Laboratorio dei Biomateriali
Università di Modena e Reggio Emilia

nanoP2

Dr. Antonietta M. Gatti

cnism
consorzio nazionale interuniversitario per le scienze fisiche della materia

Consortium

University of Modena and Reggio Emilia
LABORATORY of BIOMATERIALS

INFM - Istituto Nazionale per la Fisica della Materia

Johannes Gutenberg University
Institute of Pathology

UNIVERSITY OF CAMBRIDGE
Department of Materials and Metallurgy

biomatech
France

FEI COMPANY™
THE STRUCTURAL PROCESS MANAGEMENT COMPANY
Italy

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An RTD project funded by the European Commission

Nano pathology

The Role of Micro and Nanoparticles in Biomaterial-Induced Pathology

Project
QLRT-2002-147
(2002-2005)

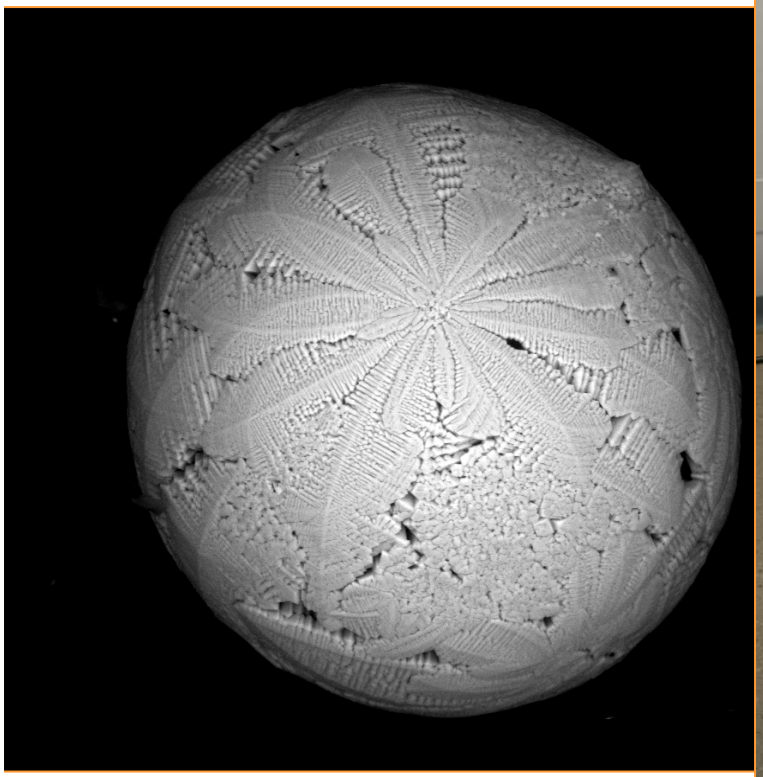
Nano-pathology

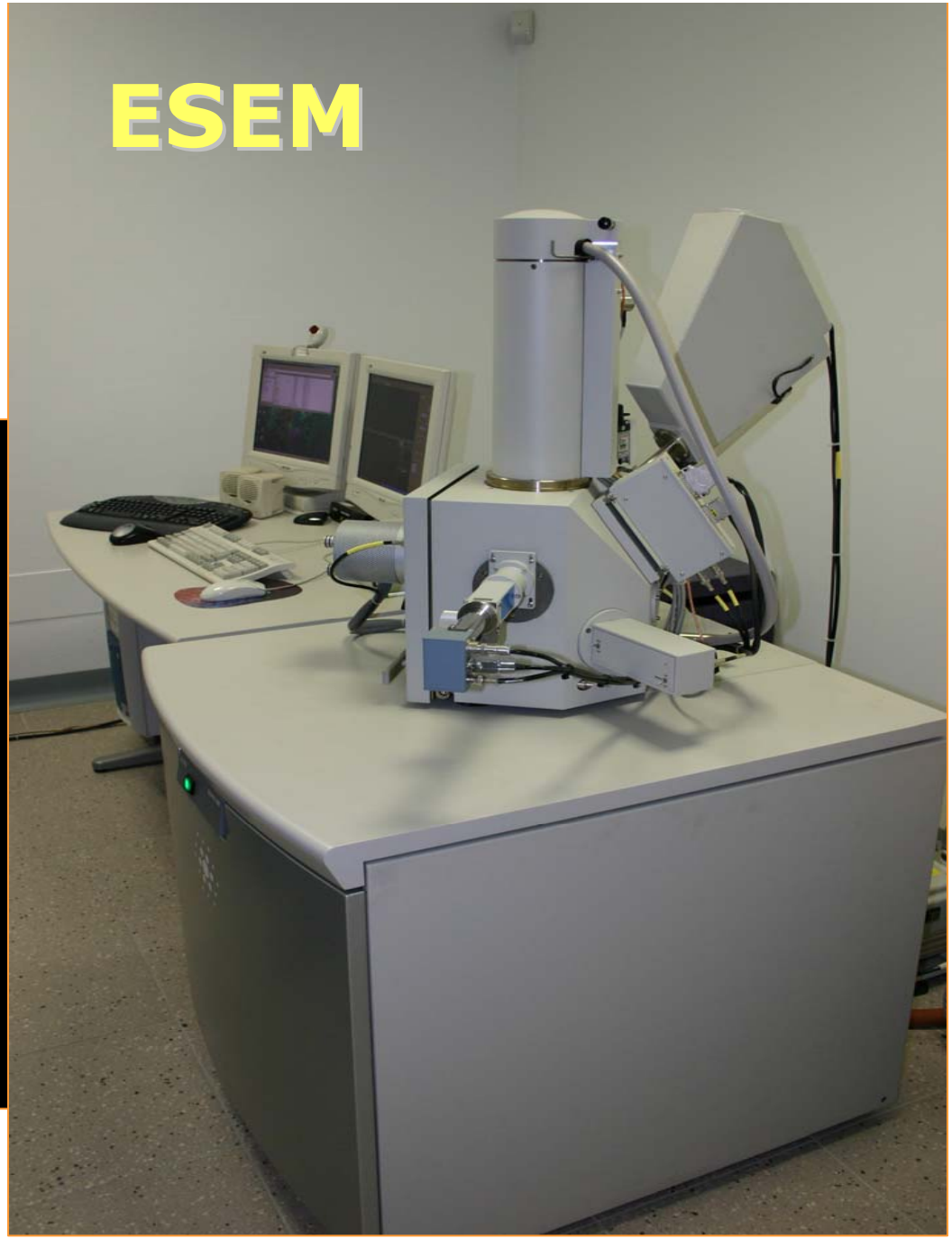
Nanopathology

is the branch of learning that deals with how the organism reacts to the presence of micro- and nano-particles

Environmental Scanning

Electron Microscope





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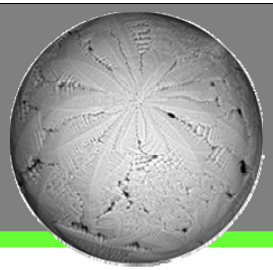

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Development of an Integrated Platform for Nanoparticle Analysis to verify their possible toxicity and the eco-toxicity

Partners

1. **University of Salzburg, A**
2. **Fraunhofer Institute of Biomedical Engineering, DE**
3. **Consiglio Nazionale delle Ricerche, I**
4. **Università della Magna Graecia, I**
5. **Grimm Aerosol, DE**
6. **VITO n.v. NL**
7. **CSEM SA, CH**
8. **Institut Català de Nanotecnologia, ES**
9. **Joint Research Centre Ispra -EVCAM**

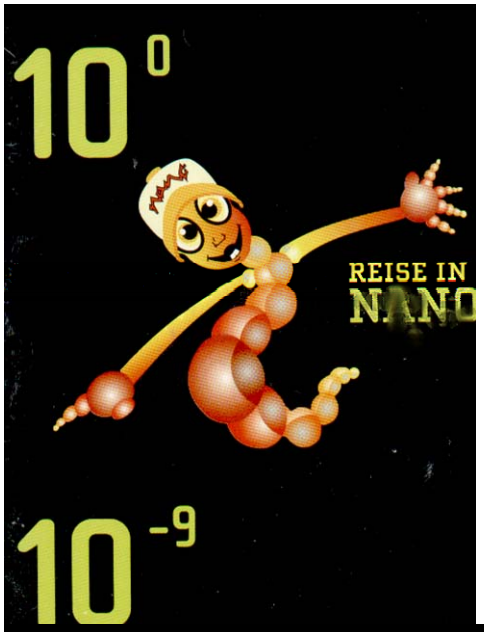
CNISM
Consorzio Nazionale Interuniversitario per le Scienze Fisiche della Materia

CNISM

University of Modena & Reggio Emilia

European Community


varian
EDAX
Field Emission Gun-
Environmental Scanning
Electron Microscope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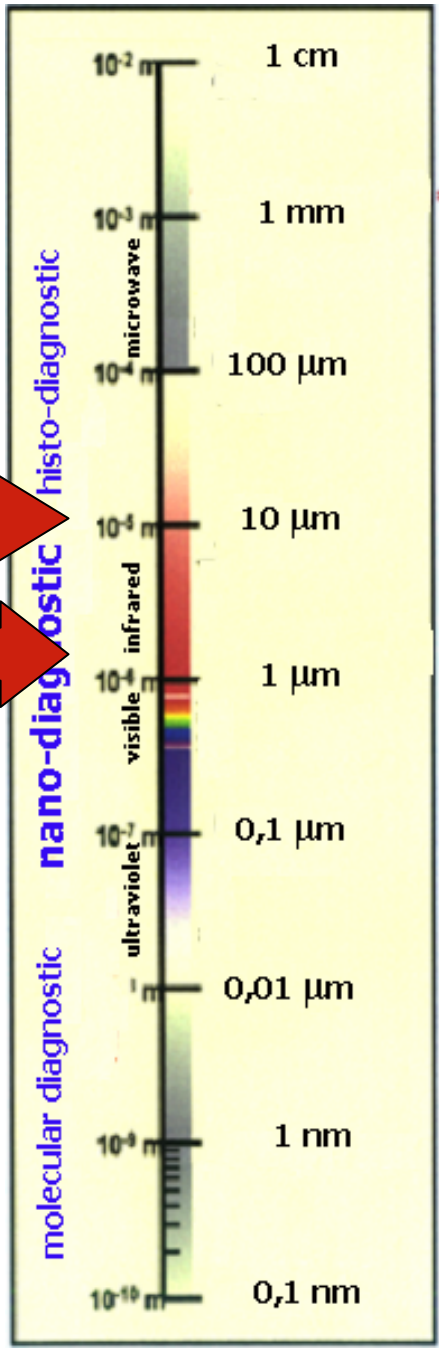
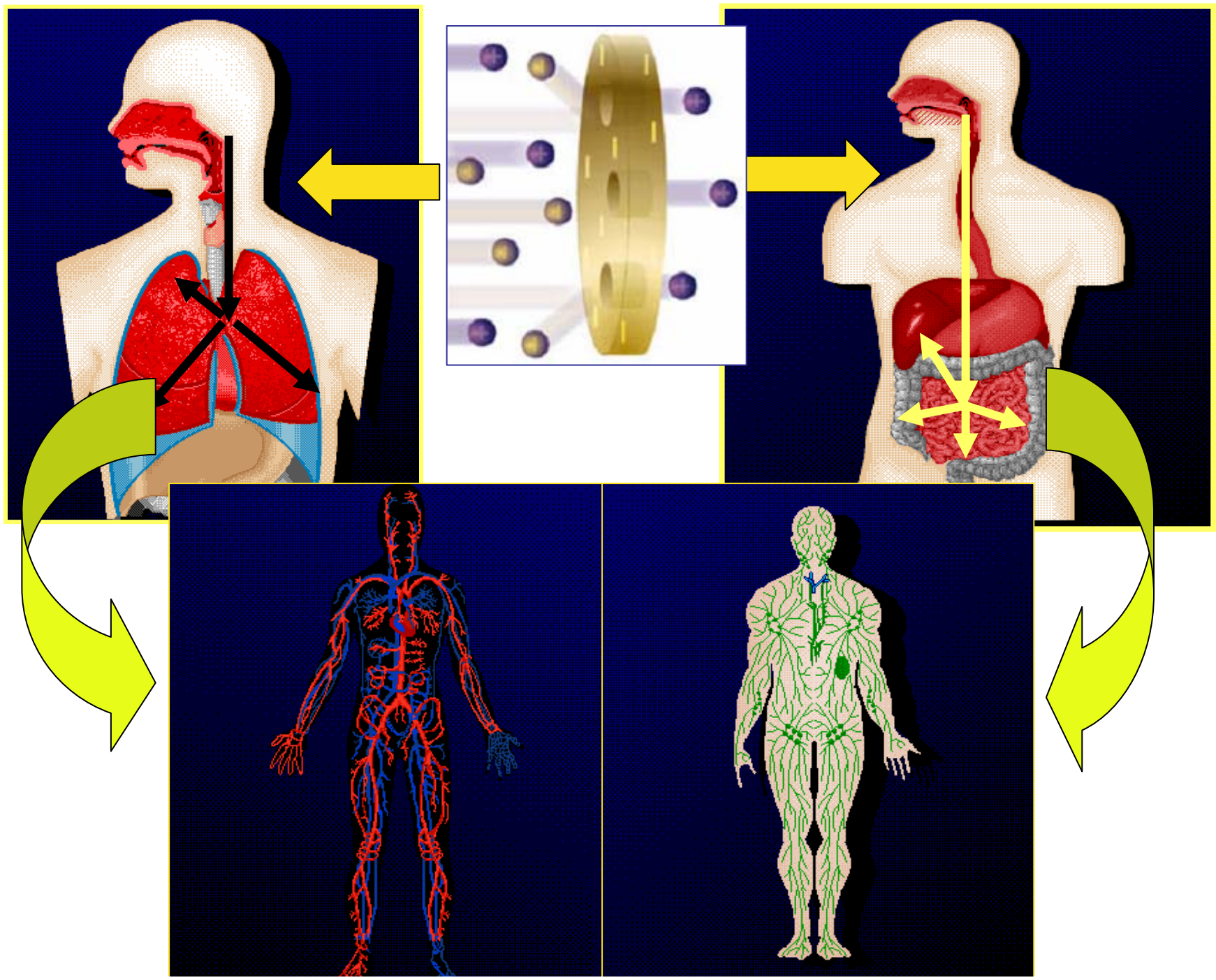
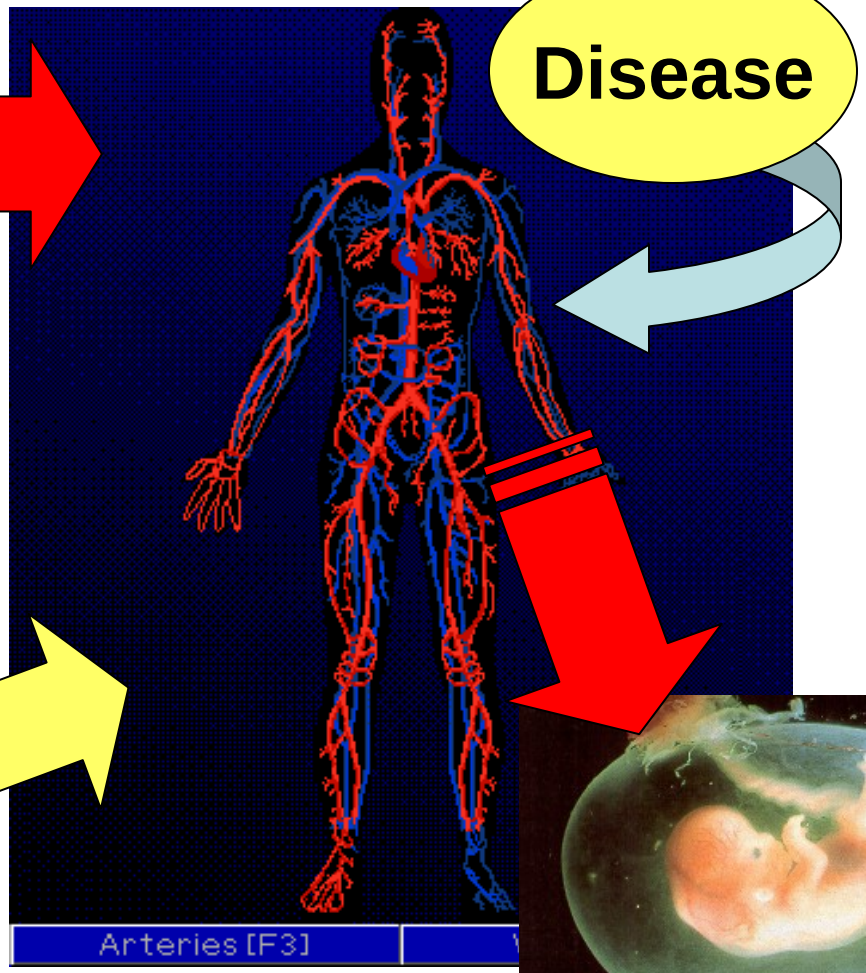
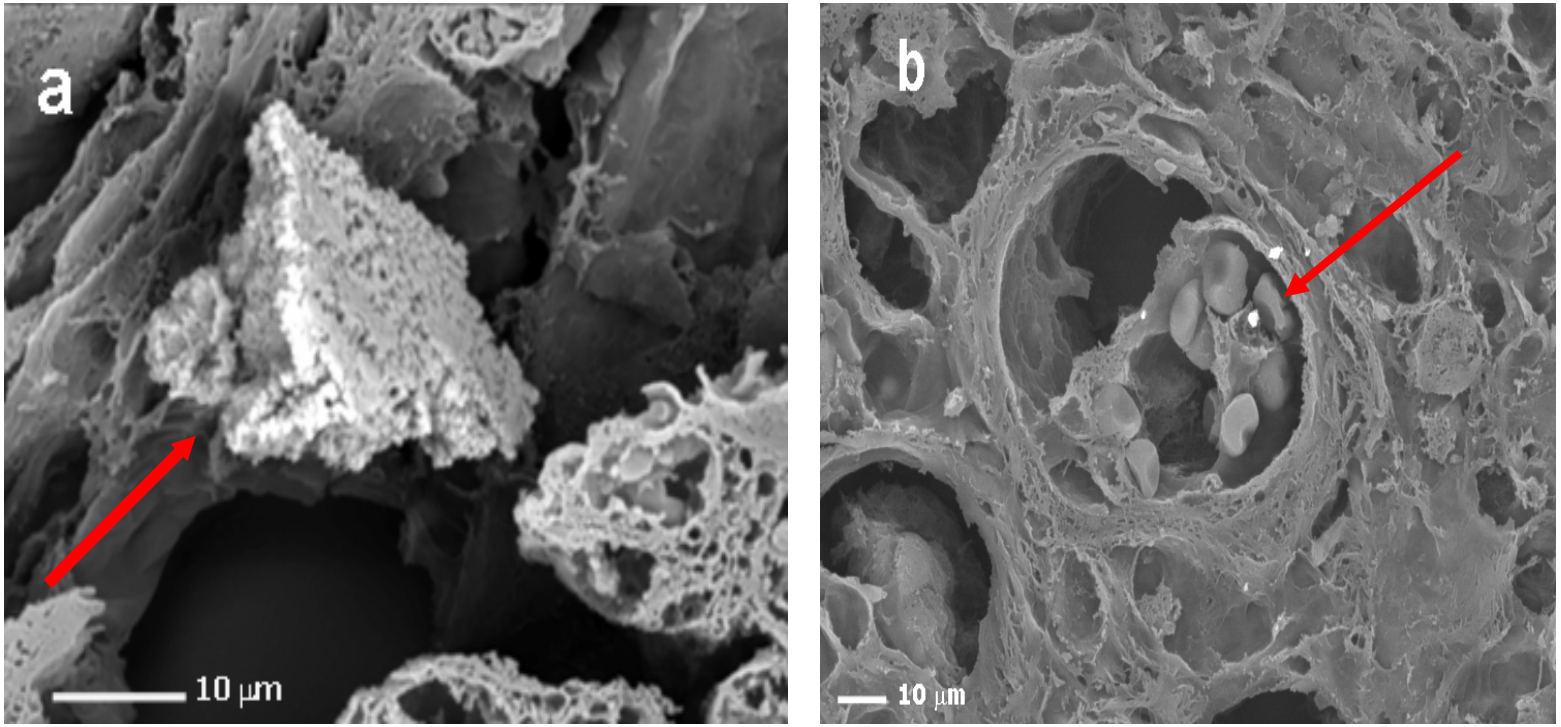

histo-diagnostic
nano-diagnostic
molecular diagnostic
microwave
infrared
visible
ultraviolet
1 cm
1 mm
100 µm
10 µm
1 µm
0,1 µm
0,01 µm
1 nm
0,1 nm



Impact of the environmental nanopollution



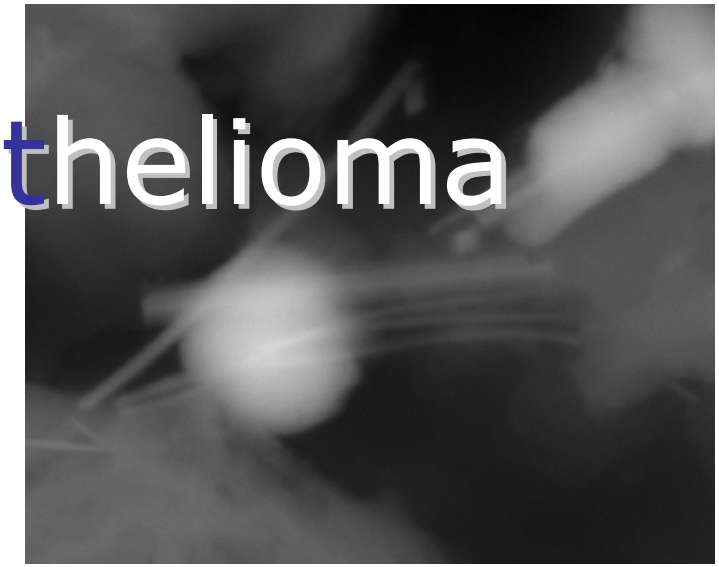
Lung

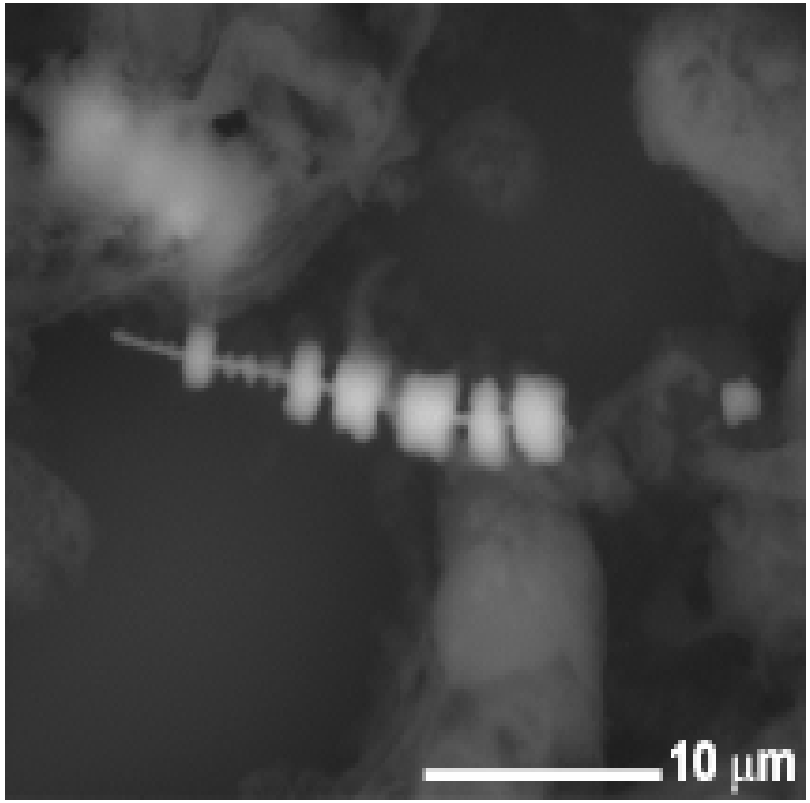


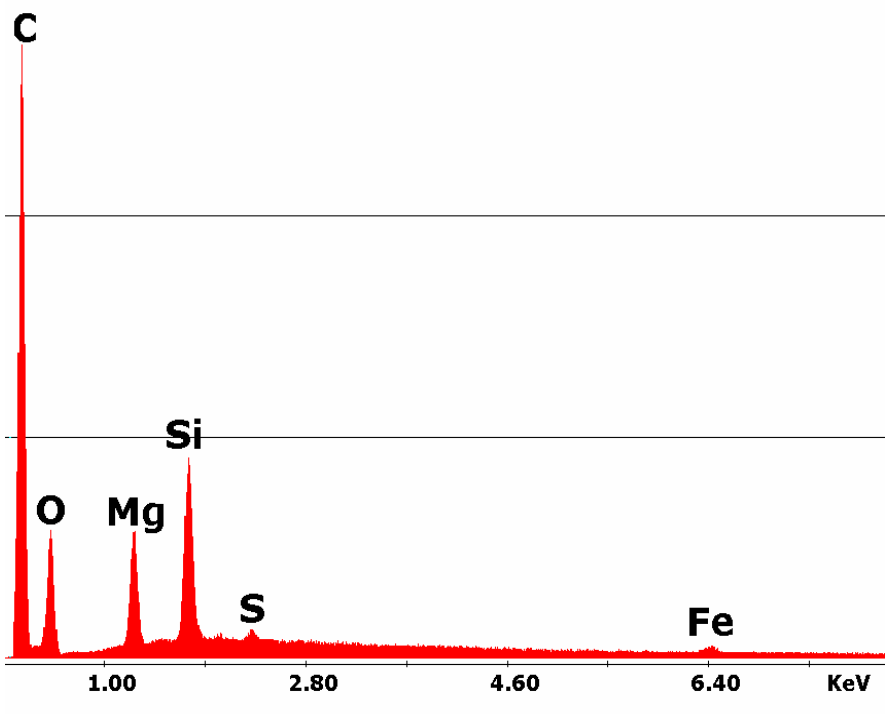
Nemmar et al.: Circulation 2002, 105:411

Passage of 100nm sized particles in the blood and in the liver

Pulmonary Mesothelioma

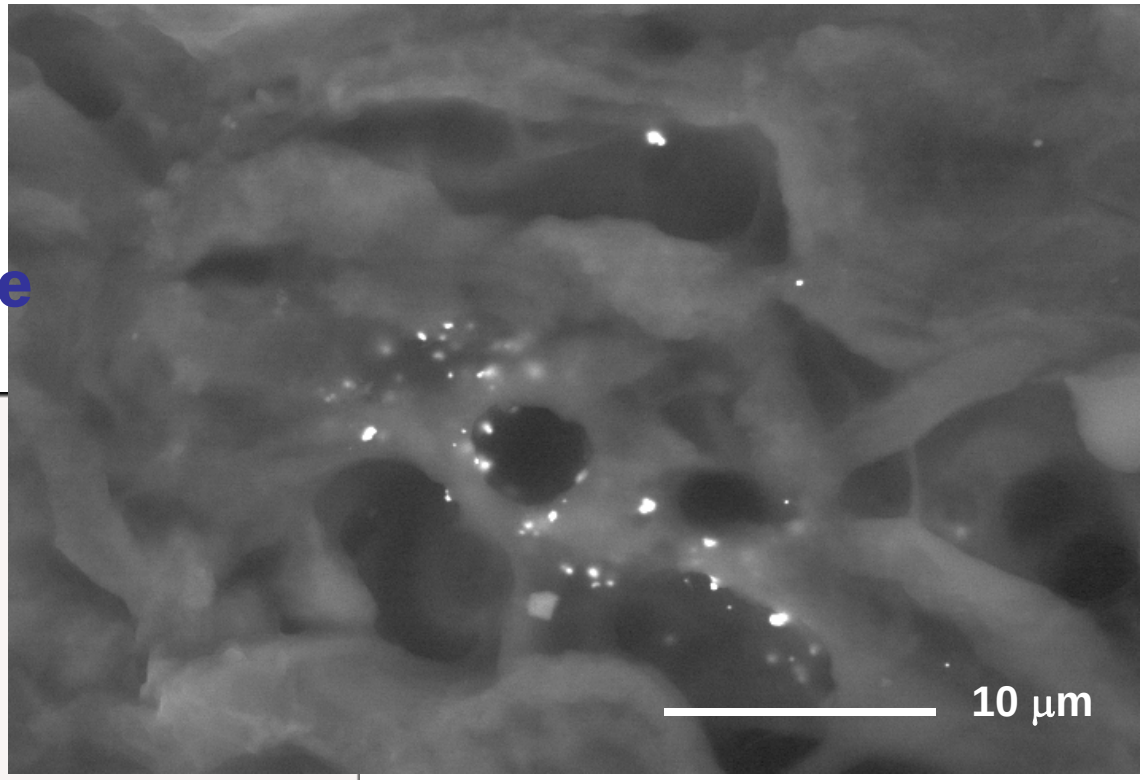


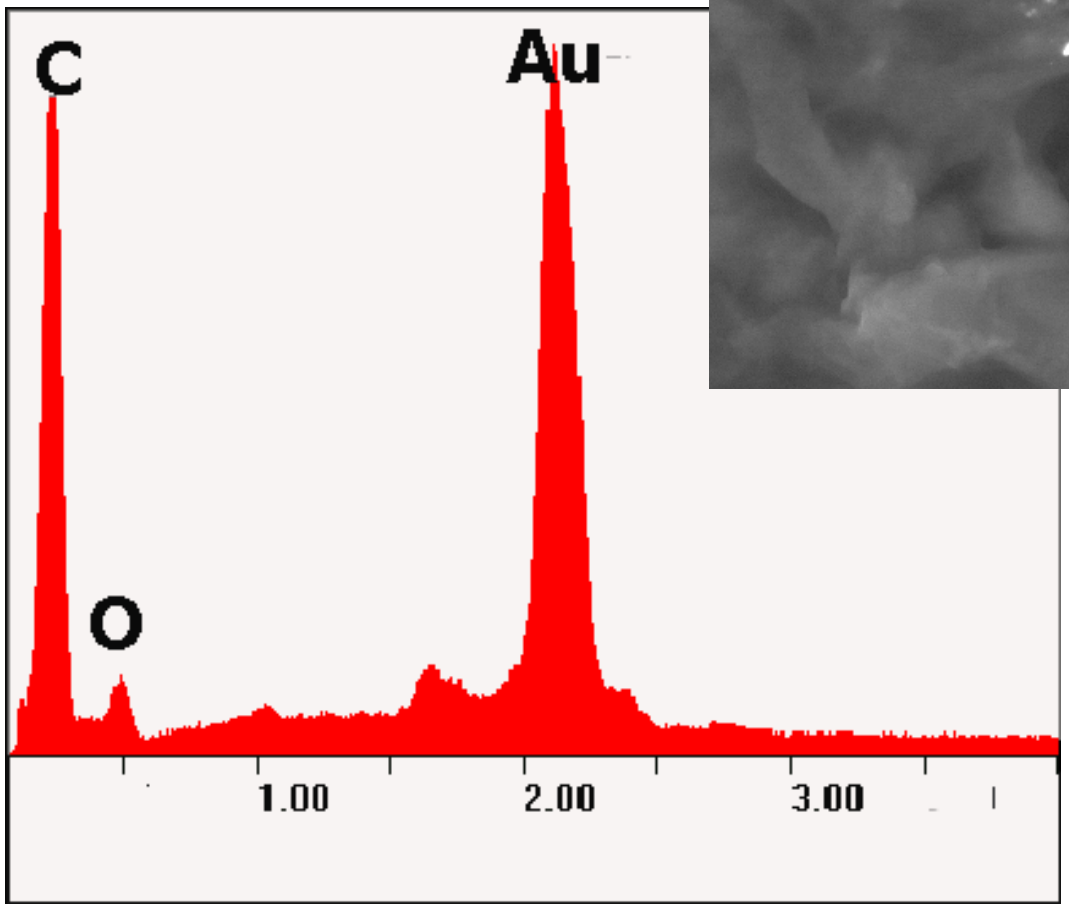




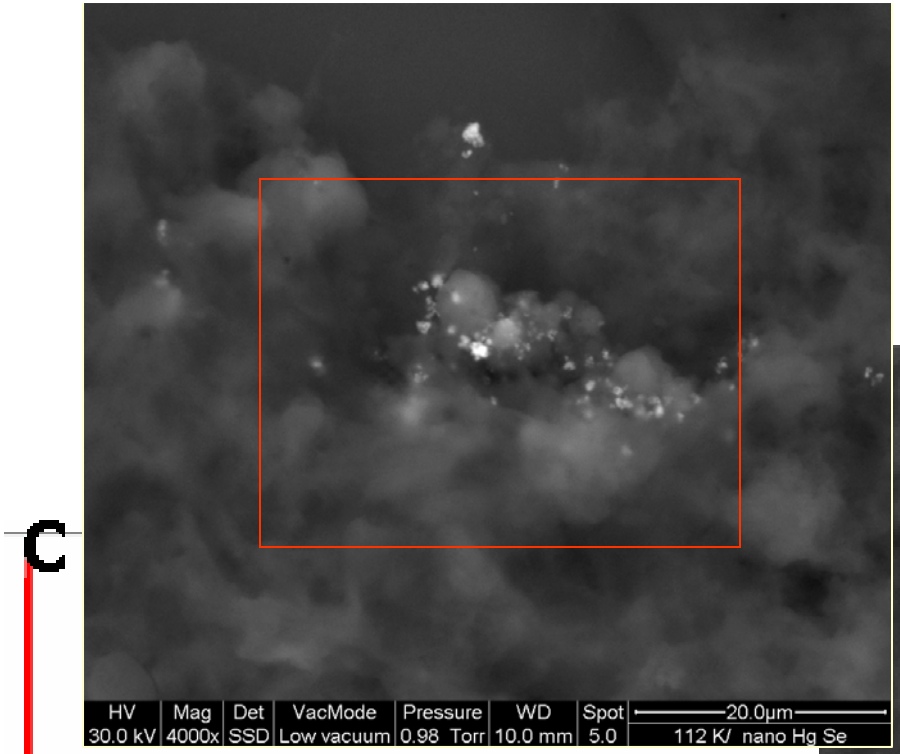
Asbestos fiber

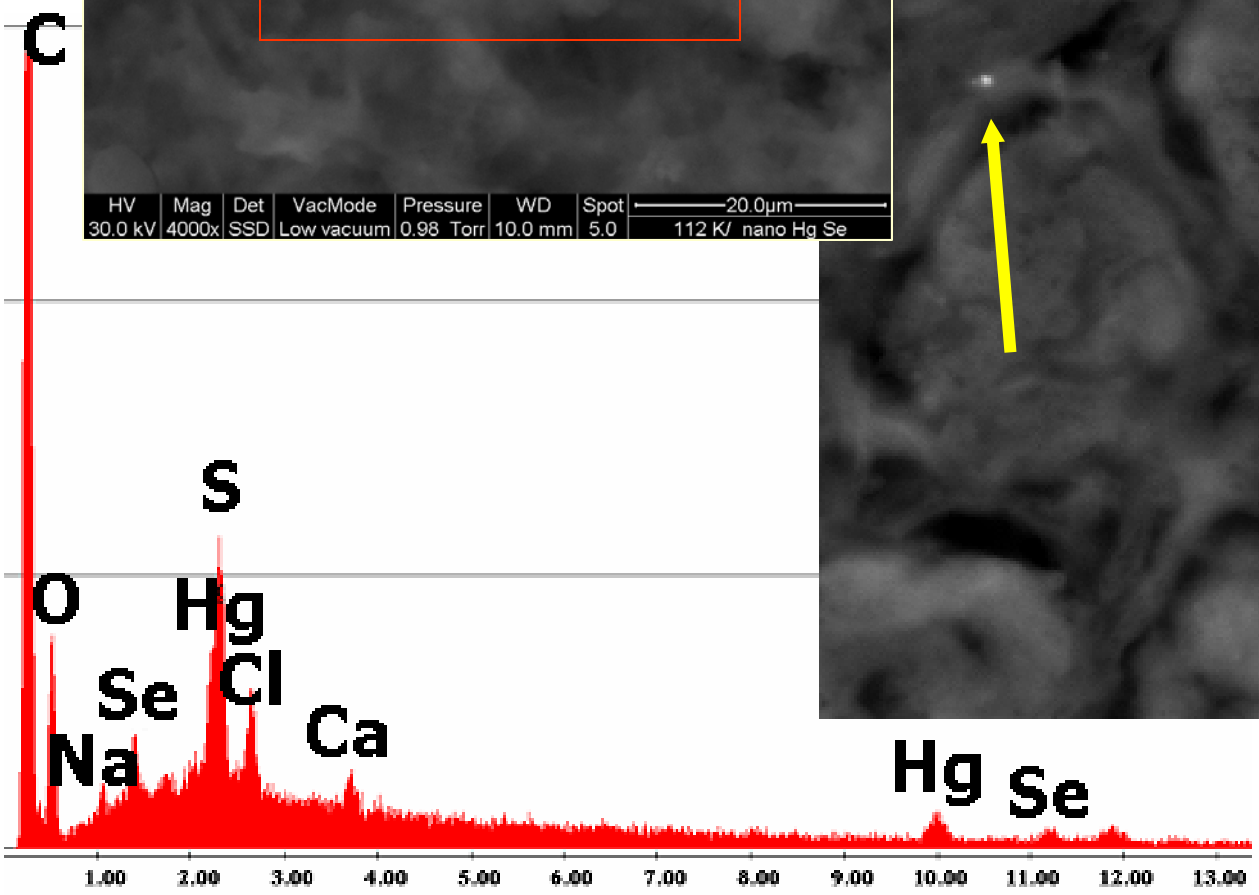
Nanoparticles of Gold in a liver granuloma. The patient was treated with colloidal gold particles for knee arthrosis

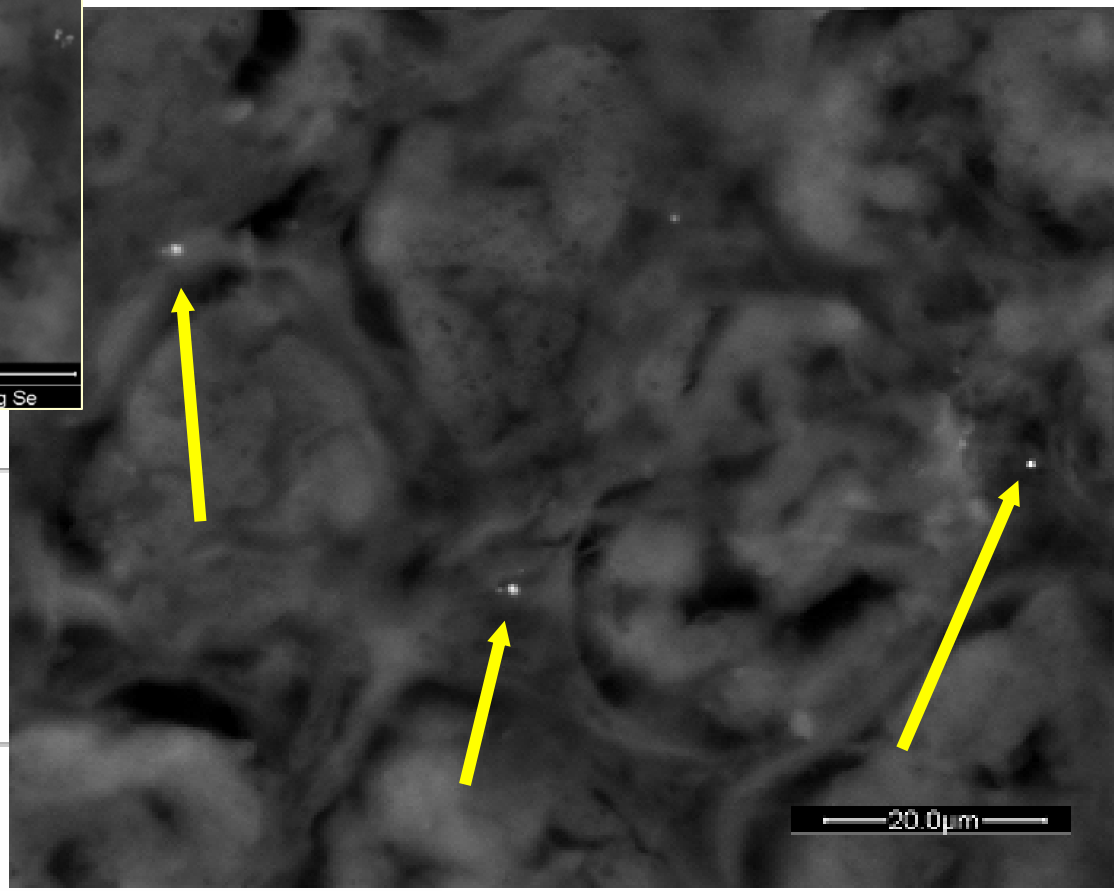




Gulf-War kidney

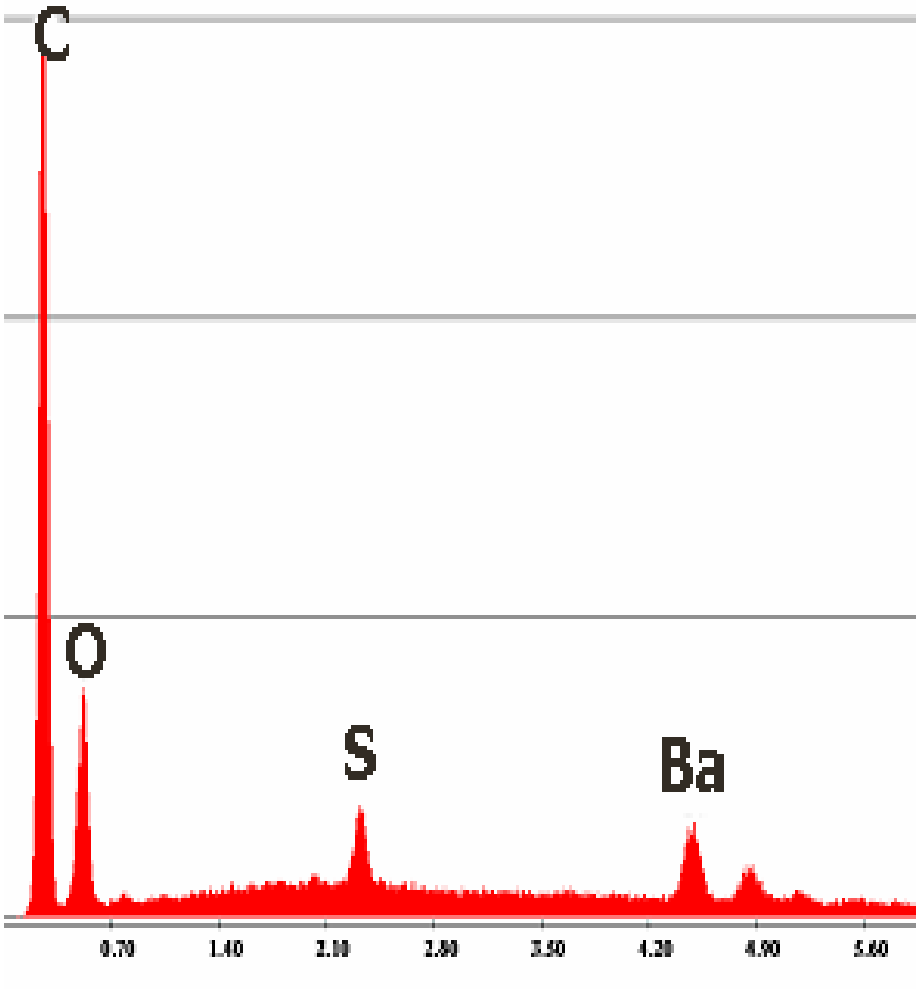


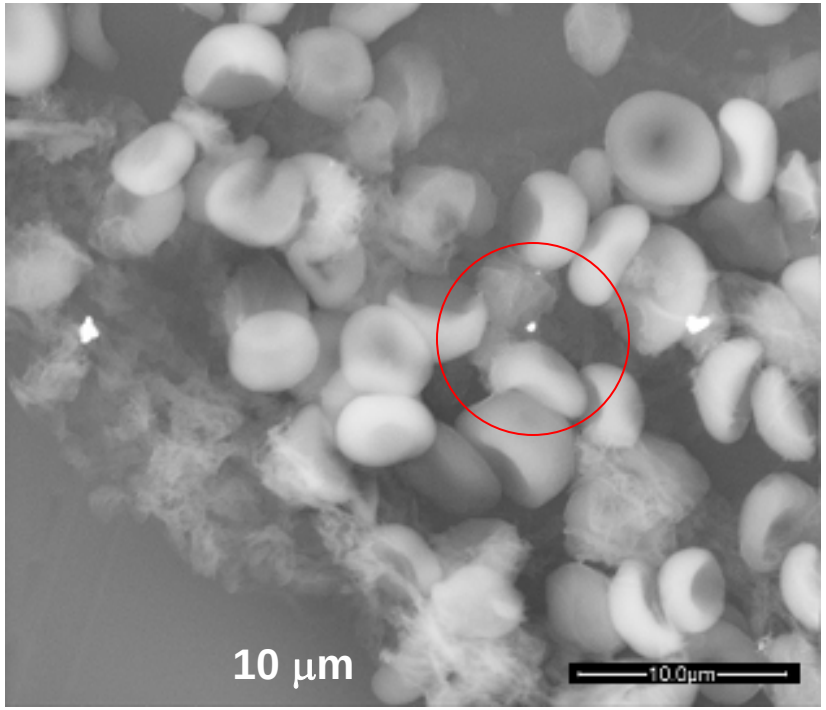


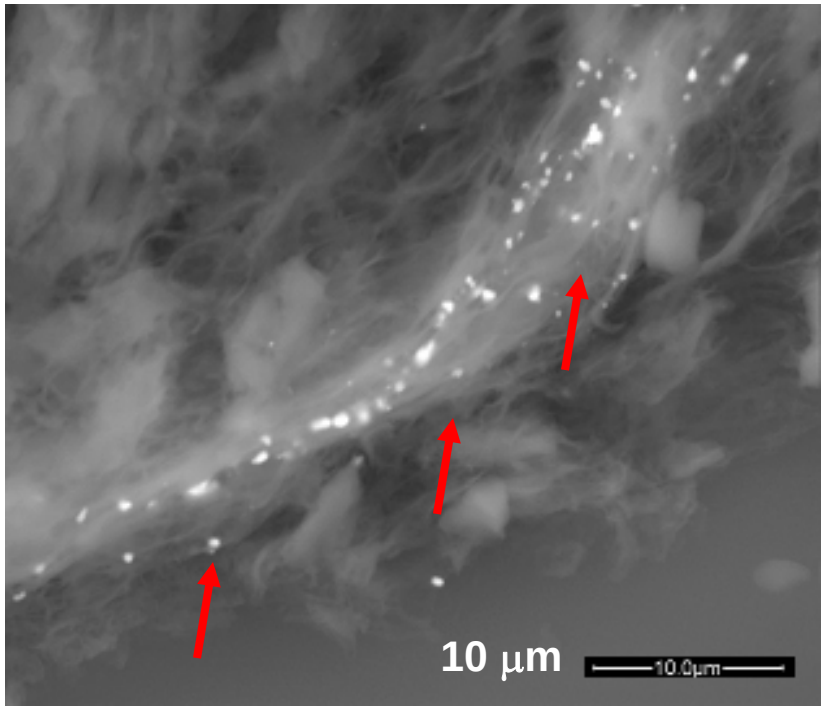


Cluster of nano Hg-Se

Barium-sulphate nanoparticles found inside a thrombus

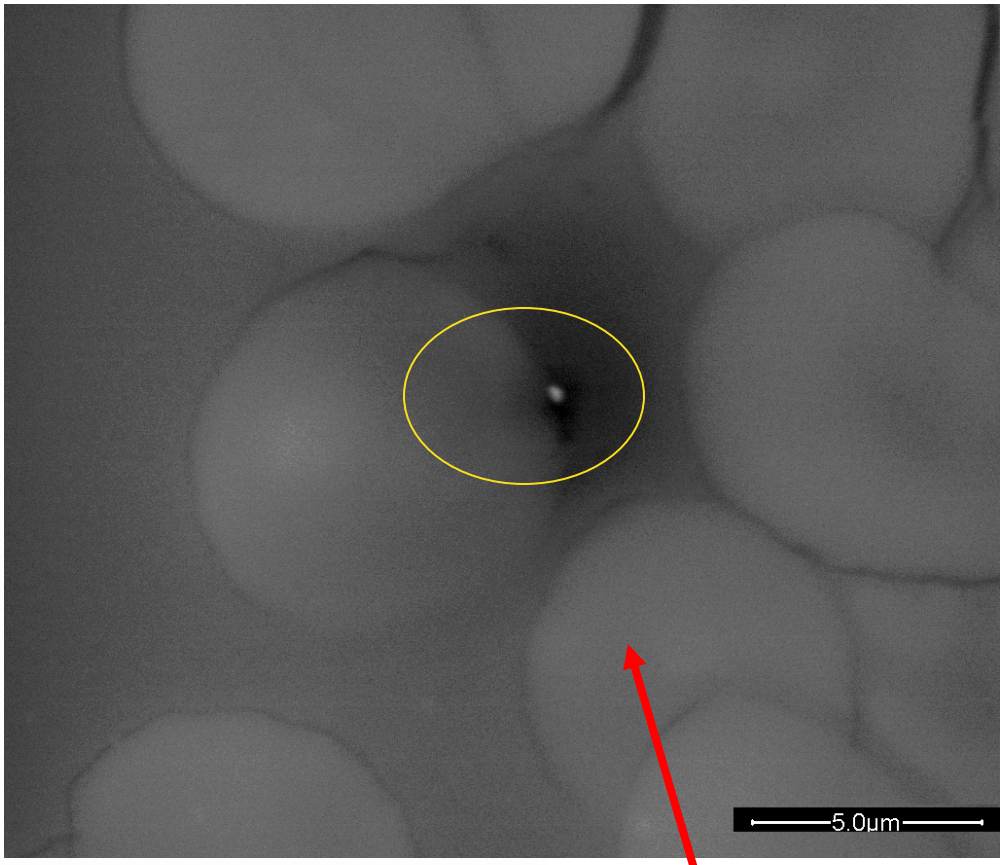




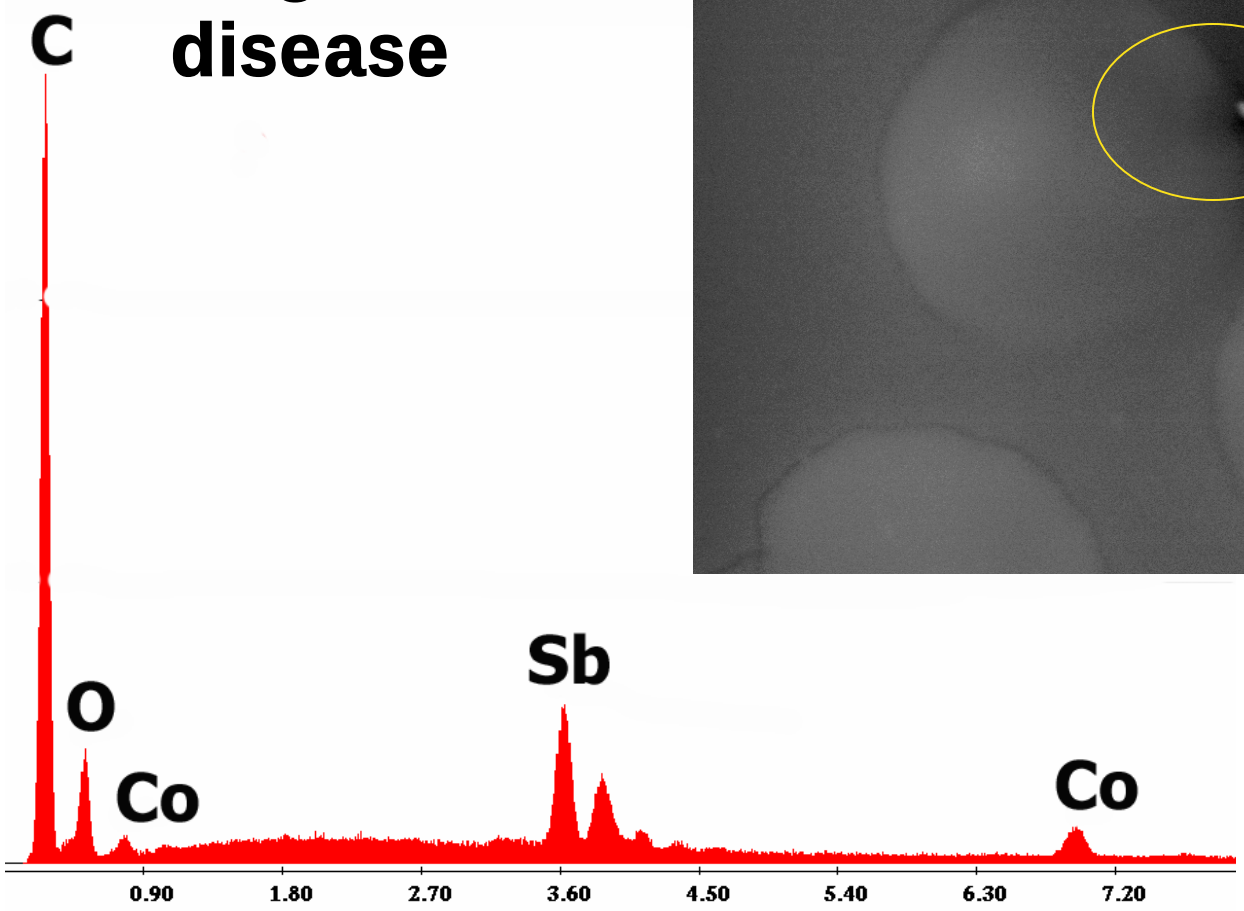


BLOOD

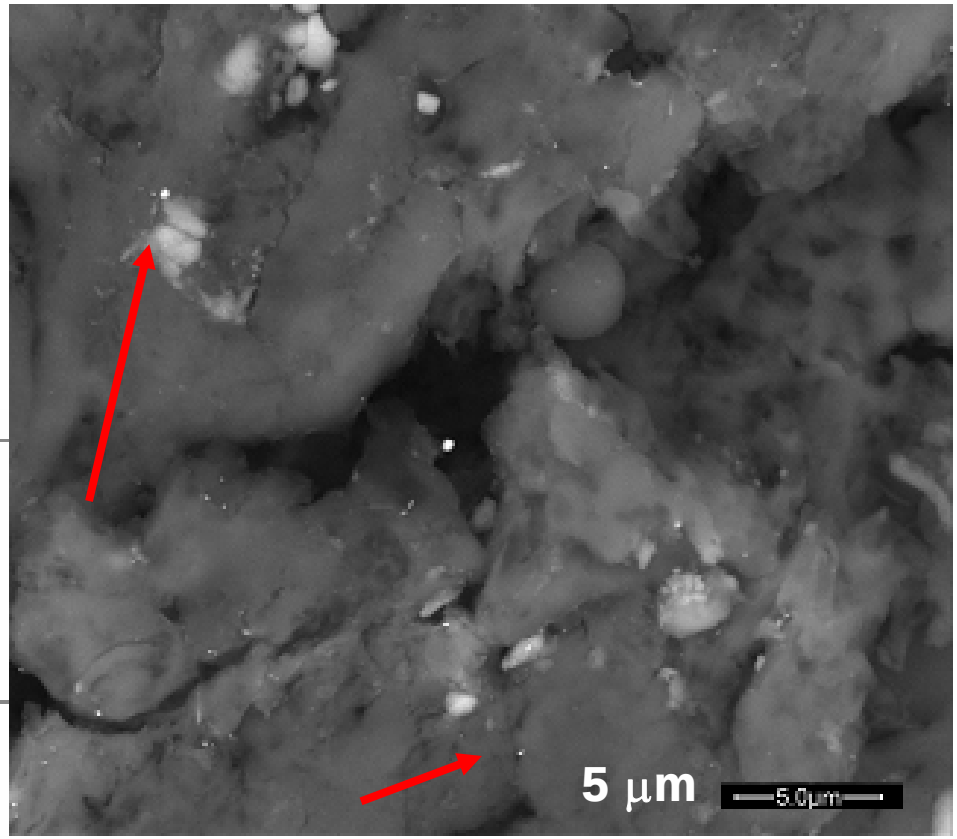
Soldier's wife affected by Burning Semen disease

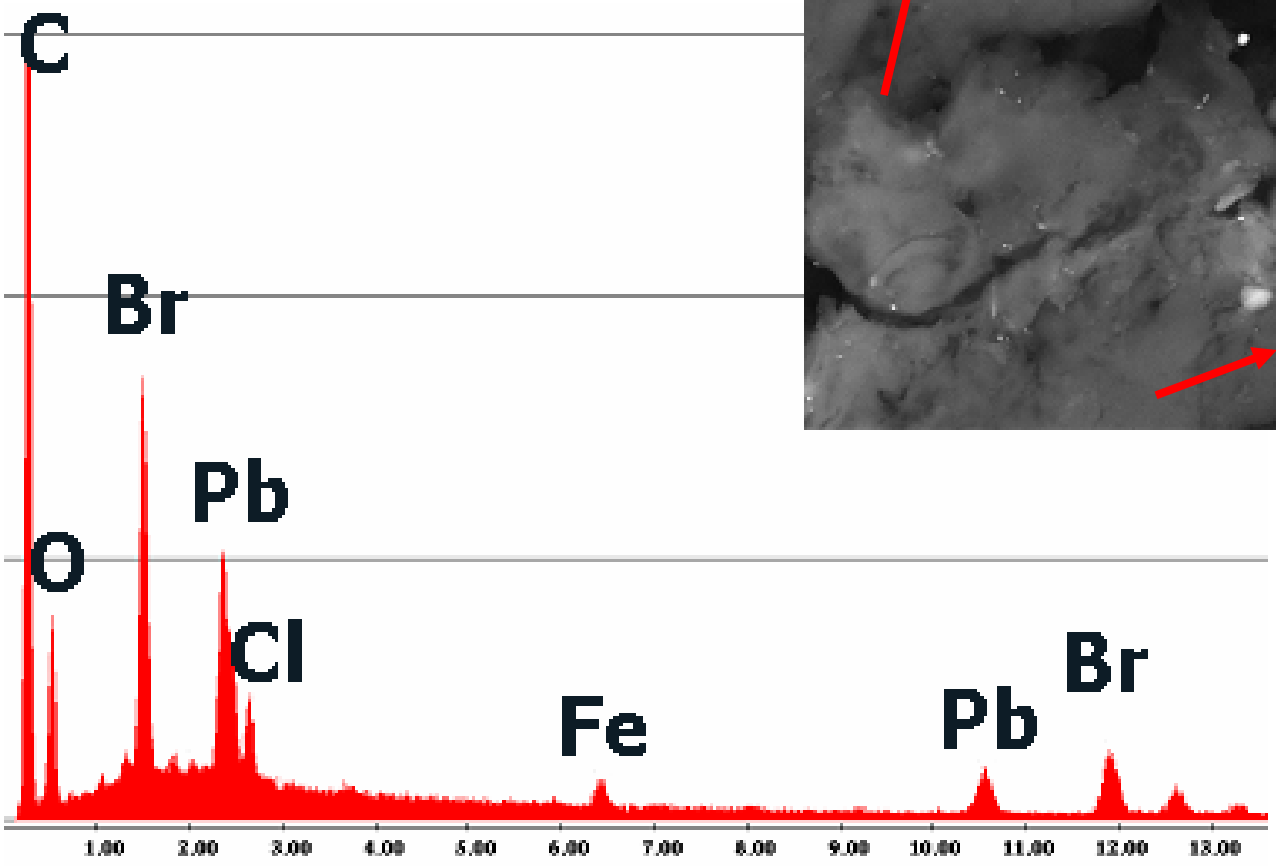


Red cells

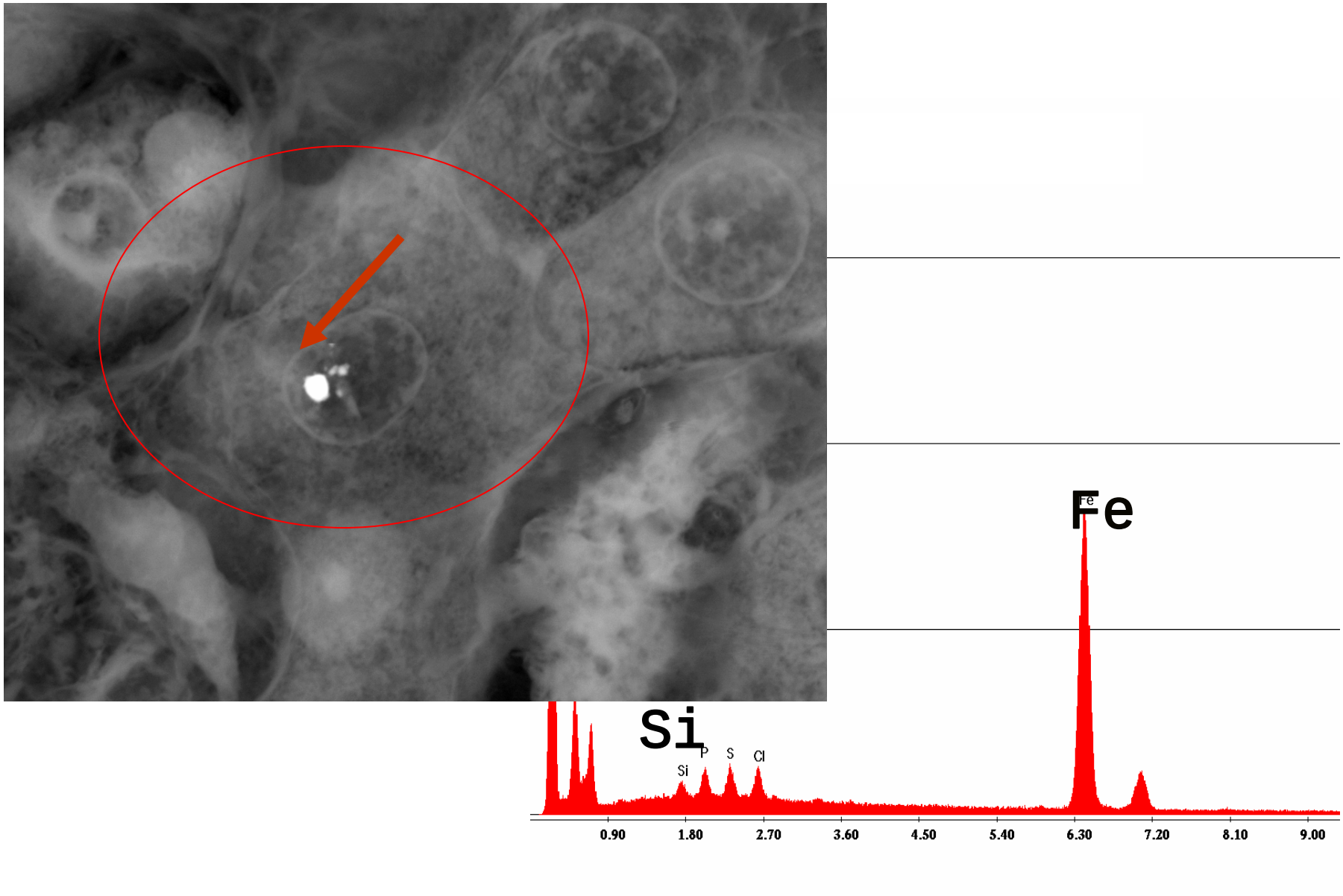


Section of a lymph node in a civilian of Sarajevo affected by Hodgkin Disease (FEG-ESEM)

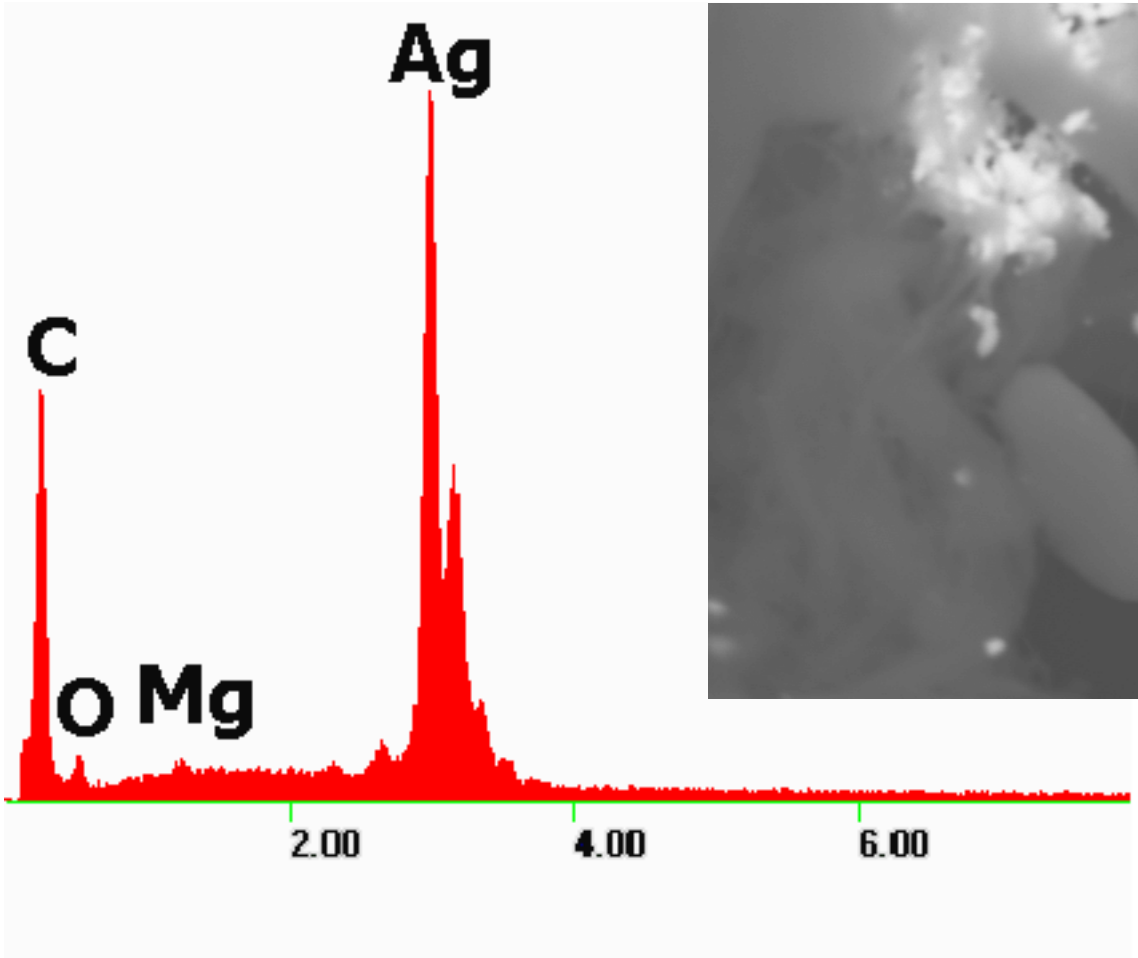


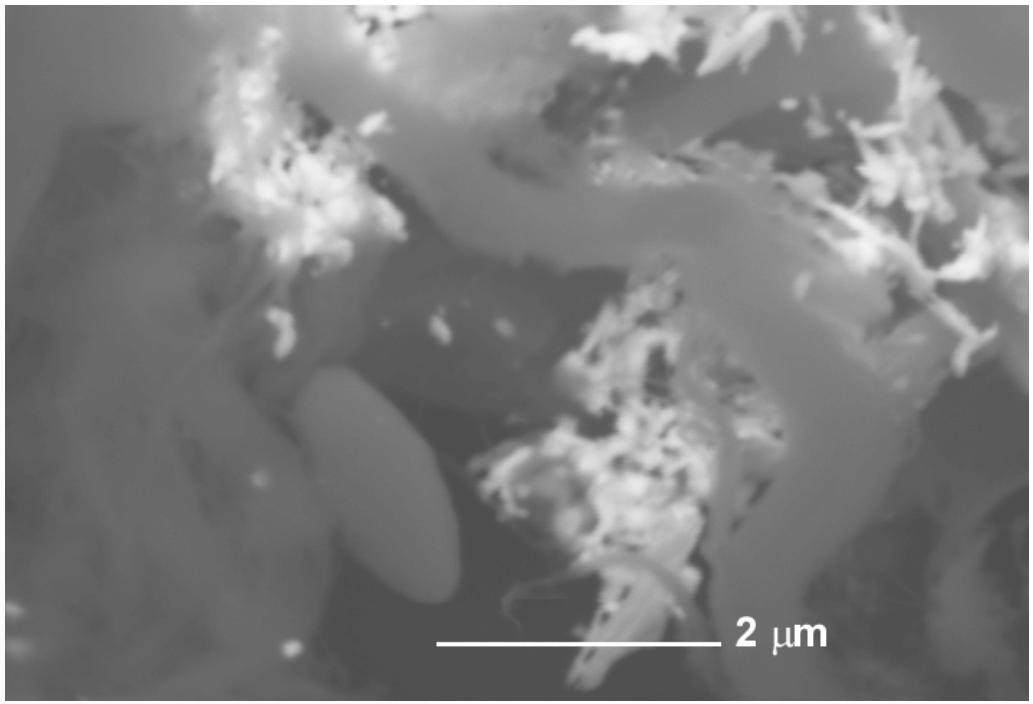


Liver cancer

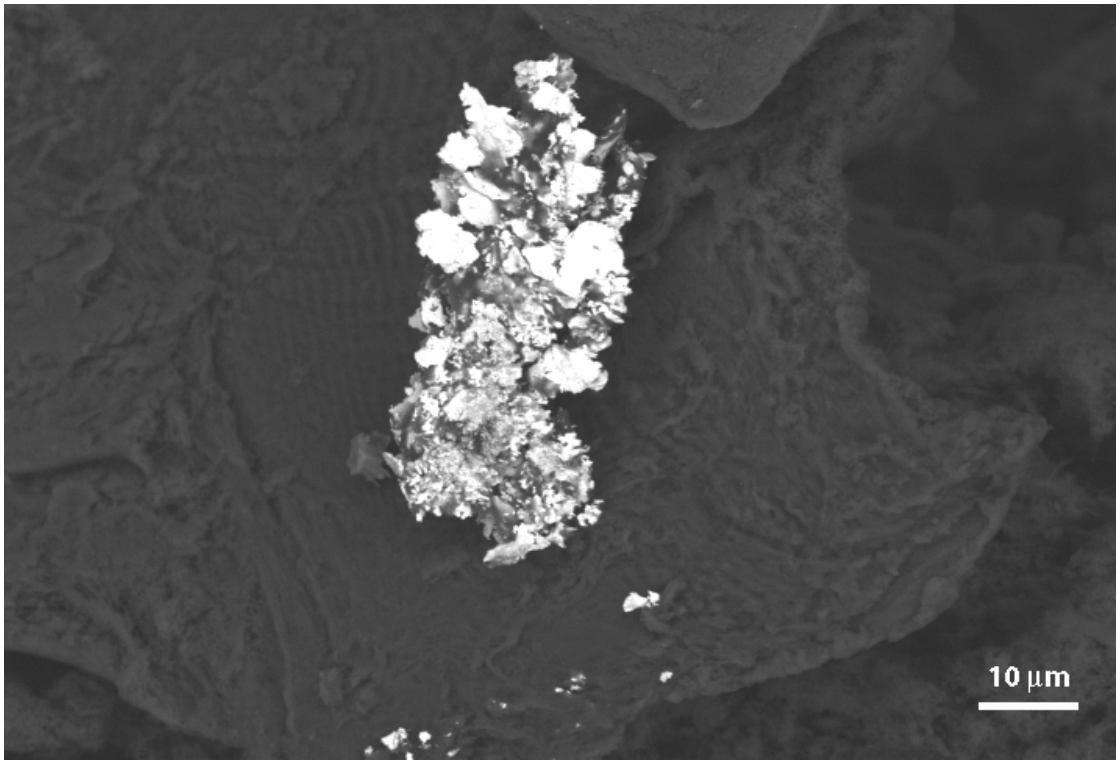


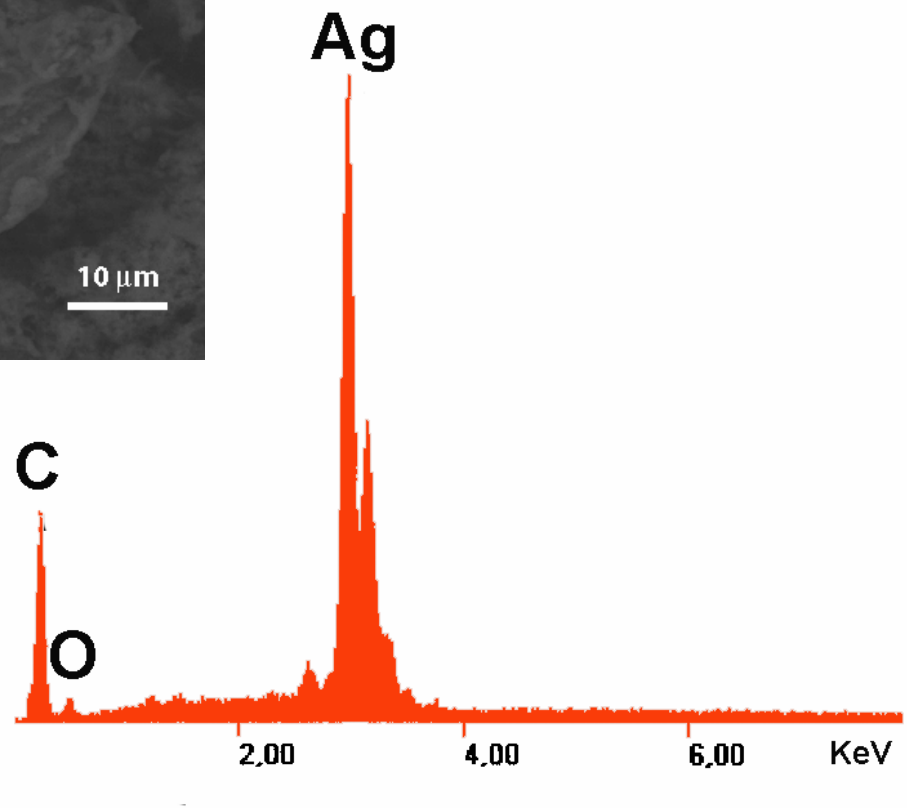
Colon cancer
with clusters of Silver nanoparticles



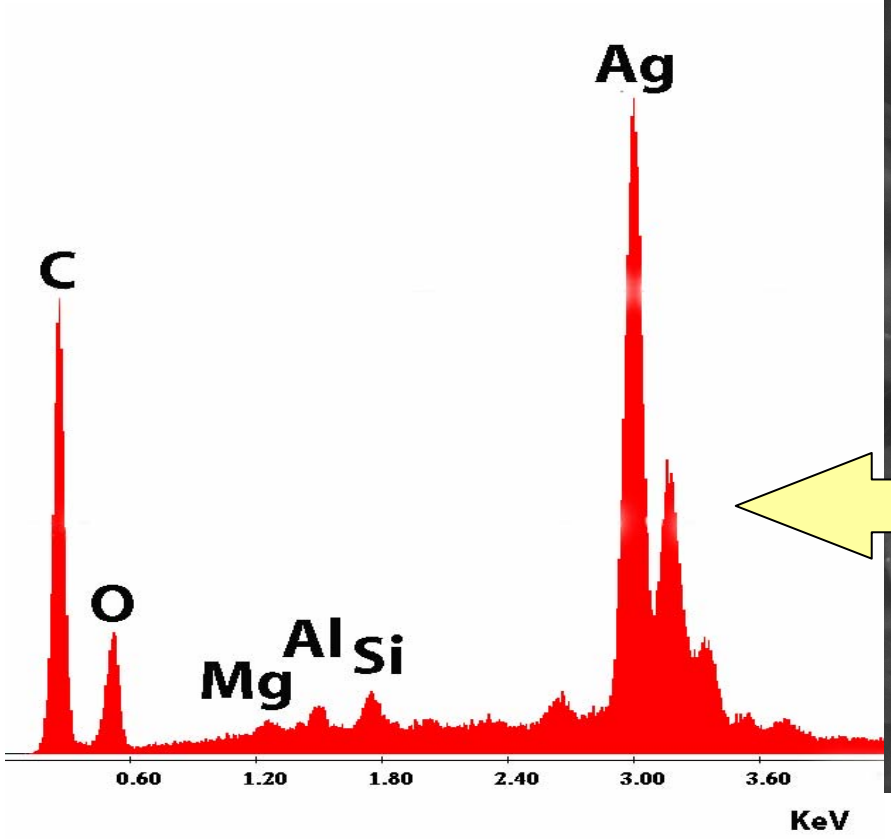


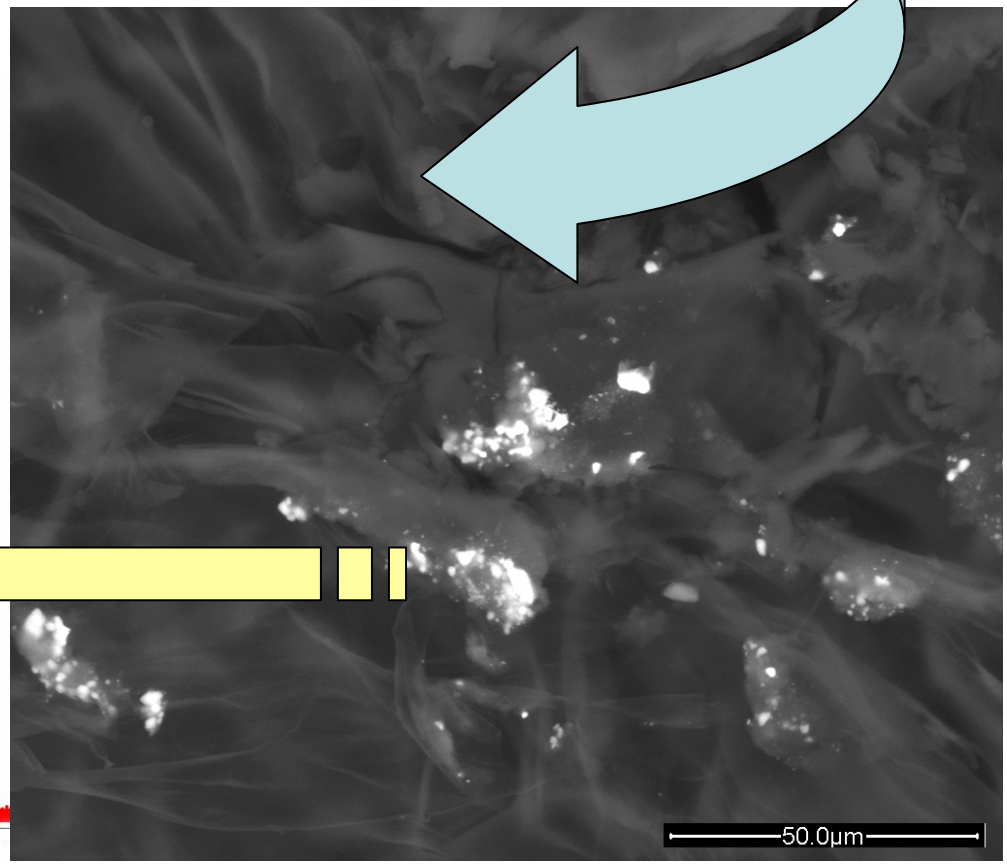
Industrial Hamburger



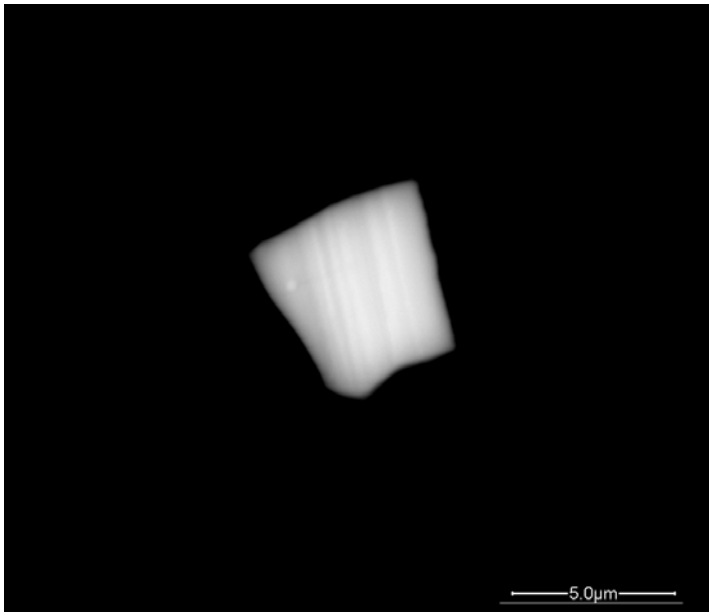


Hay

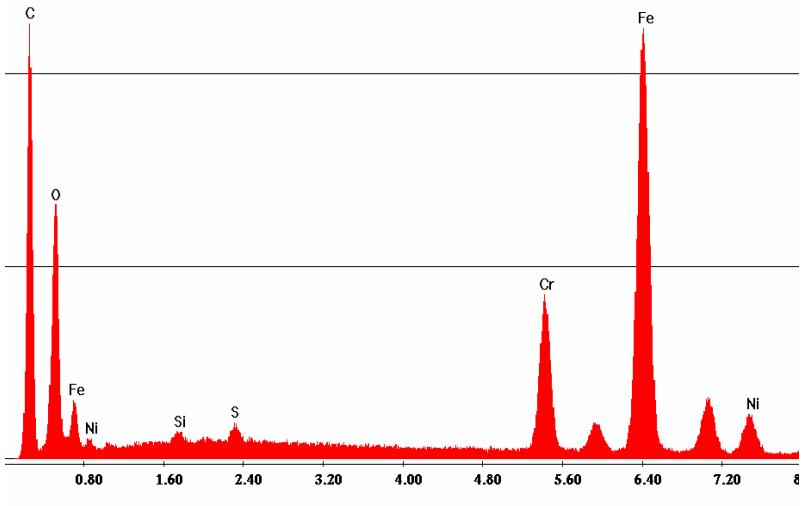


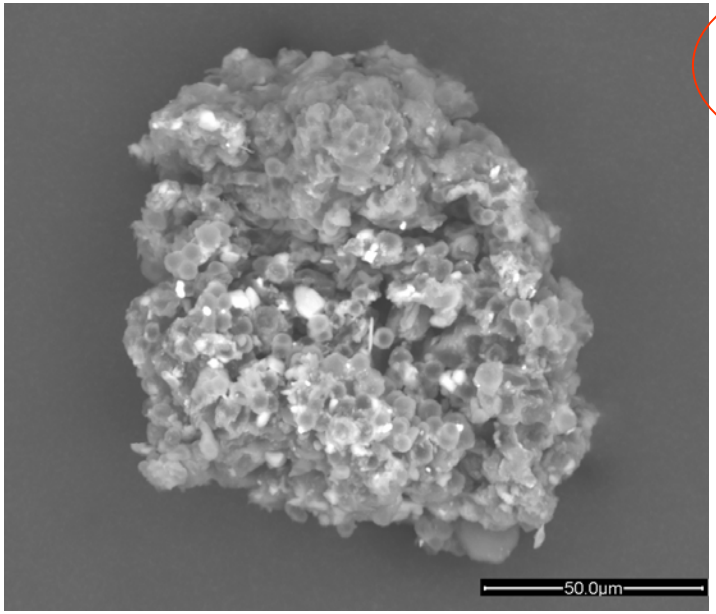


Gas emission of a diesel car

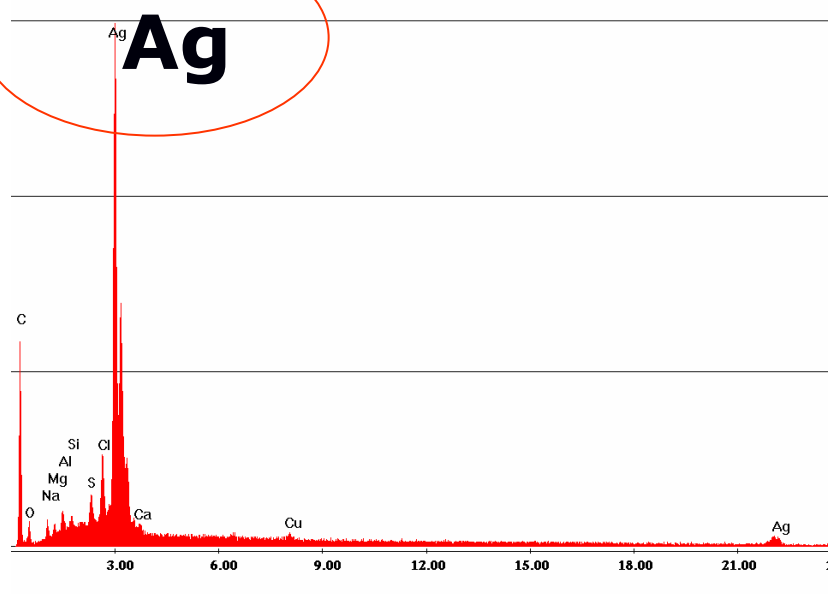


CrFeNi

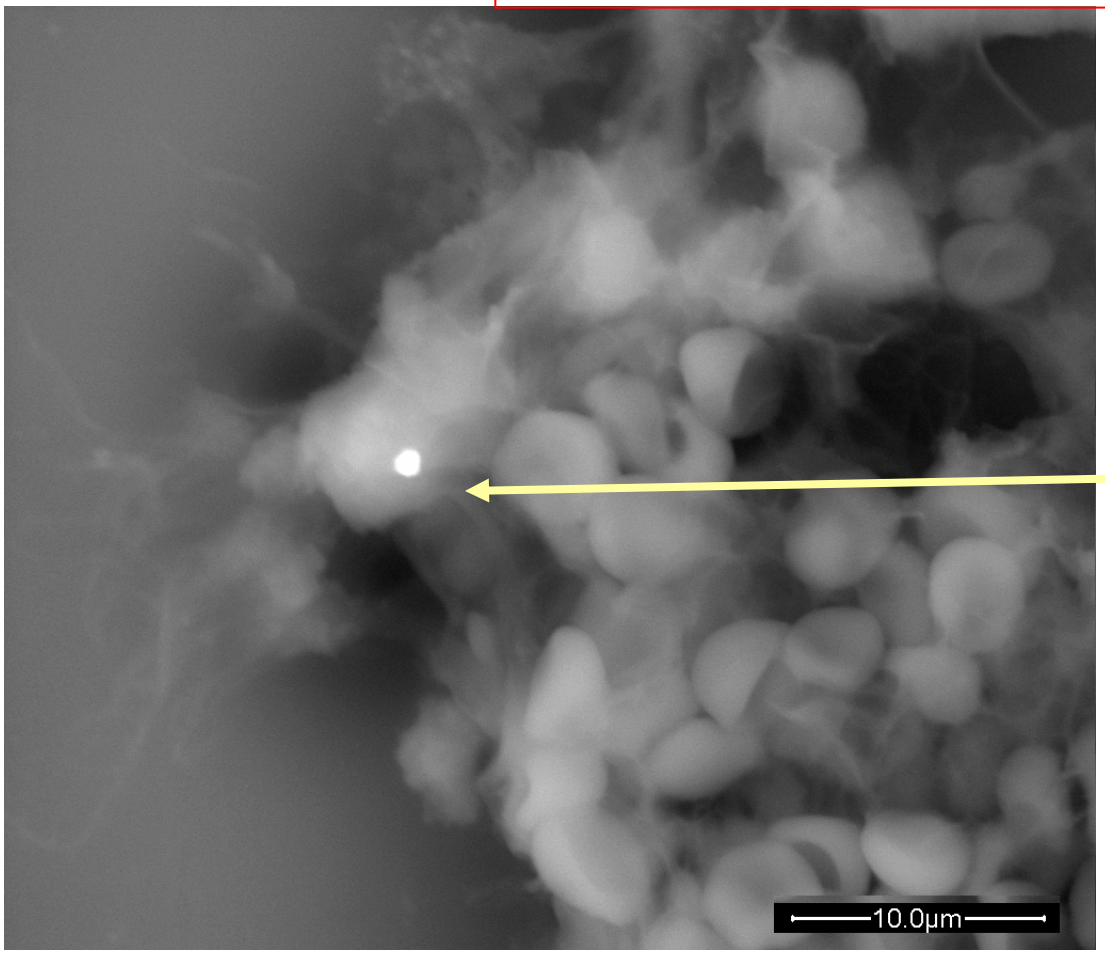


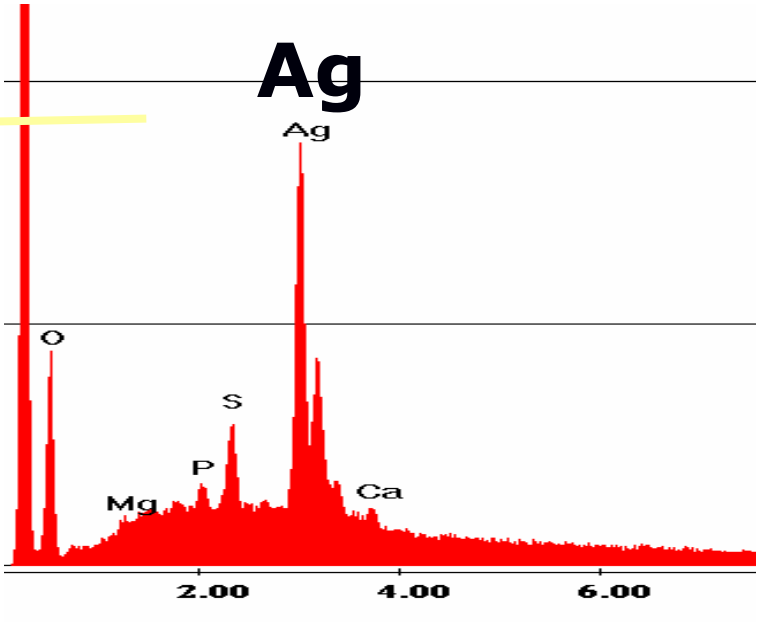


Ag

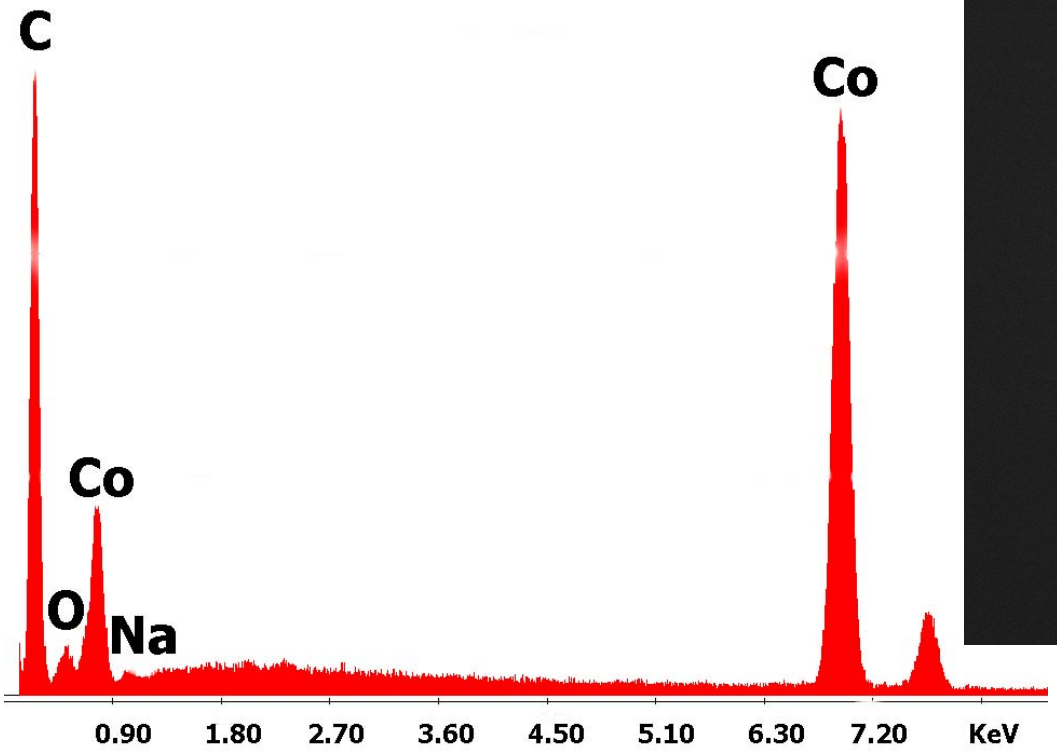


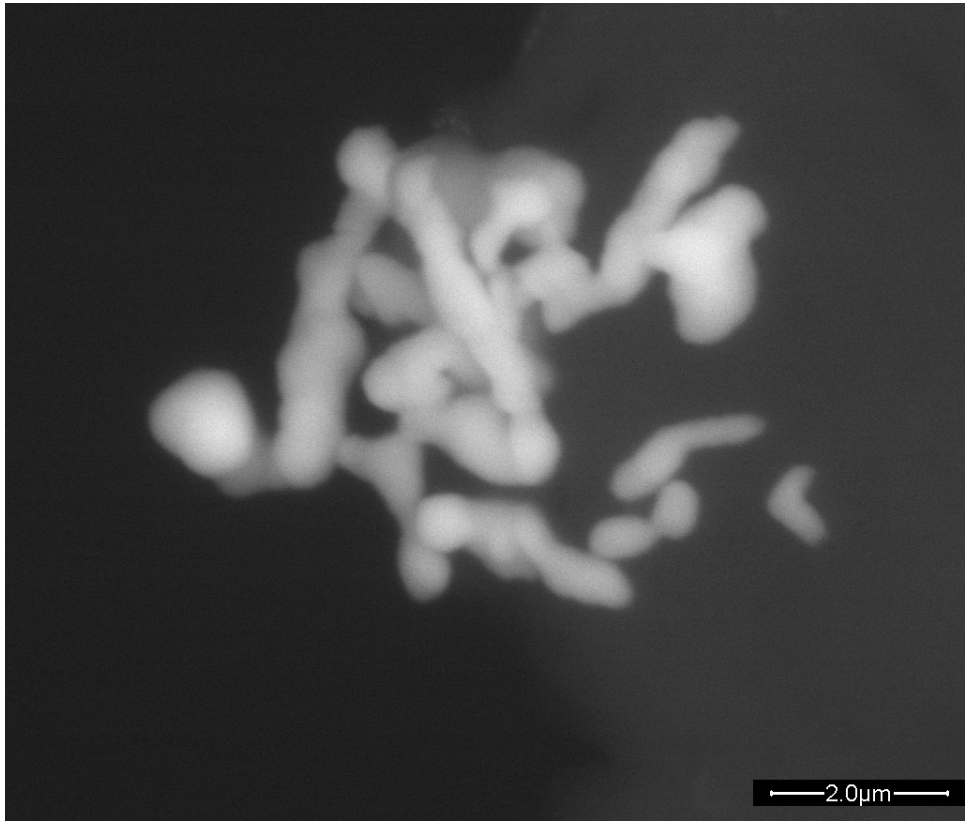
Blood clot in vivo



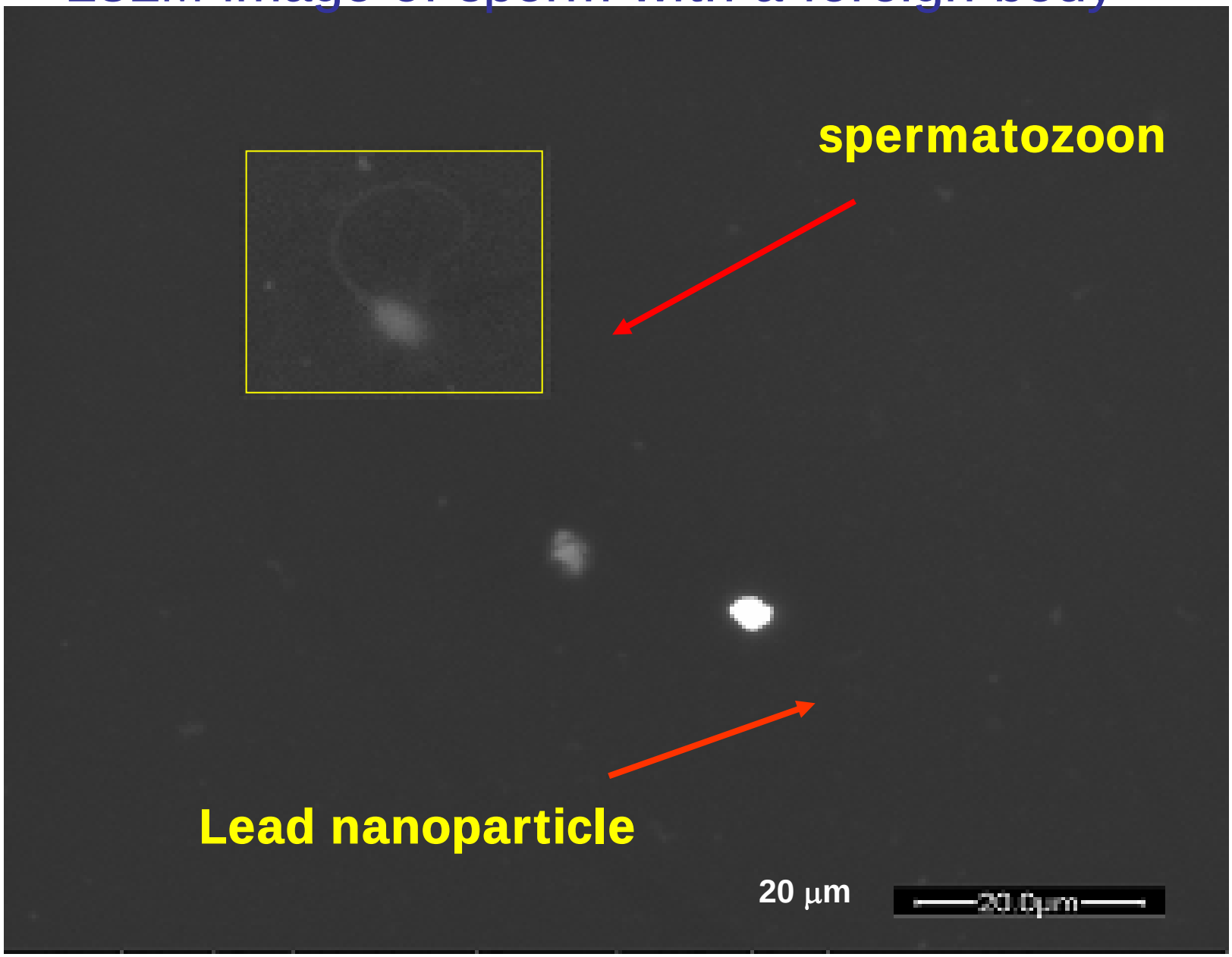


Bladder Carcinoma in a mine-sweeper



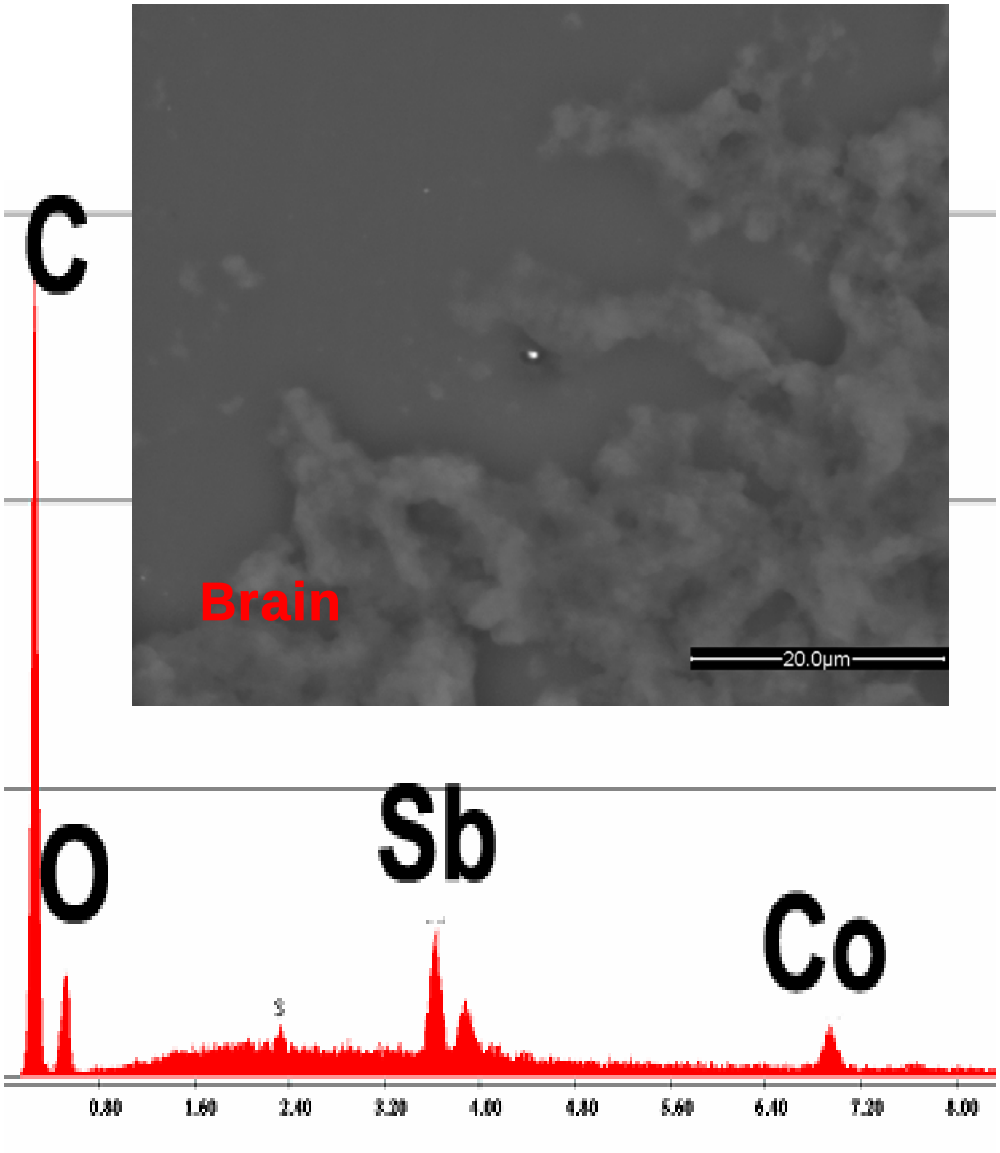


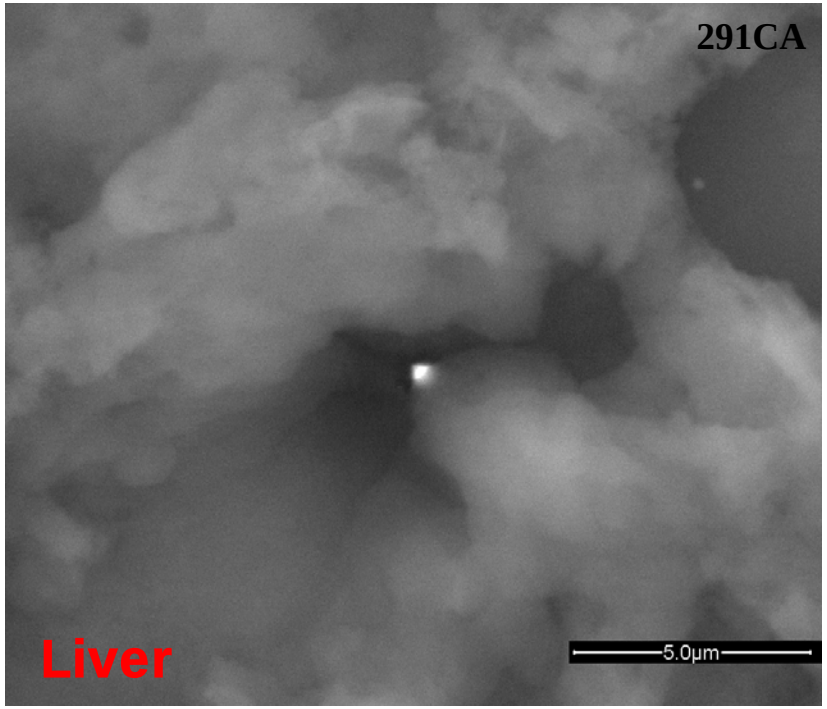
ESEM image of sperm with a foreign body

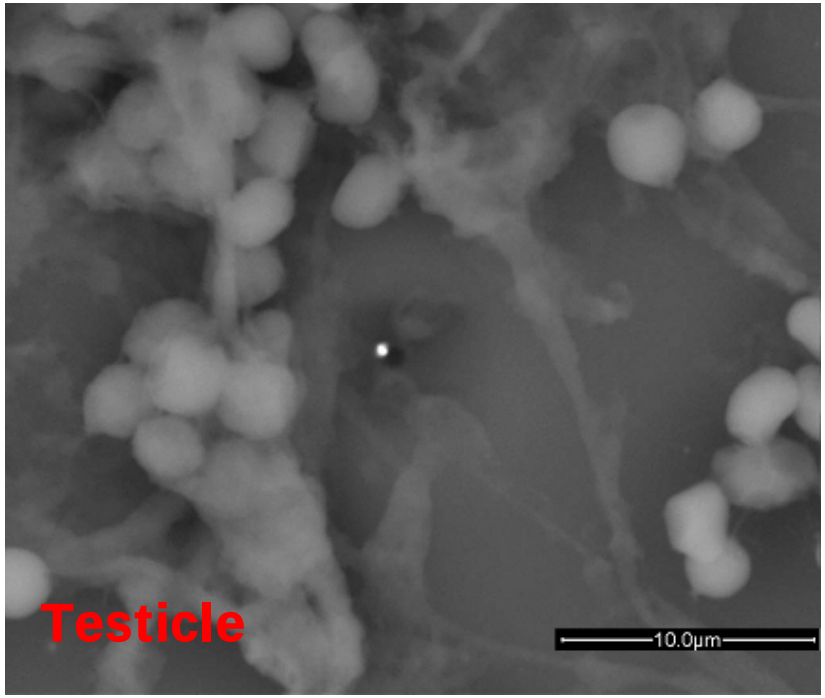


Malformed lamb born inside a groundfire in Sardinia, 2003

Internal organs of the malformaed foetus





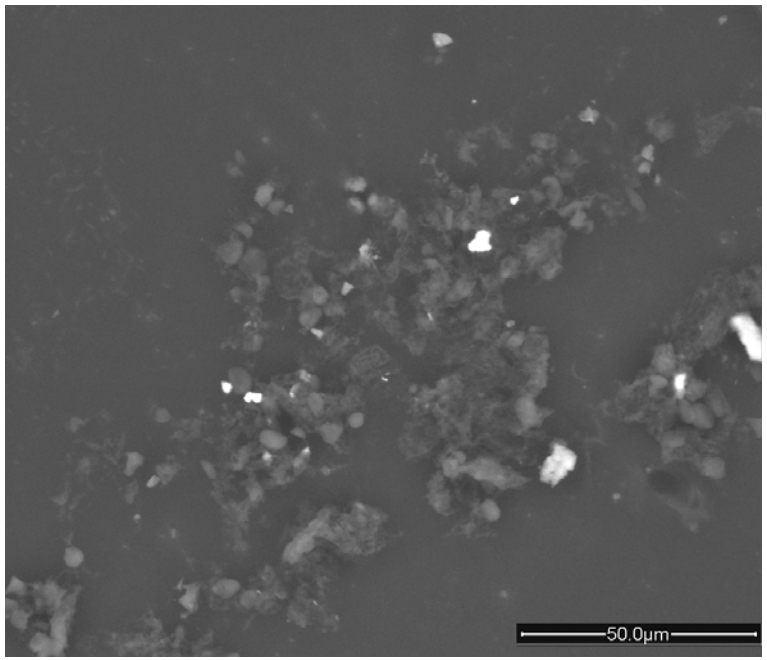


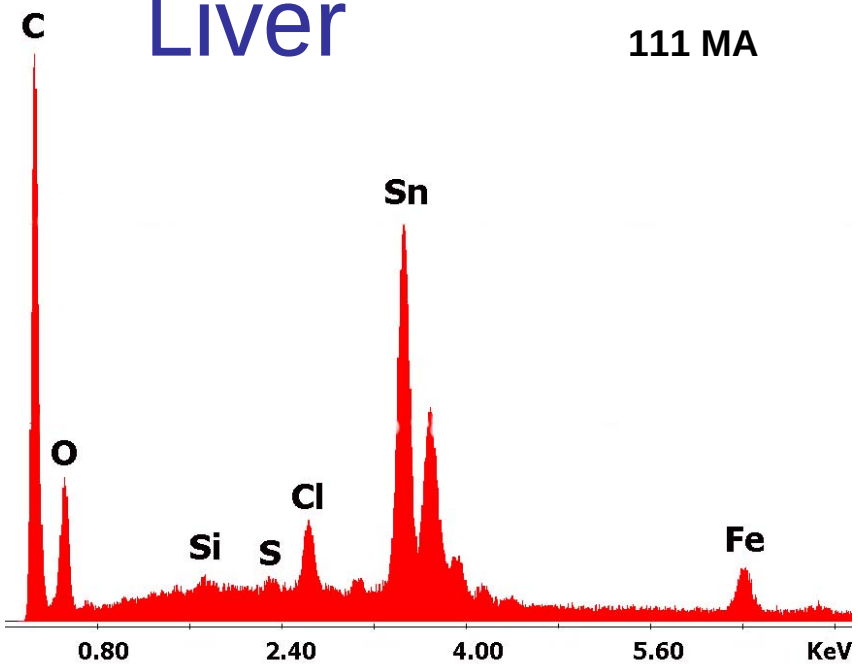
Neu-Laxova syndrome

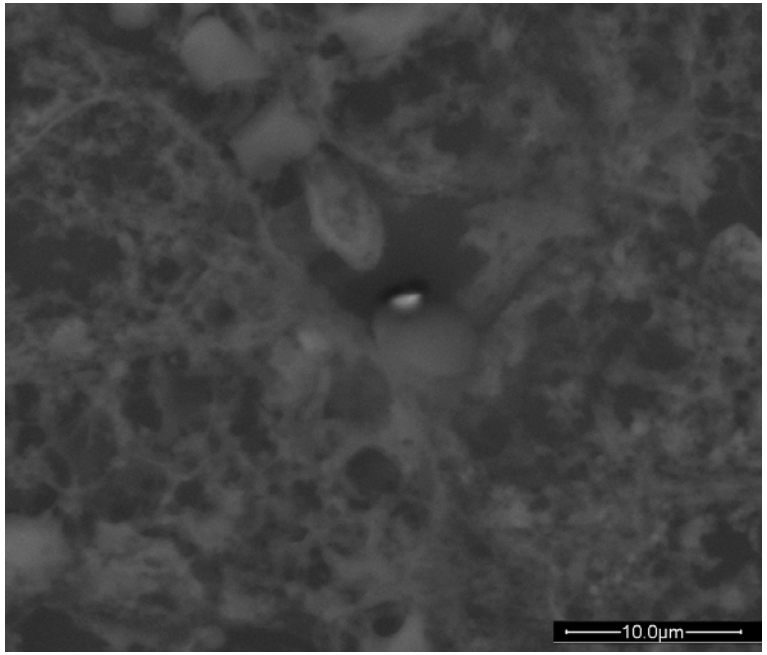
Neu-Laxova syndrome **is a rare congenital abnormality characterised by intrauterine growth restriction, microcephaly, facial dysmorphy, short neck, edema, scaly skin and perinatal death. Additional features such as spina bifida, cryptorchidism and shallow orbital cavities have been reported. Chromosomal analysis in reported cases has revealed a** ***normal karyotype*** **and an** ***autosomal recessive inheritance*** **has been postulated.**

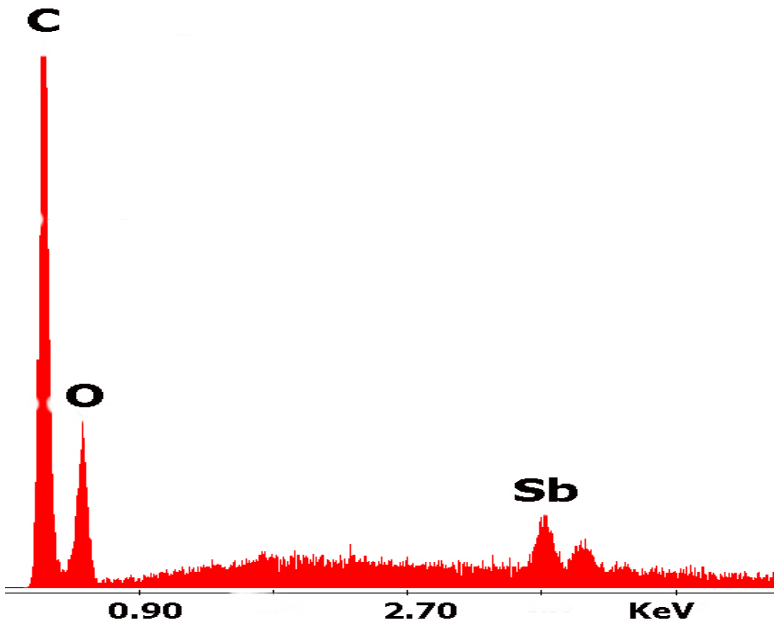
Liver

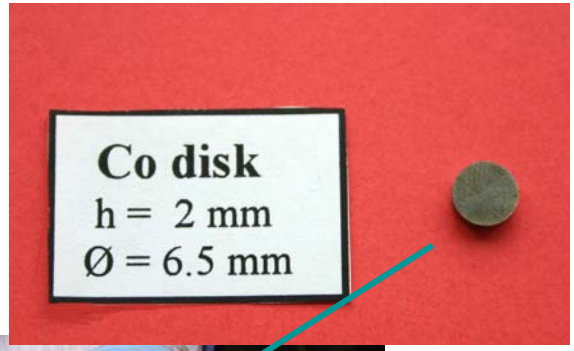
111 MA

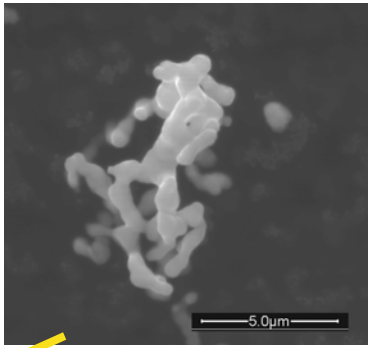


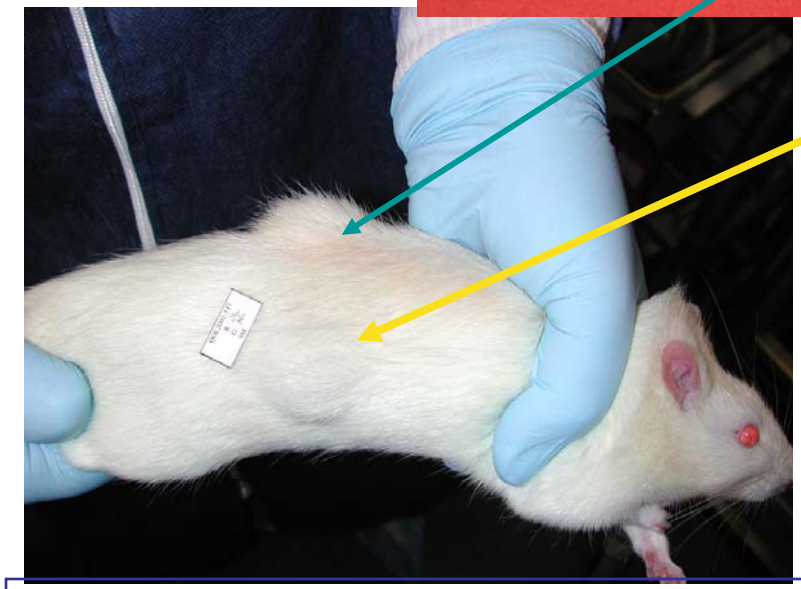






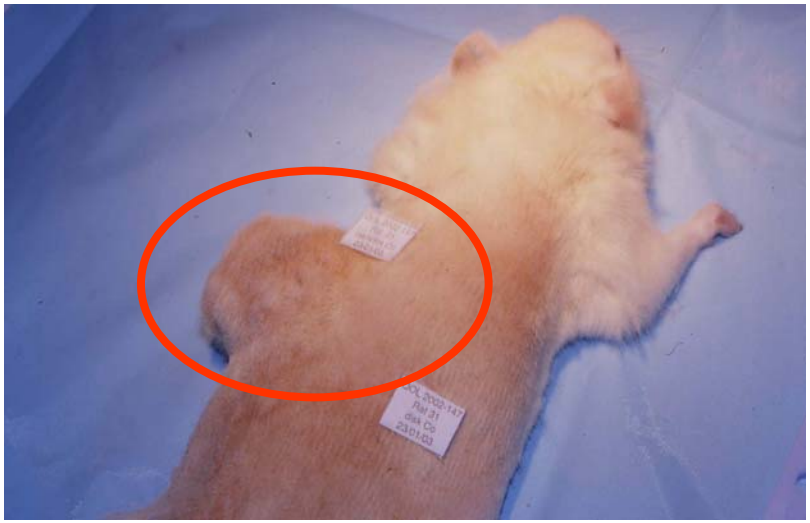


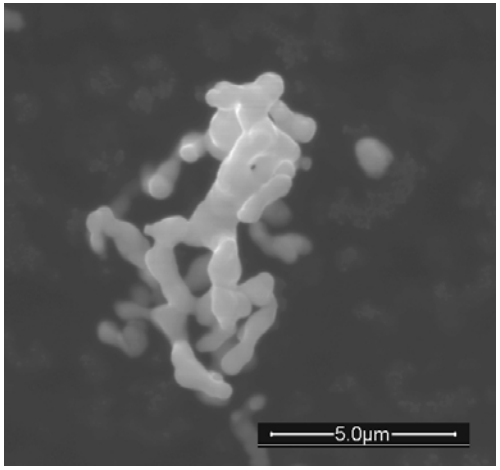




Ni Group :
nodules observed on both sides (particles + bulk material) in all animals 6 months after implantation

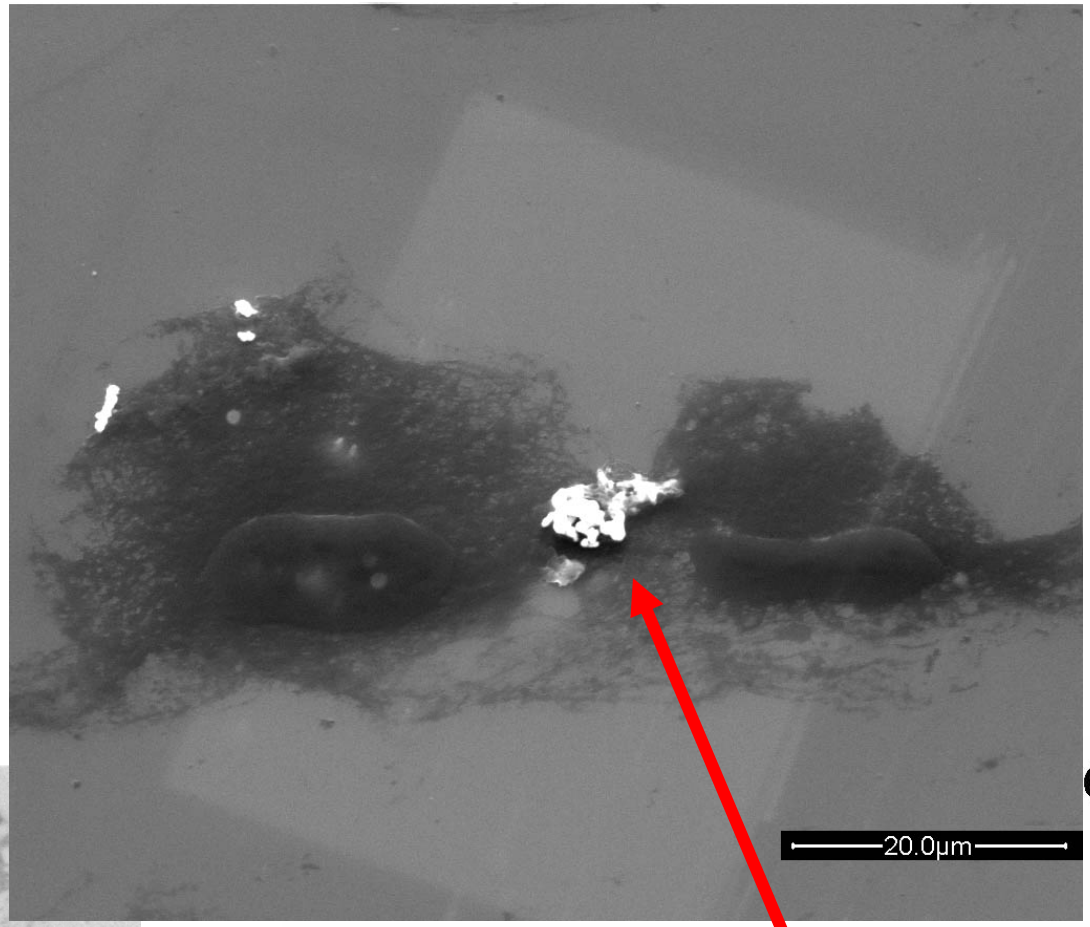
Co Group :
Nodules observed on the left side (nanoparticles IM) in all cases 8 months after implantation – nothing on the right side (bulk material implanted SC)

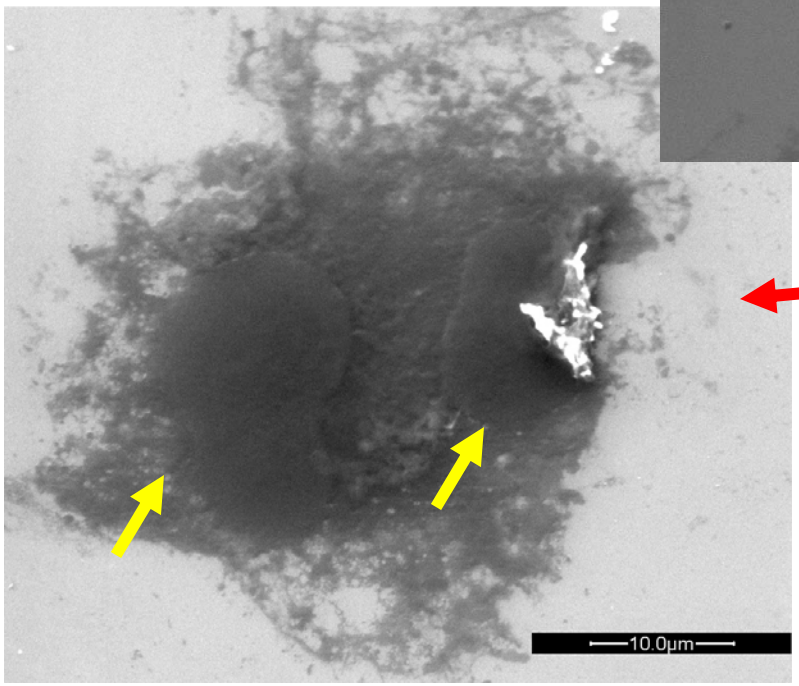


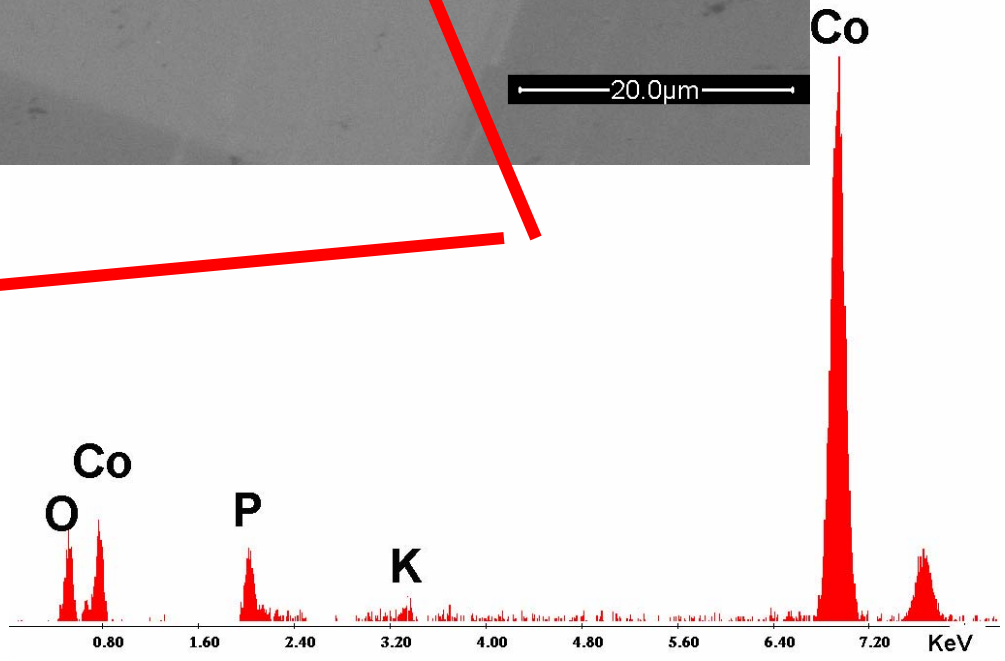


Nickel and Cobalt nanoparticles induced rabdomiosarcoma after 6-month implantation in rats, the bulk samples only fibrotic capsules or granulomas.

3T3 Cells with Co nanoparticles





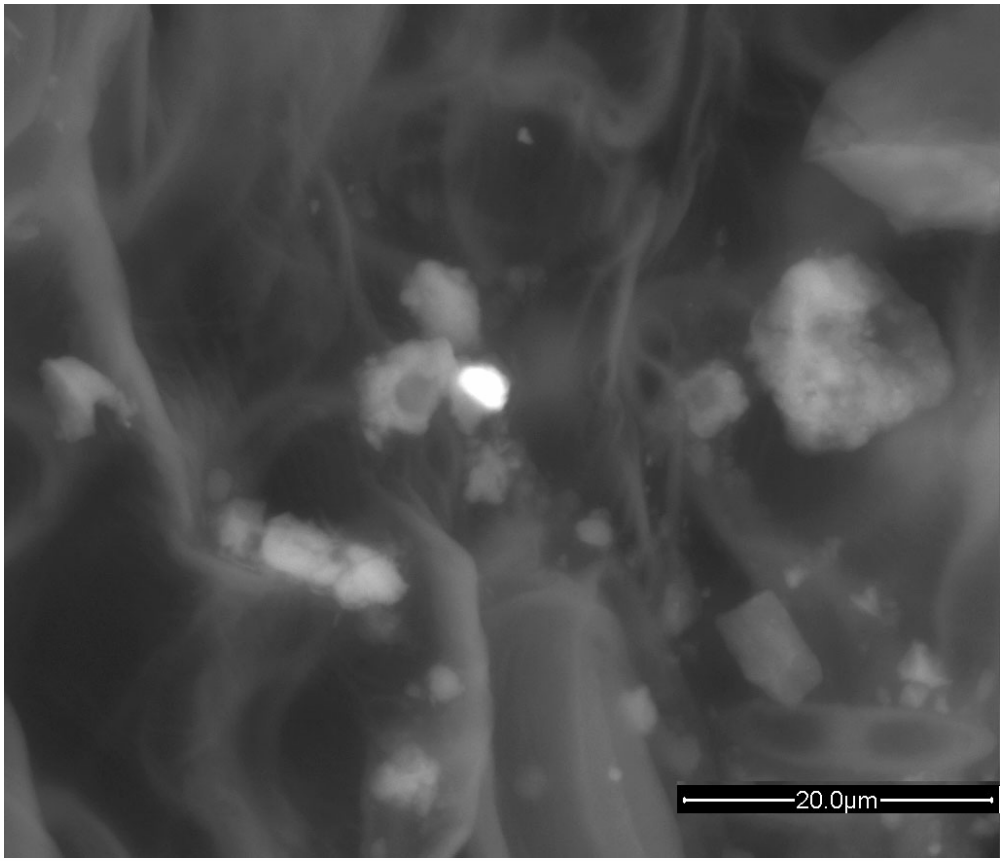


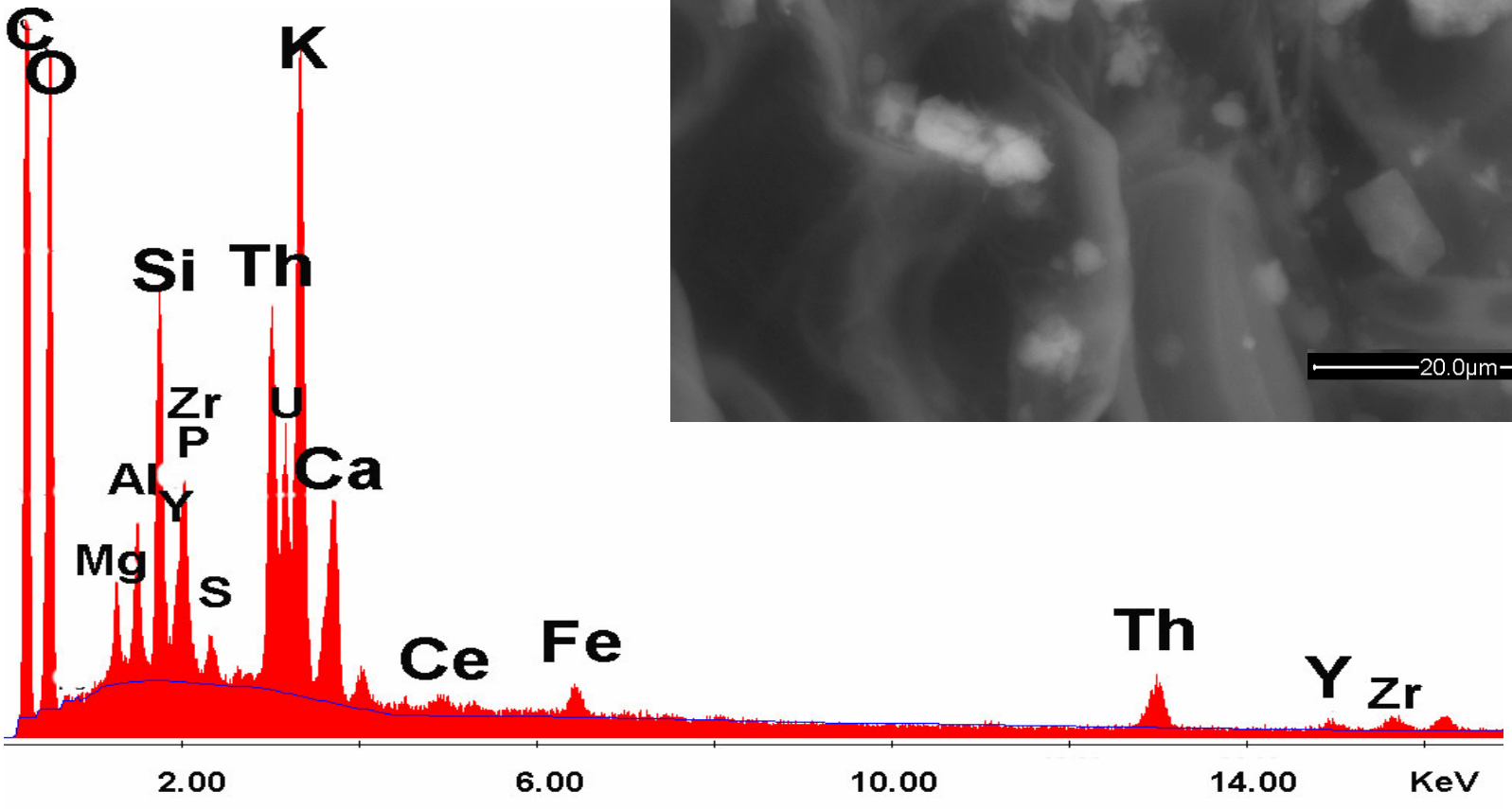
We live in a pollutted world

and

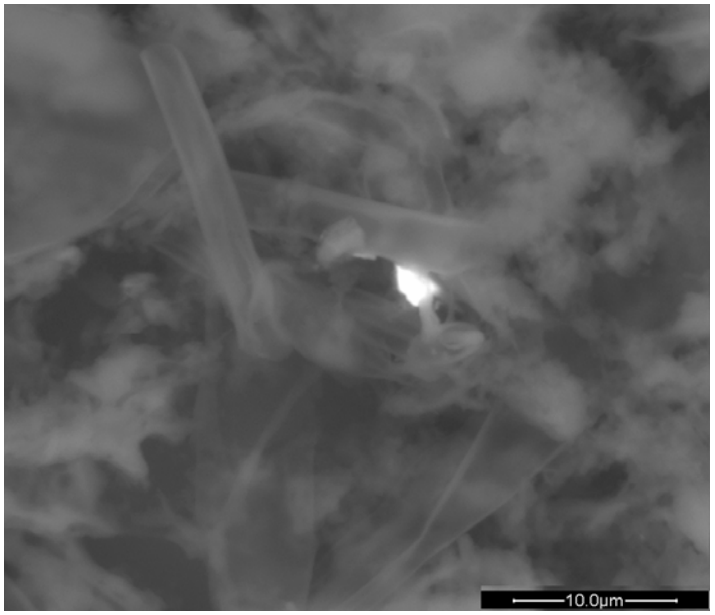
We have no defence against…..

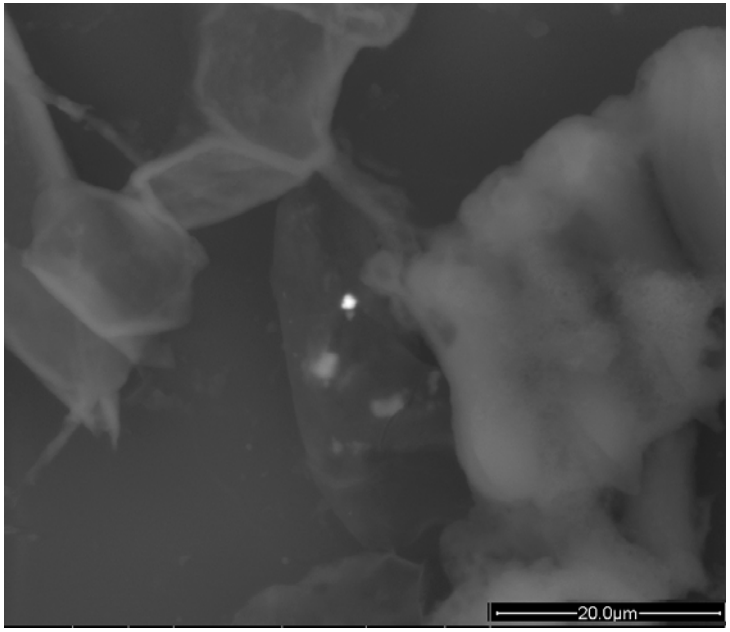
Cigarette from Bagdhad

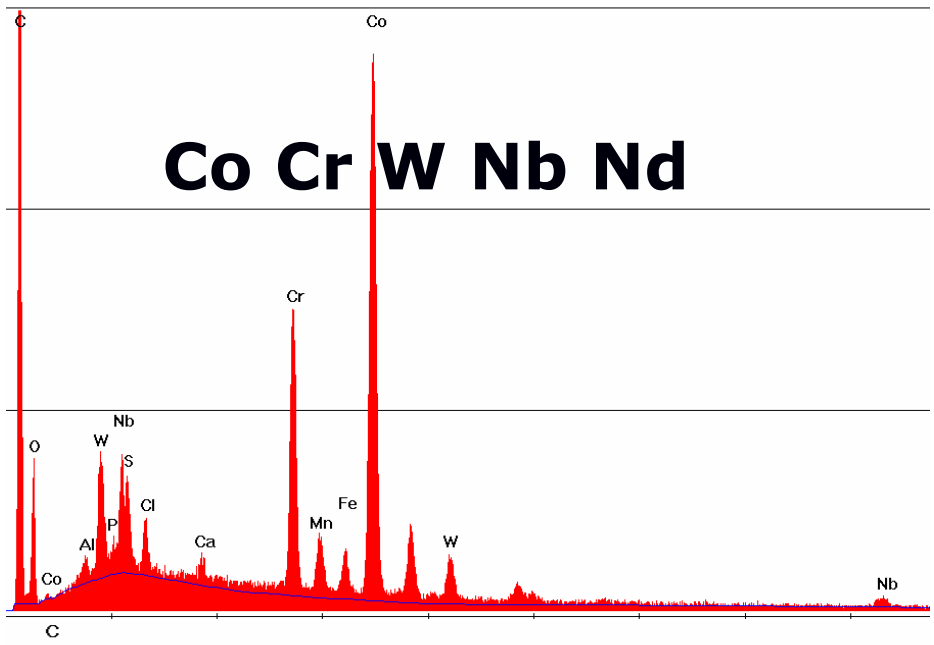


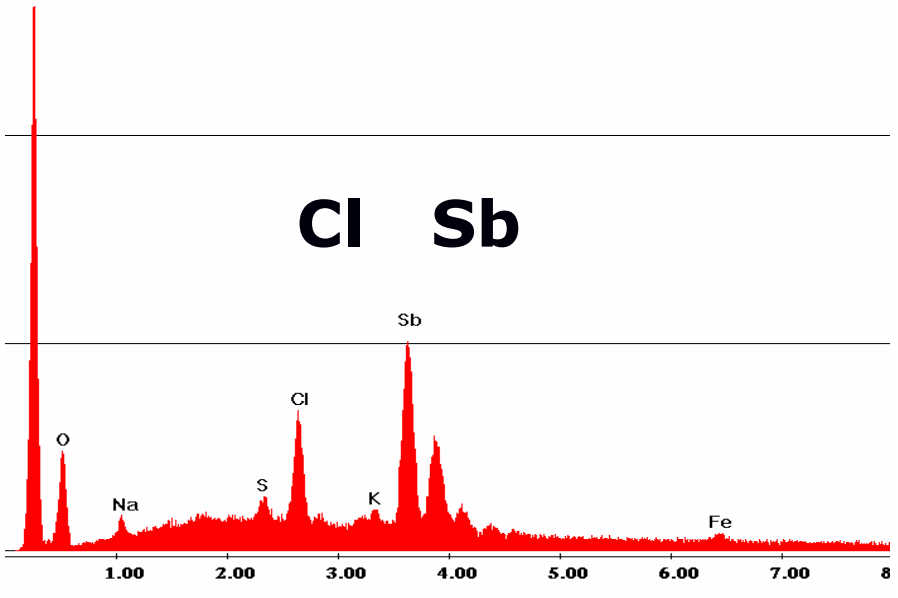


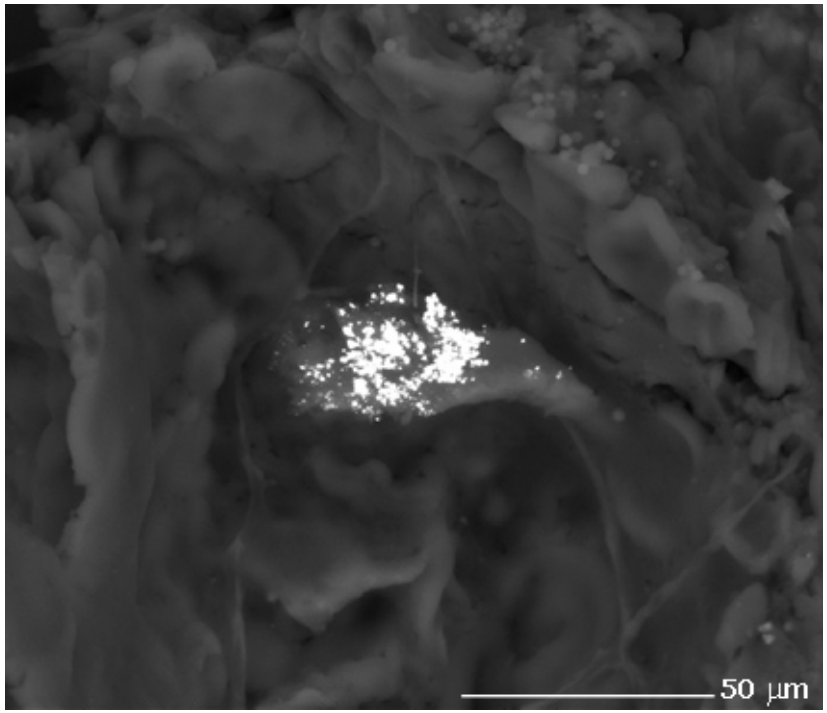
Anchovy's liver from the Adriatic sea



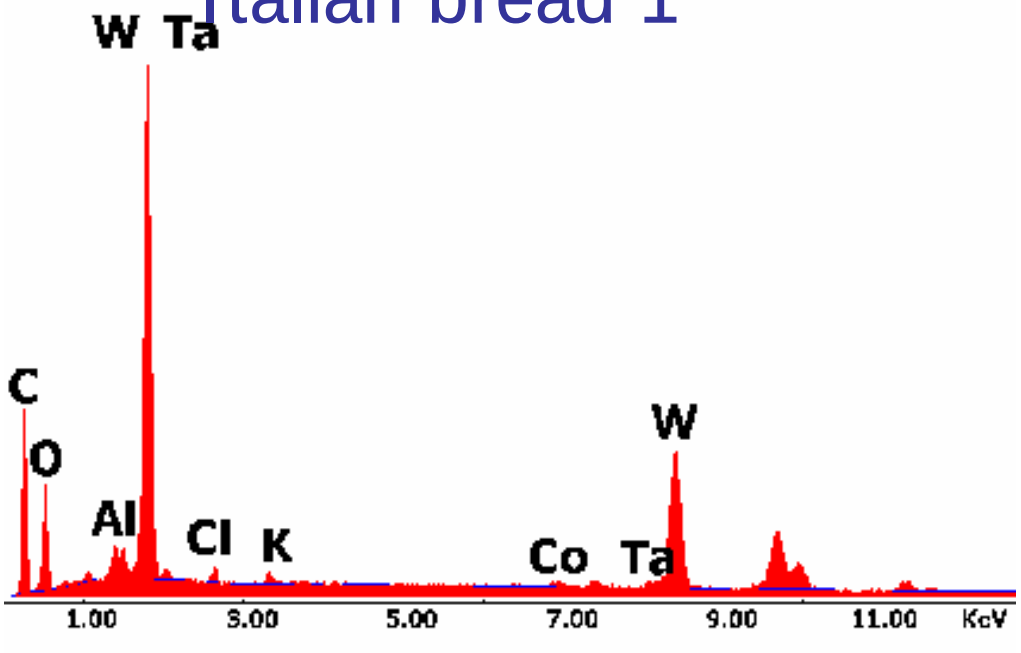


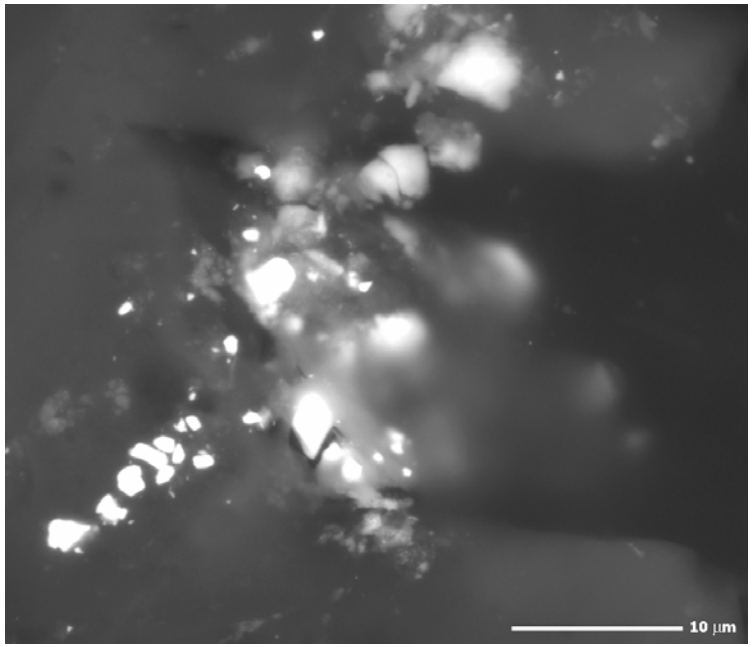




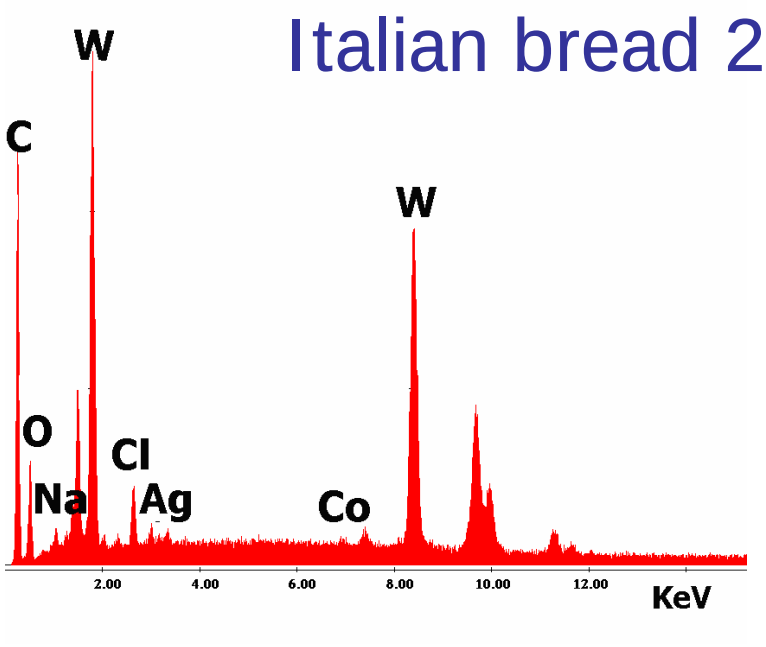


Italian bread 1

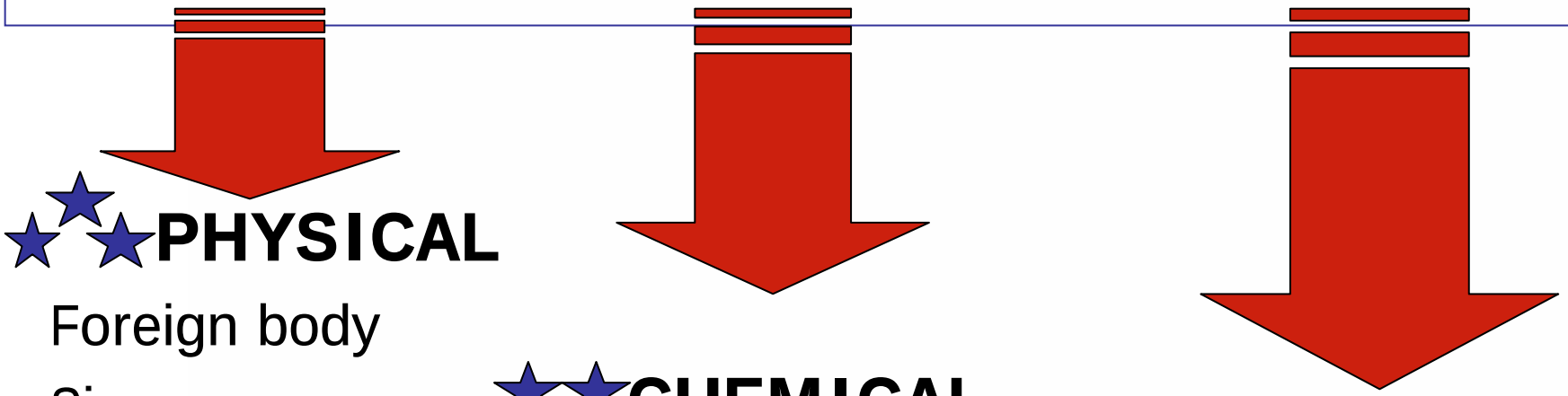




Italian bread 2



Factors influencing the pathogenicity of micro- and nanoparticles



PHYSICAL

Foreign body

Size

Shape

Surface area

Concentration

Intake velocity

Radioactivity

CHEMICAL

Composition

Corrodibility

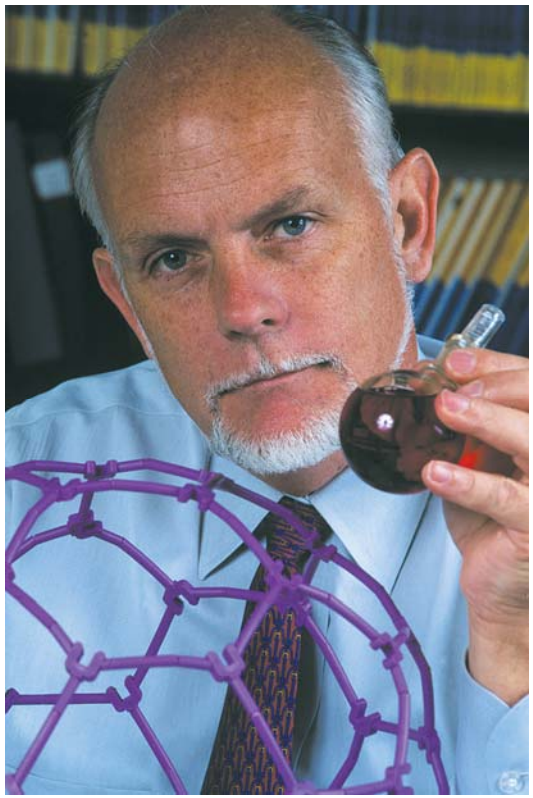
Speciation

BIOLOGICAL

Organ (cell) involved

Health condition

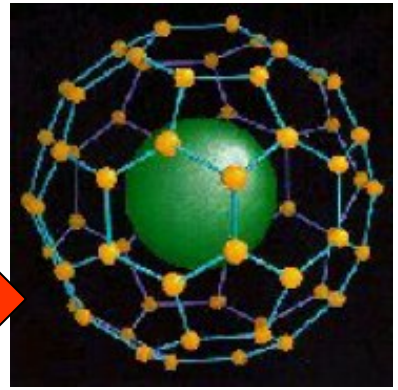
Individual variability



Nobel Laureate Richard Smalley 1996 for the synthesis of fullerenes

Dead 31st October 2005.

In laboratory the exposure to nano can (and must) be avoided



Partners for nanoP2

- University of Mainz – DE
- CNR of Italy- I
- University of Malta – UK
- University of Sarajevo - BiH


Thanks
Memento quia pulvis es et in pulverem reverteris