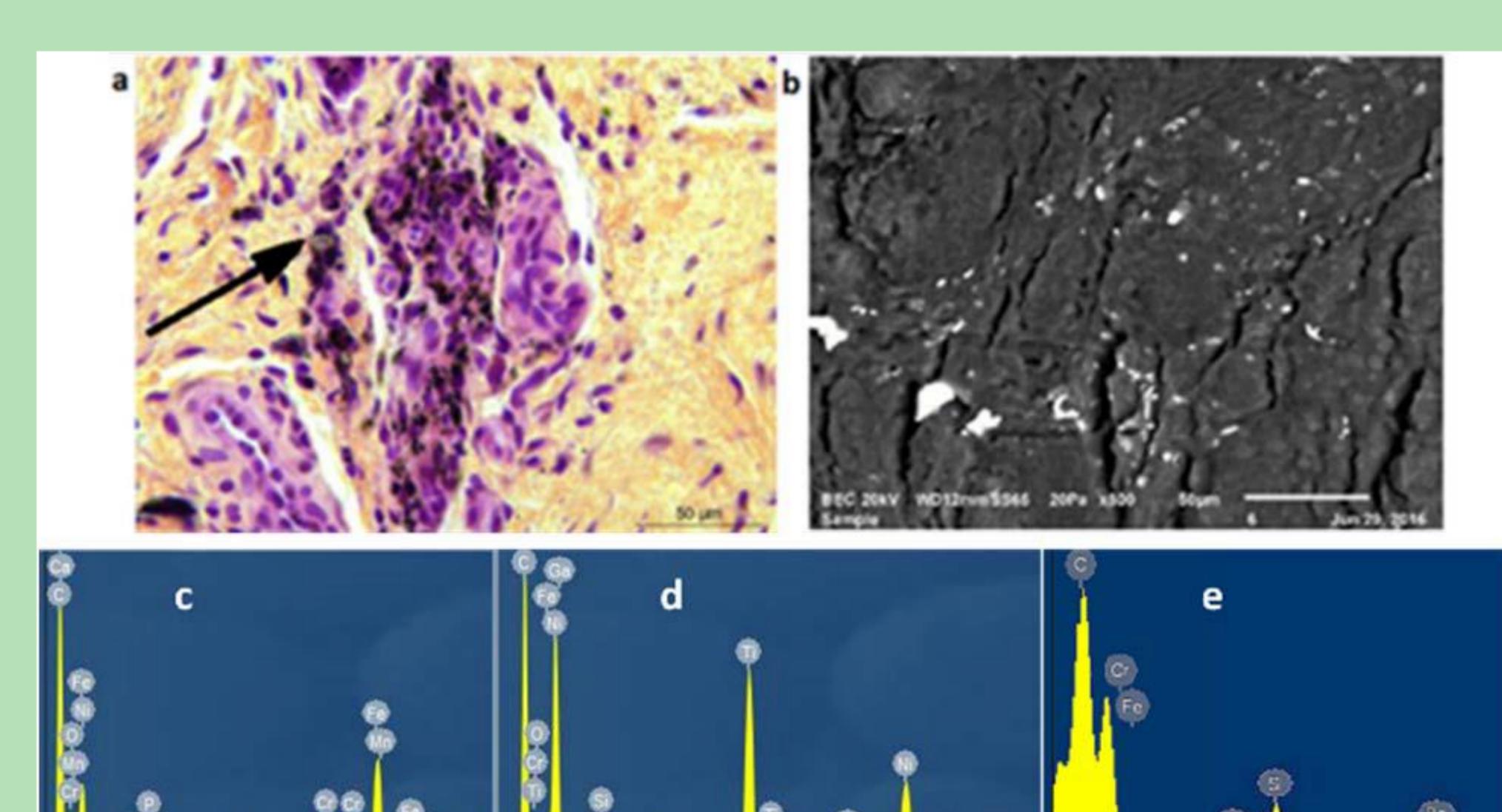
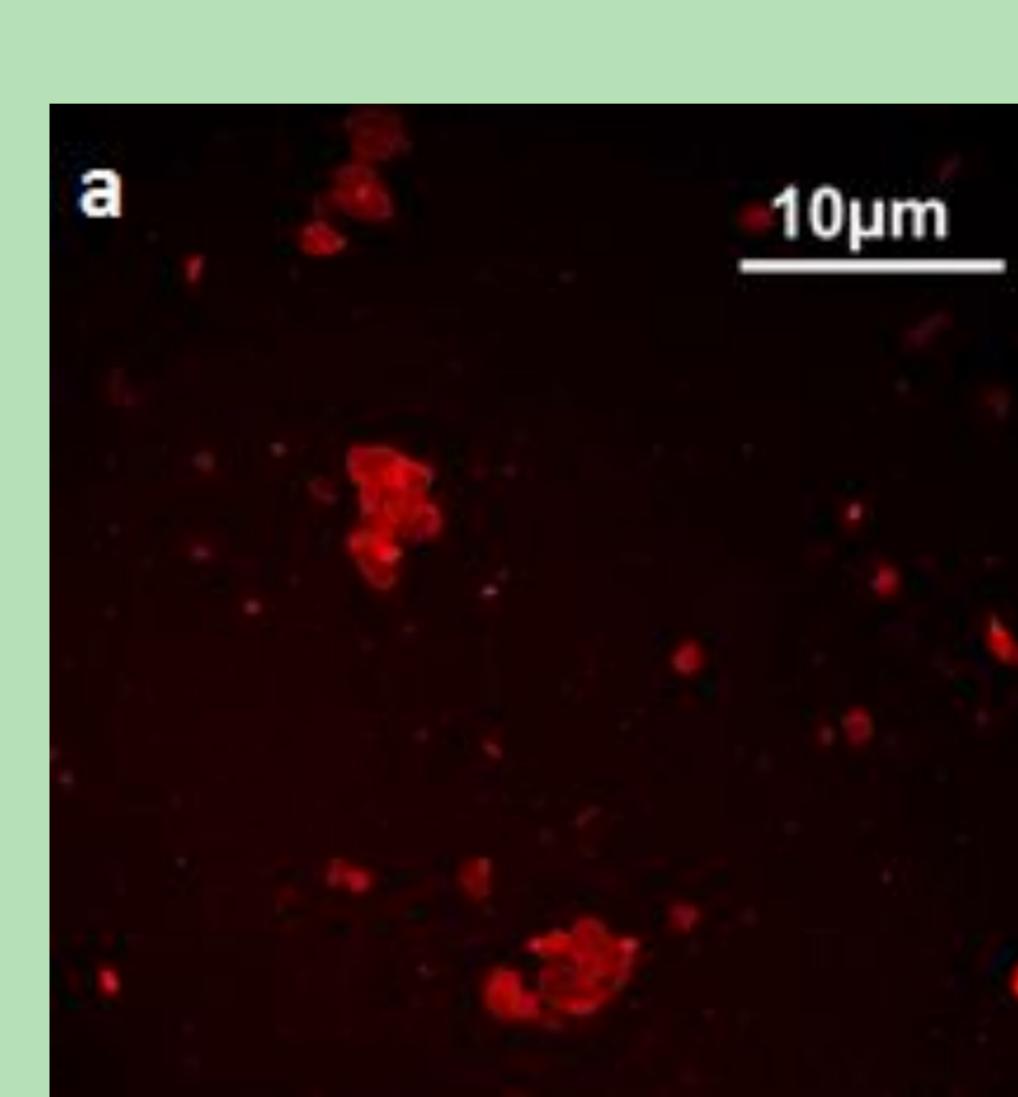
## A new multi-scale implant analyse protocol



Macro scale : 3D reconstruction with 3D scanner



Micro scale : particule and surface analysis by optic and confocal microscopy



Nano scale : MEB-EDX analysis

## Objectives

- Understand the wear mechanics of hip prosthesis by the multi-scale implant analyse protocole.
- Obtain *in vitro* the same wear than *in vivo* with the use of a biomimetic lubricant.
- Better predict the *in vivo* wear rate of the new implants after an *in vitro* test.