

INTERACTIUNEA CELULEI EUCARIOTE ANIMALE CU NANOPARTICULE TiO_2 DOPATE

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STUDII IN DOMENIU

2004 – OBERDORSTER et al., TiO₂ in tesut nervos

2006 – SIPZNER et al., penetrarea TiO₂ in culturi de fibroblasti

2006 – WOLOSCHAK et al., TiO₂ intracelular

2007 – WANG et al., NP TiO₂ transportate in alte tesuturi prin tractul intestinal

2008 – GHESHLAGHI et al., TiO₂ - microtubuli

2009 – ARORA et al., TiO₂@Fe₃O₄ ~ doxorubicina, carcinom ovarian

2009 – JHA et al., implicarea unor procariote in sinteza NP TiO₂ (*Lactobacillus*, *S. cerevisiae*)

2010 – BARILLET et al., studiul actiunii NP TiO₂ dupa acumularea lor intracelulara

MATERIAL SI METODA

ANIMALE DE EXPERIENTA – *Mus musculus*

NP TiO₂: TiO₂ nedopat

TiO₂ ~ Me (Ag, Pt sau Fe)

- **Forma de cristalizare *anatase*.**
- **Izopropoxid de titan - precursor pentru titan**
- **Nanoparticule 10-20 nm**
- **INJECTII i/p CU 0.5 ML SOL. 0.01% (1 la 2 zile)**

FACTOR DE STRES – radiatii-X (5.28 Gy)

ANALIZA US FICAT (TEM, JEOL-JEM-1010)

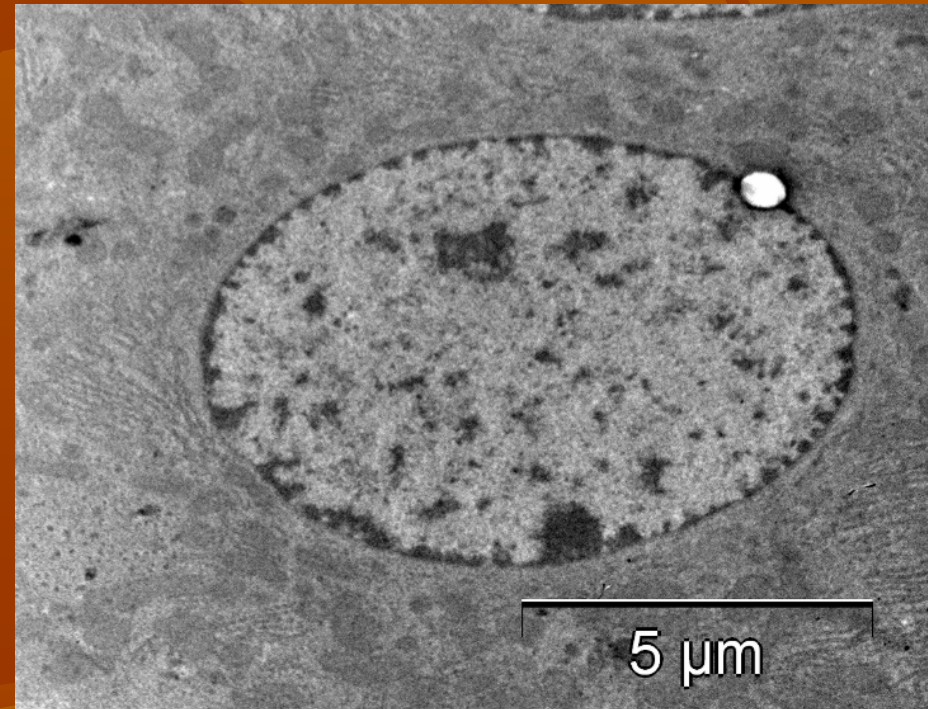
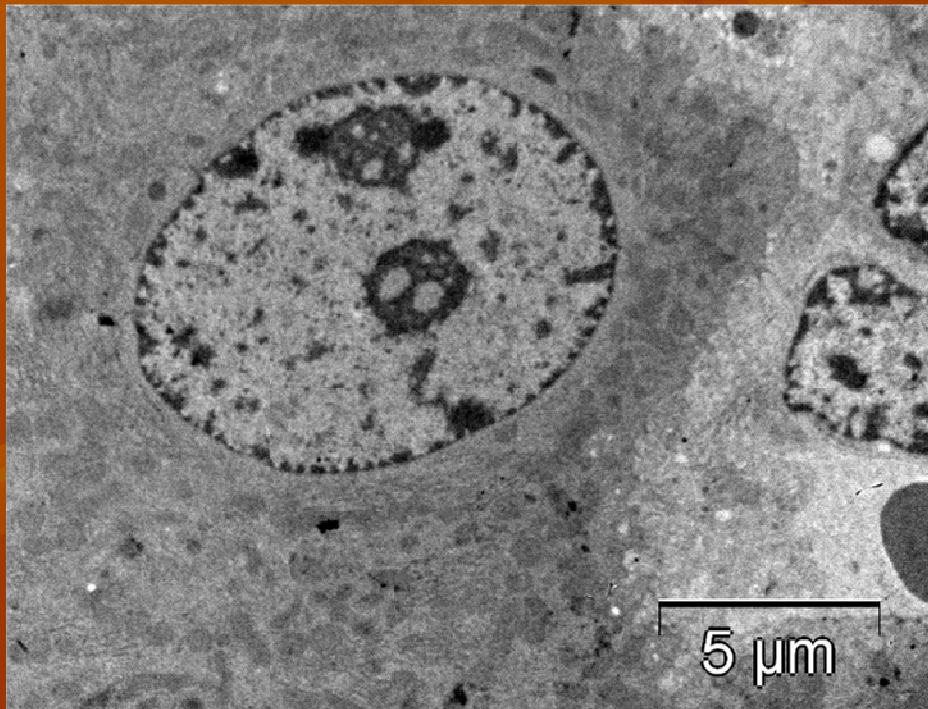
VARIANTE EXPERIMENTALE

- CONTROL
- CONTROL - X
- TiO₂
- TiO₂ - X
- TiO₂ ~ Pt
- TiO₂ ~ Pt - X
- TiO₂ ~ Fe
- TiO₂ ~ Fe - X
- TiO₂ ~ Ag
- TiO₂ ~ Ag - X

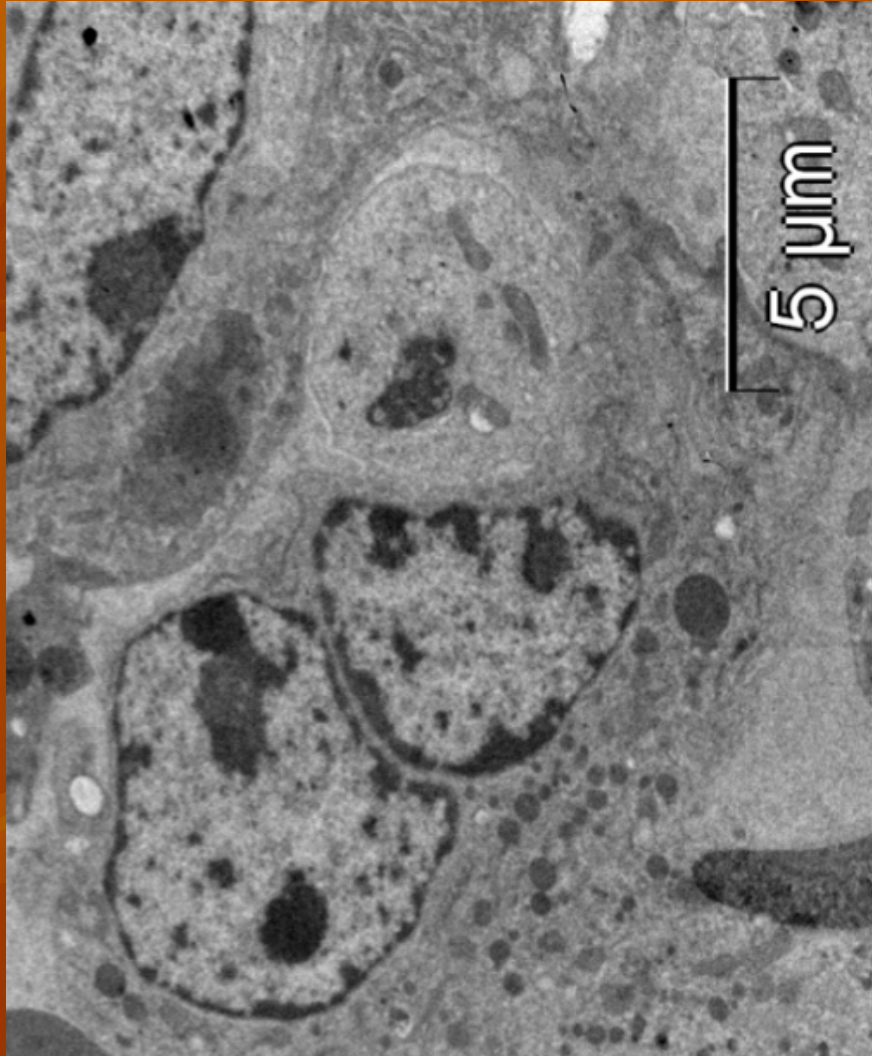
CONTROL

STRUCTURA NORMALA

- Hepatocite cu 1 (2) nucleu, contur neted
- Mitocondrii sferice numeroase
- REG bine reprezentat, REN discret, dictiosomi, glicogen; cel. Kupffer in activitate normala, Ito.



CONTROL



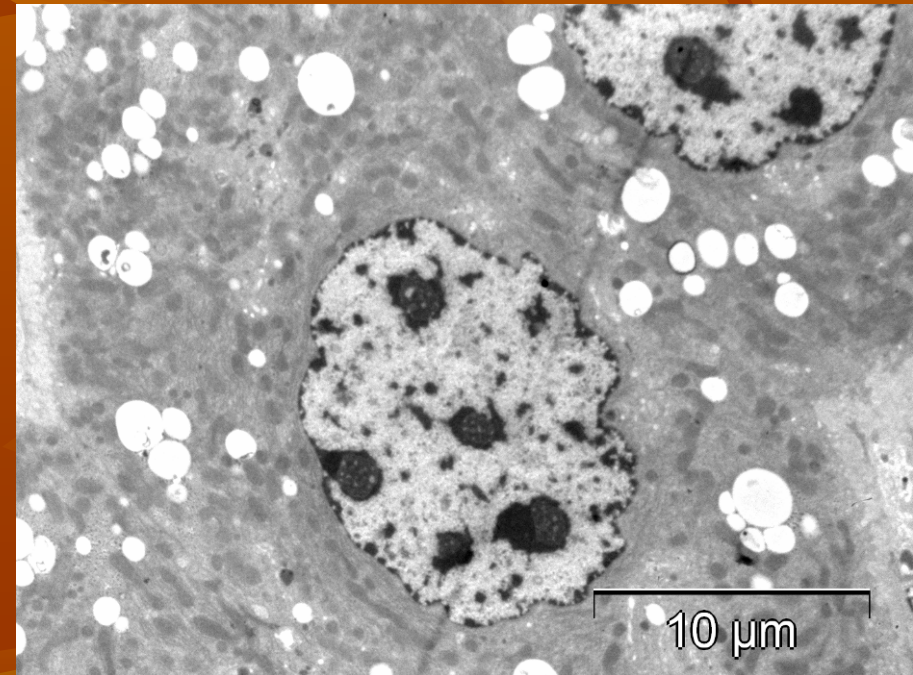
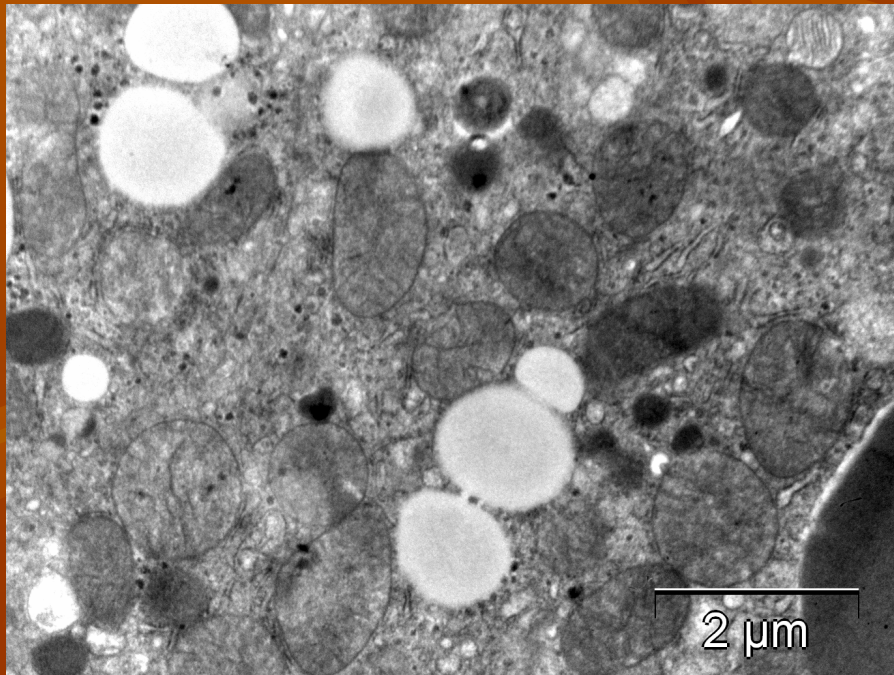
CONTROL - IRADIAT

Numeroase picaturi de lipide (necolorate)

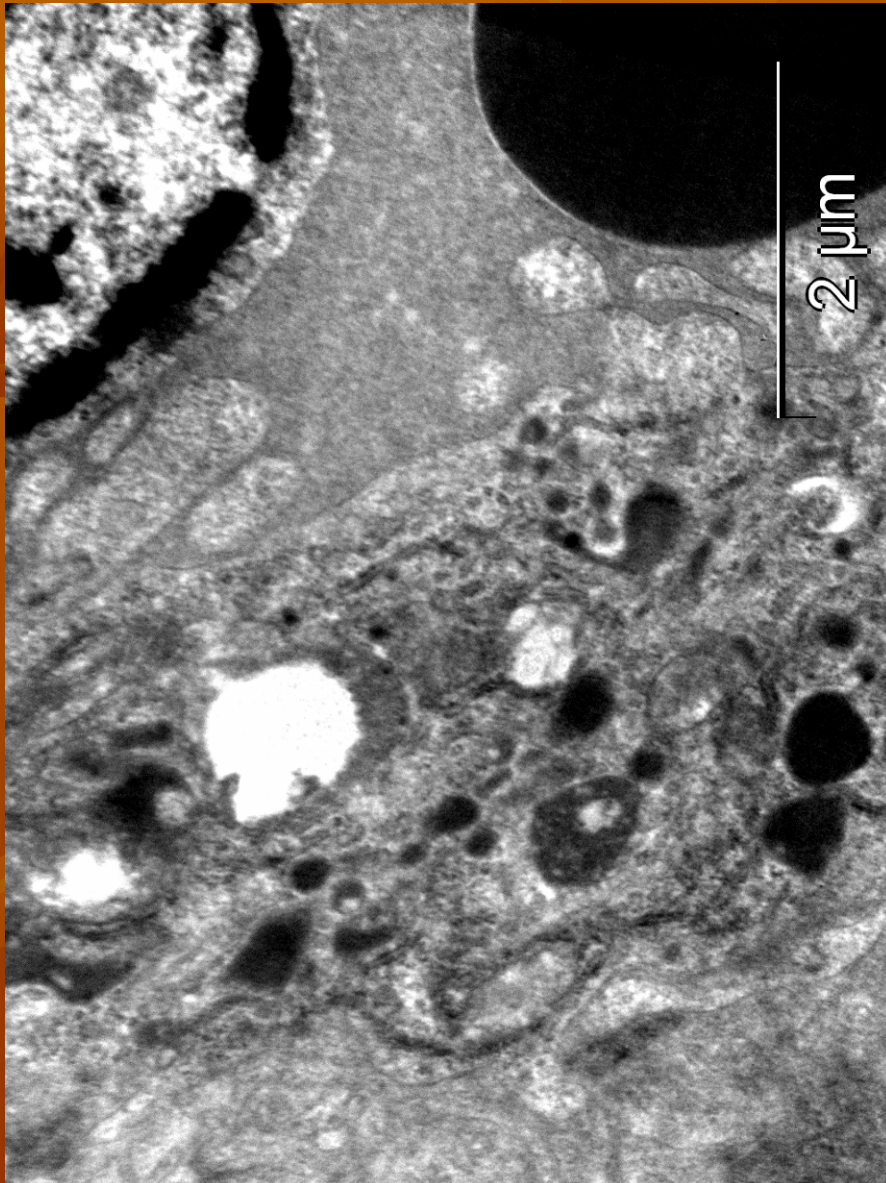
Mitocondrii cu numar redus de criste

Nucleu contur neregulat, nucleoli cu vacuolarizari; uneori heterocromatina depolimerizata, picnotica

Kupffer (lizosomi, vezicule pinocitoza). Ito cu putine lipide



CONTROL - IRADIAT

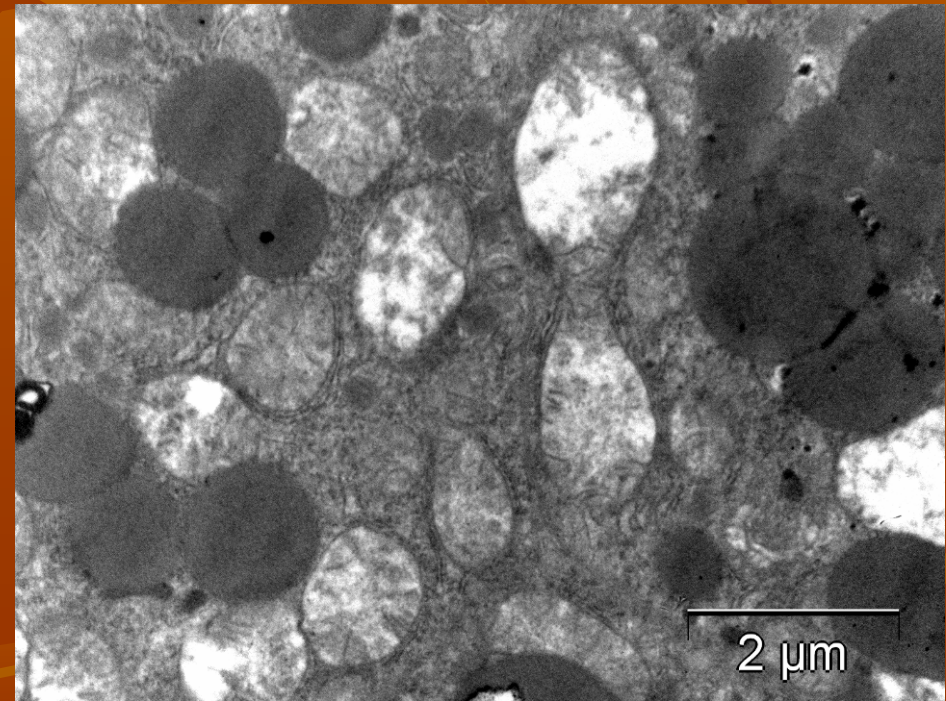
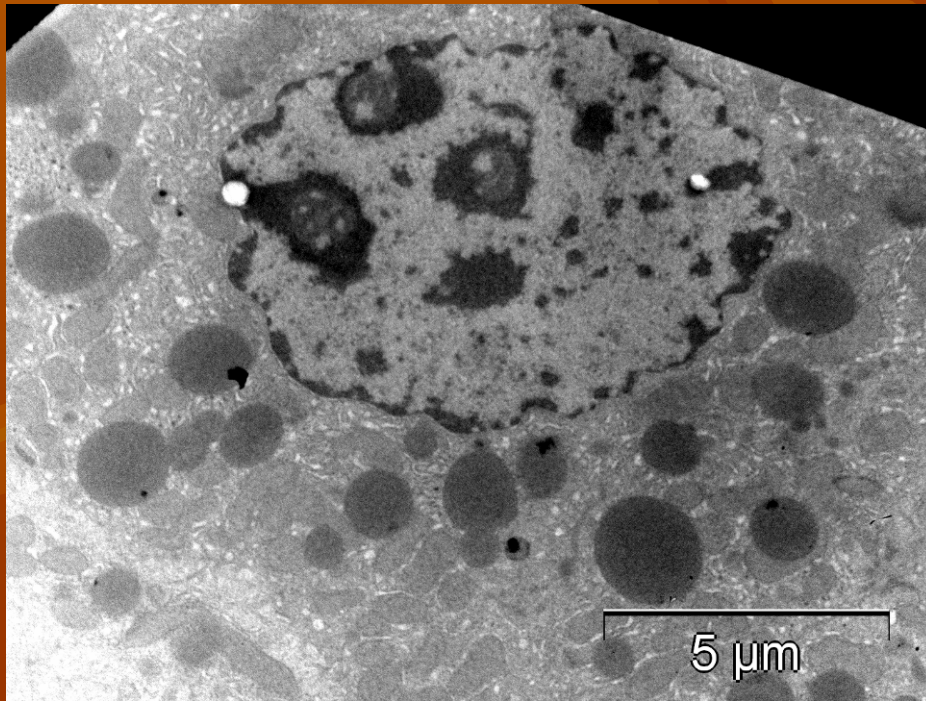


TiO₂ NEDOPAT

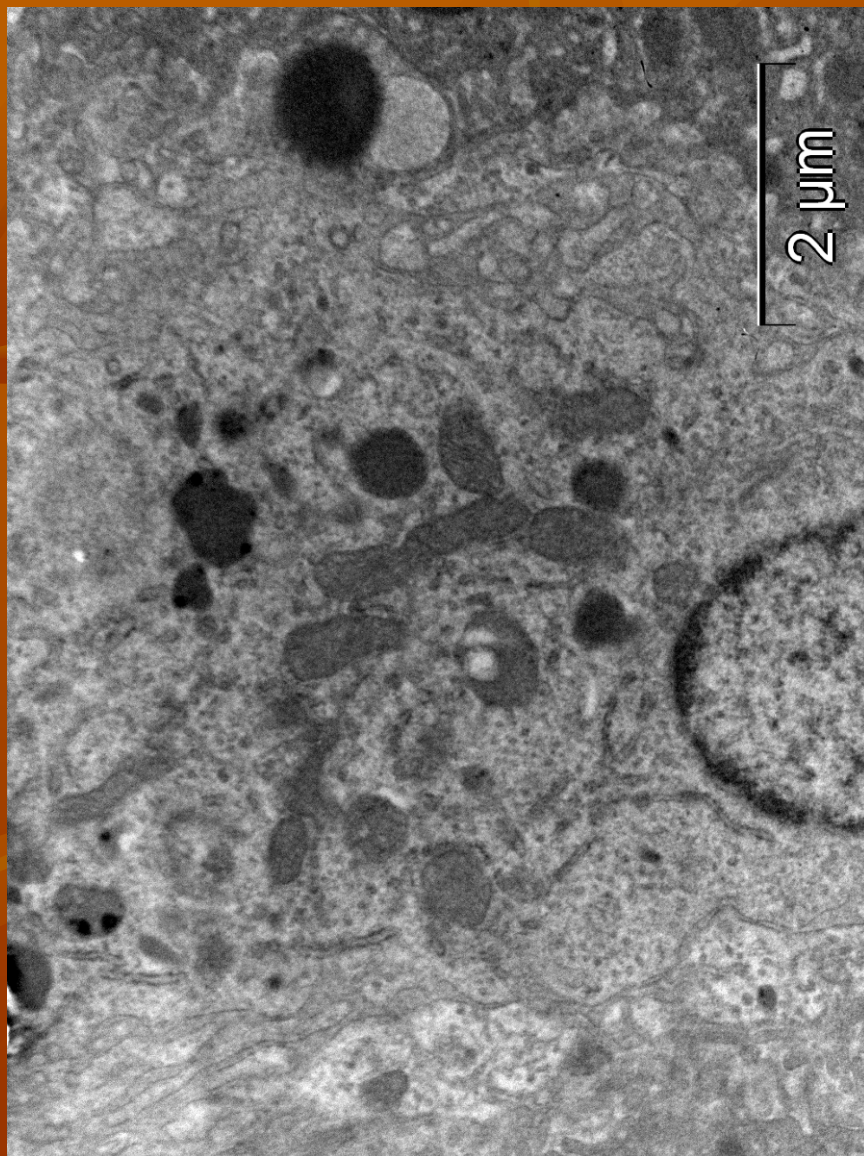
Prezenta TiO₂ afecteaza tranzitul de lipide: in hepatocite numeroase picaturi de lipide, absente insa in celula Ito.

Nucleu contur neregulat, cu invaginari; heterocromatina parietala; nucleolul putin evident.

Mitocondrii criste normale, matrix electron-clar sau normal, uneori in diviziune



TiO₂ NEDOPAT



TiO₂ NEDOPAT, IRADIAT

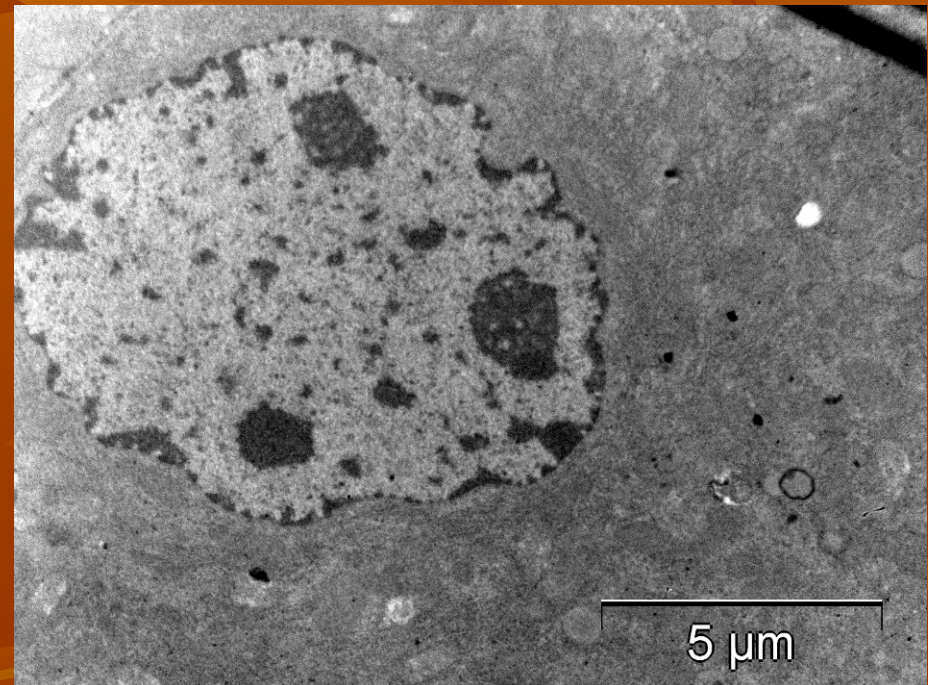
Iradierea-X in prezenta TiO₂ are efecte atenuate

Nucleul si nucleoli, mitocondria - structura cvasi-normala

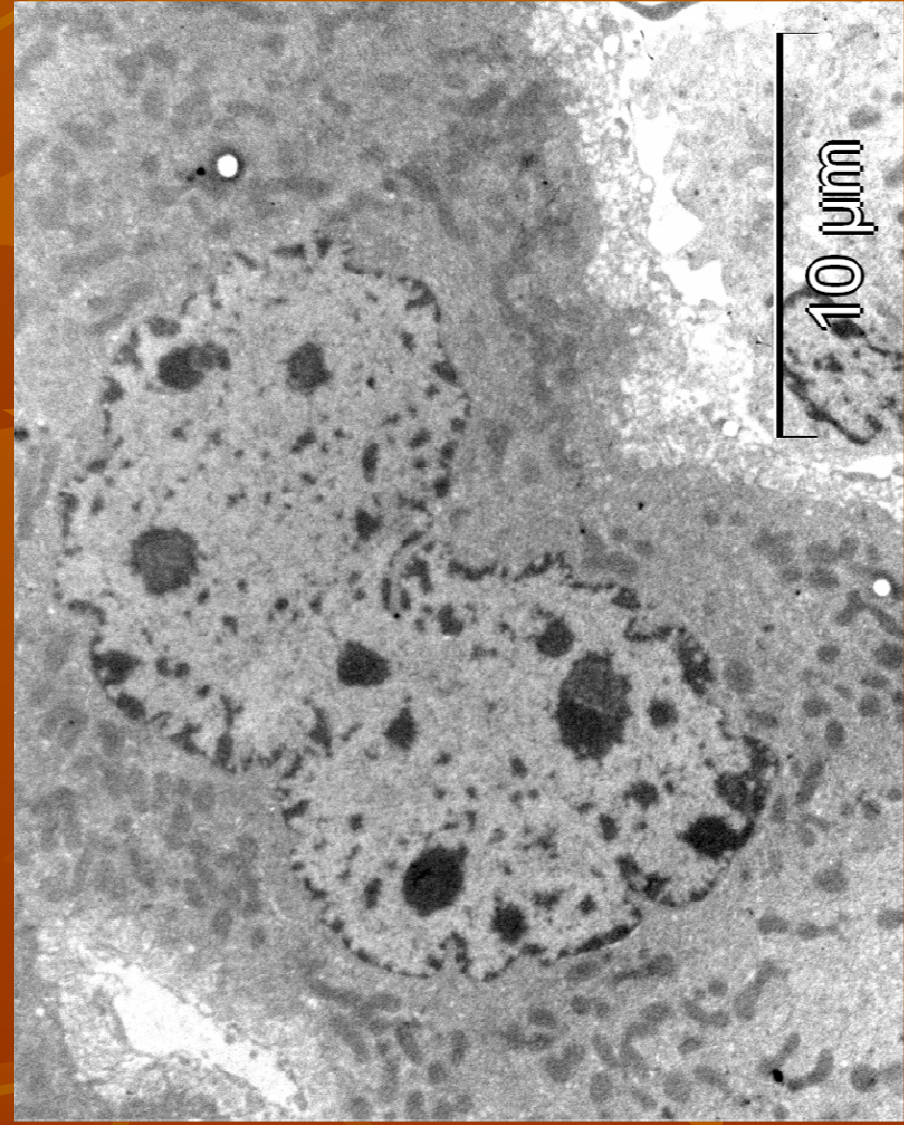
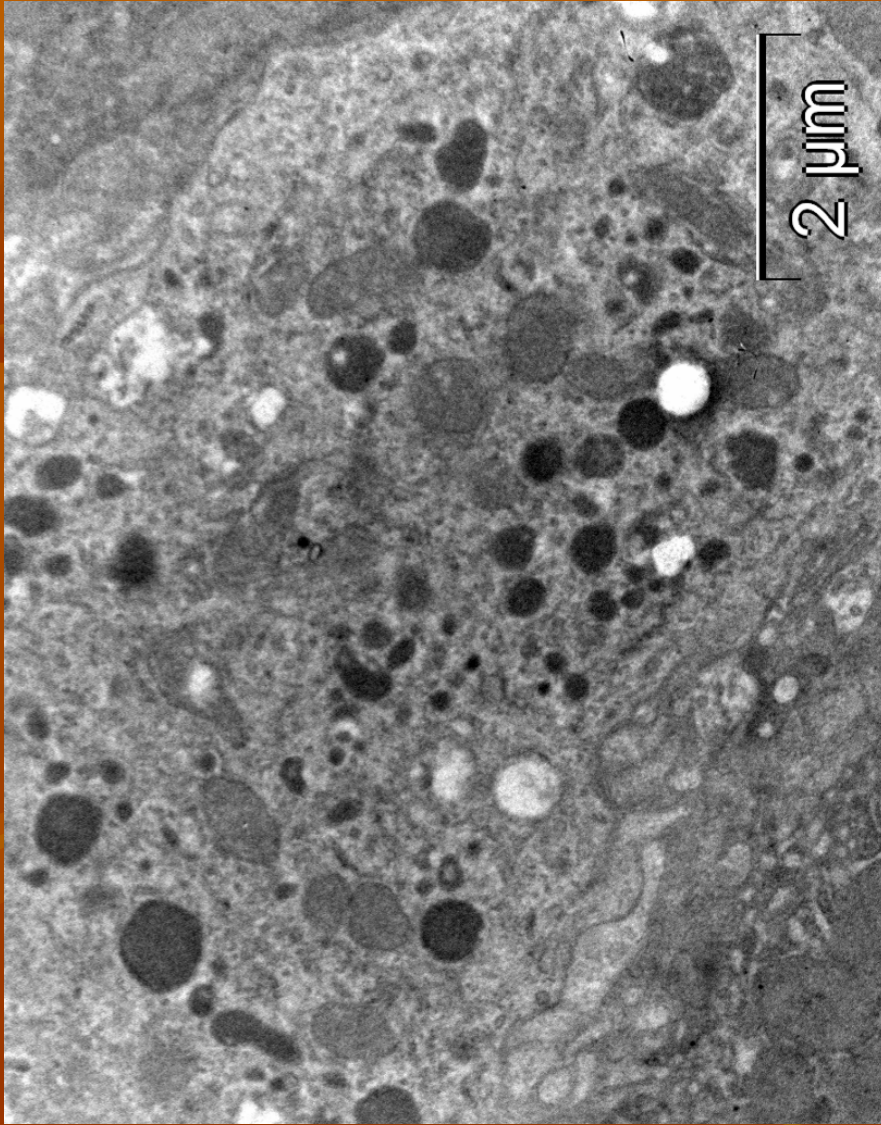
Usoare dilatari ale REG, cantitate redusa de lipide

Stimulare: hepatocite in diviziune amitotica

Celule Kupffer active, foarte incarcate



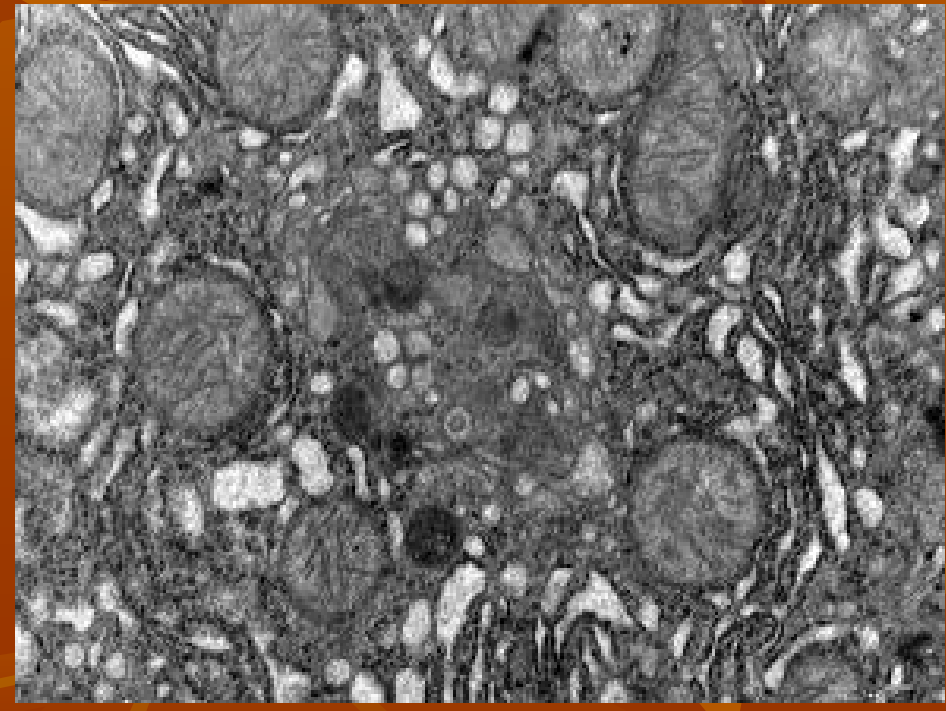
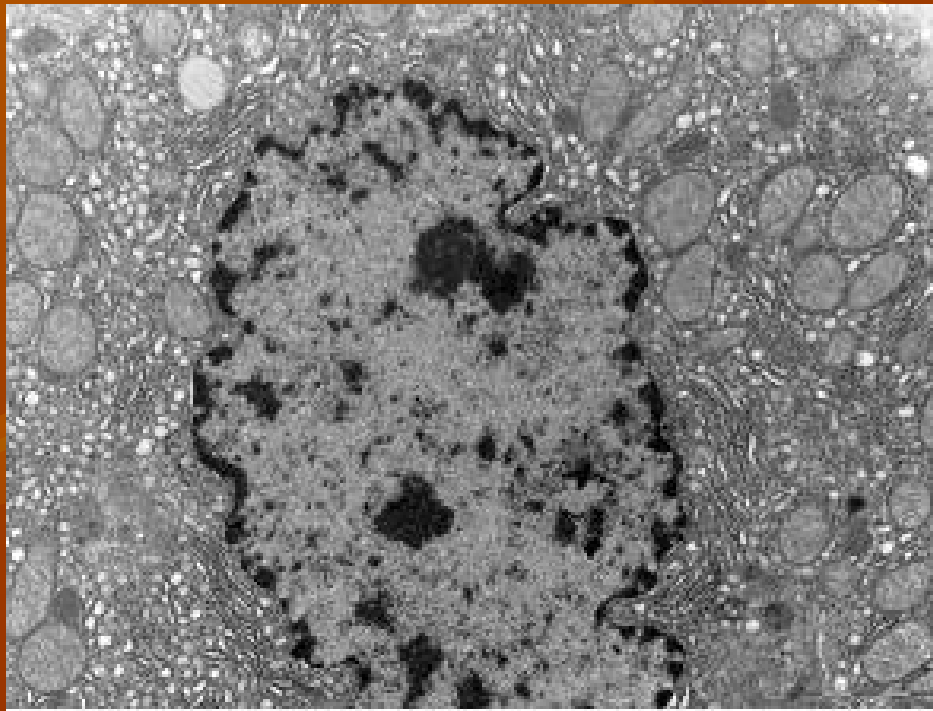
TiO₂ NEDOPAT, IRADIAT



TiO₂ ~ Pt

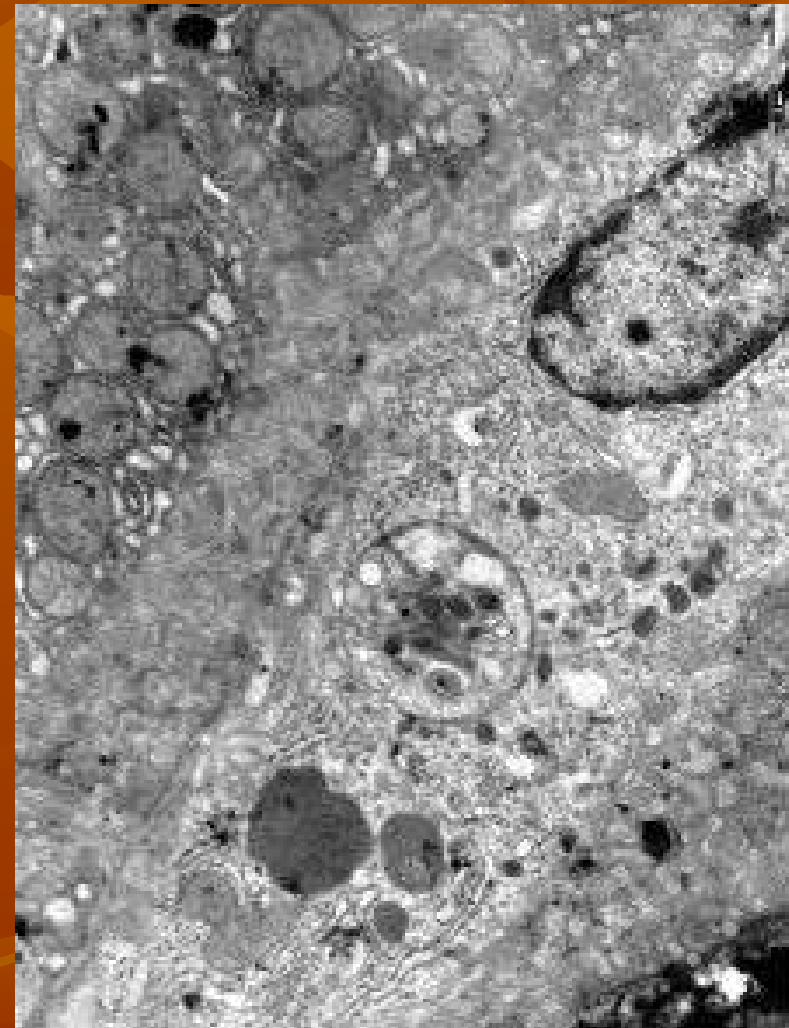
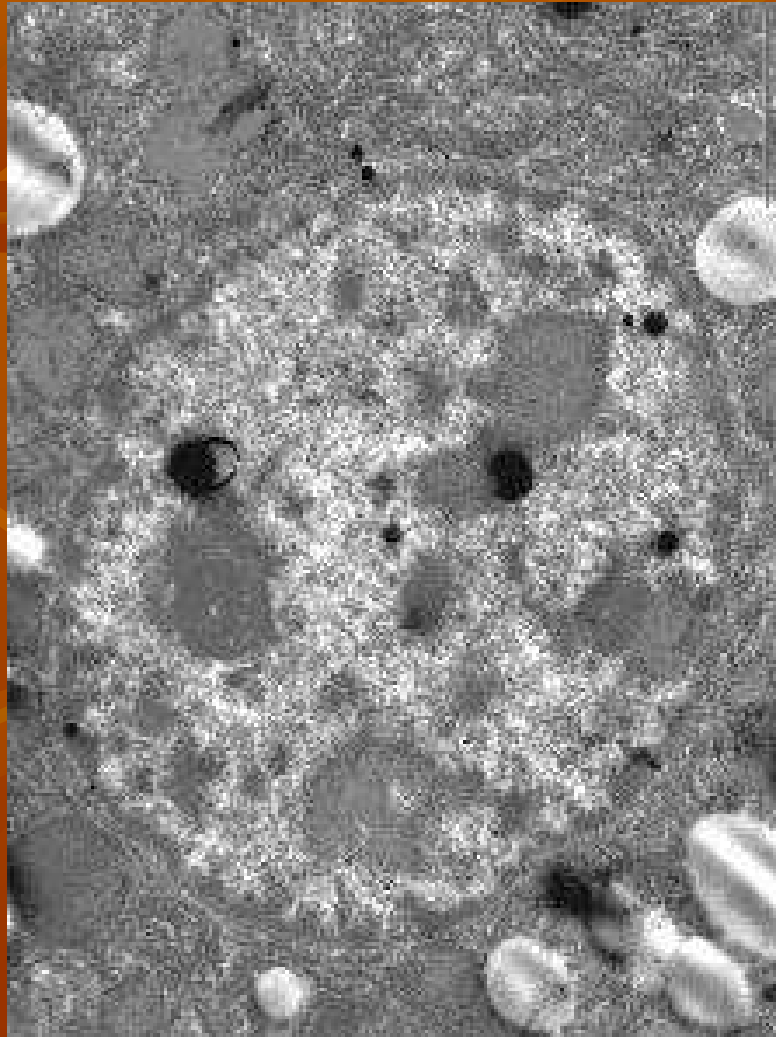
Modificarile induse, dependente de modul de administrare al suspensiei TiO₂~Pt-3/5 injectii

TiO₂ ~ Pt - efect protector, putine modificari: mitocondriile au structura normala, nucleii uneori contur usor ondulat; REG usor dilatata; REN – usor proliferat; colagen



TiO₂ ~ Pt, IRADIAT

Efect radioprotector, caracterele ultrastructurale fiind aproape normale: hepatocite, celule Kupffer, celule Ito



TiO₂ ~ Fe

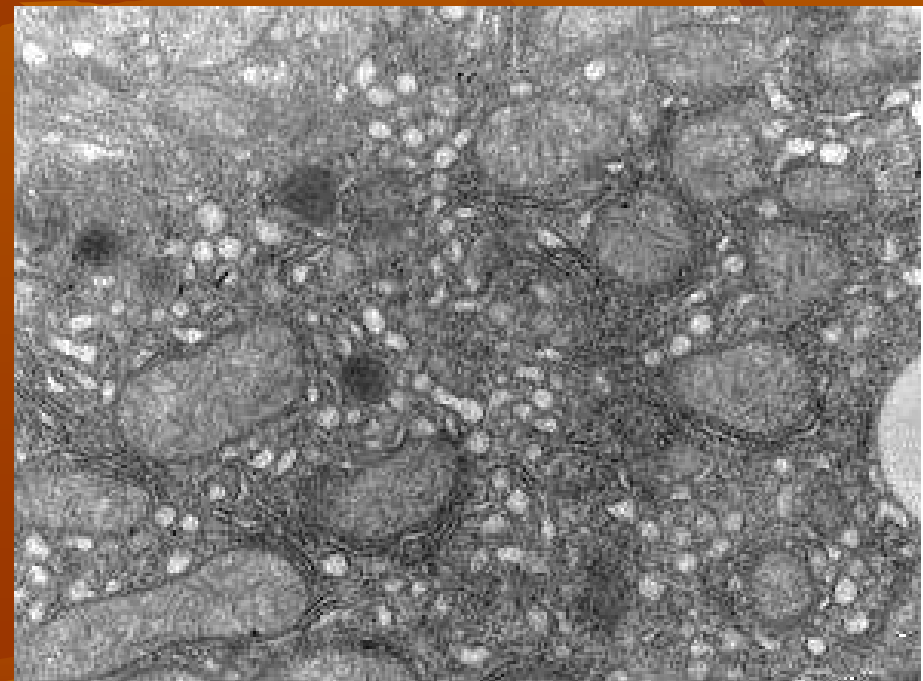
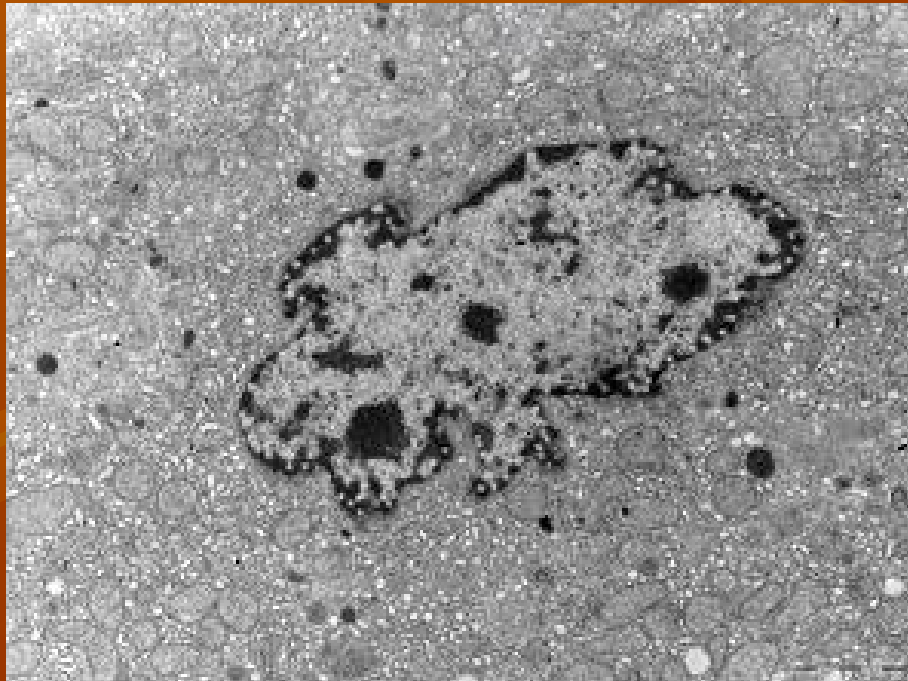
TiO₂~Fe induce modificari complexe in hepatocit

Nucleii contur neregulat, cu incisuri adanci

REG slab reprezentat; REN – proliferat

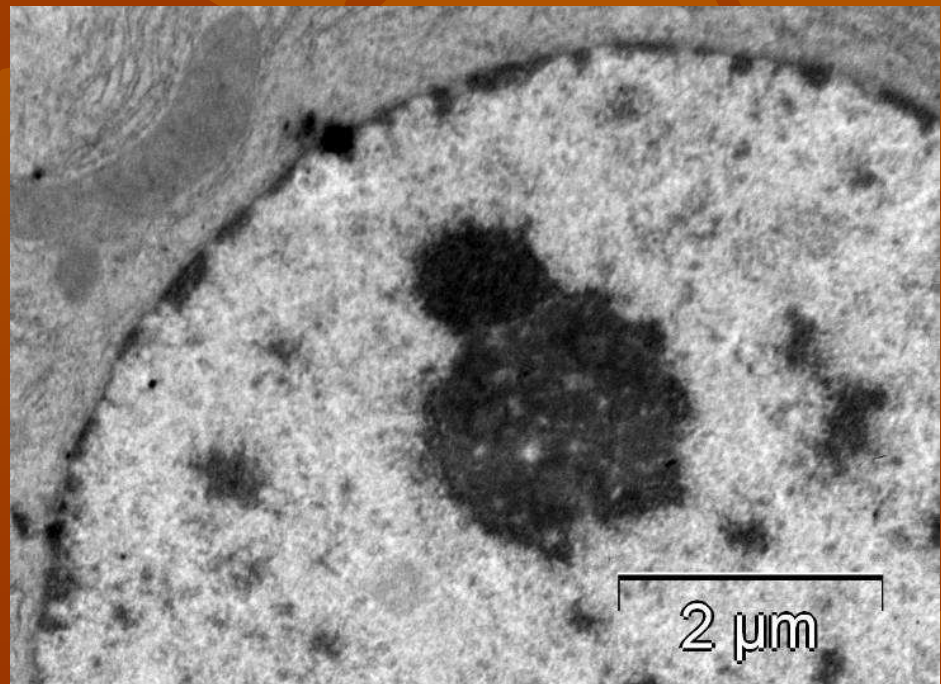
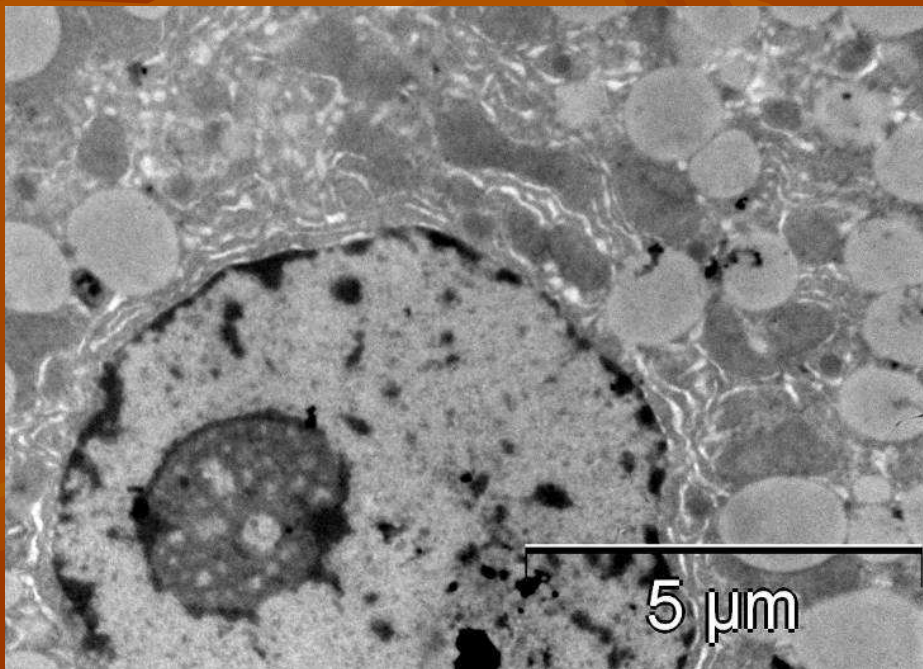
Mitocondrie: matrix, criste rarefiate vacuolarizate

Celule Kupffer, in intensa activitate metabolica



TiO₂ ~ Ag

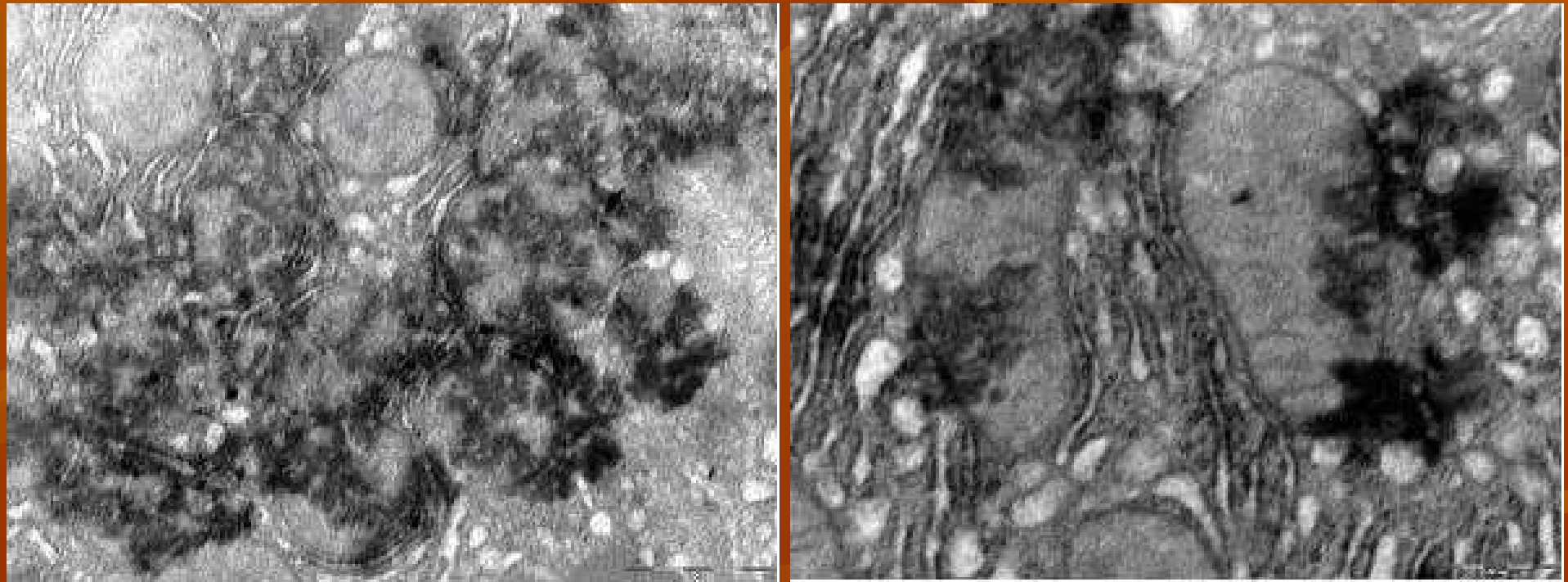
Prezenta TiO₂~Ag afecteaza reversibil structura hepatocit
In cazul iradierii-X, in nucleu sunt prezente structuri tip
LNB's implicate in rezistenta la radiatii.



TiO₂~Pt – CELULA EUCARIOTA

TiO₂~Pt sunt prezente in hepatocit, in relatie cu REN, REG si mitocondria (in cantitate diferita)

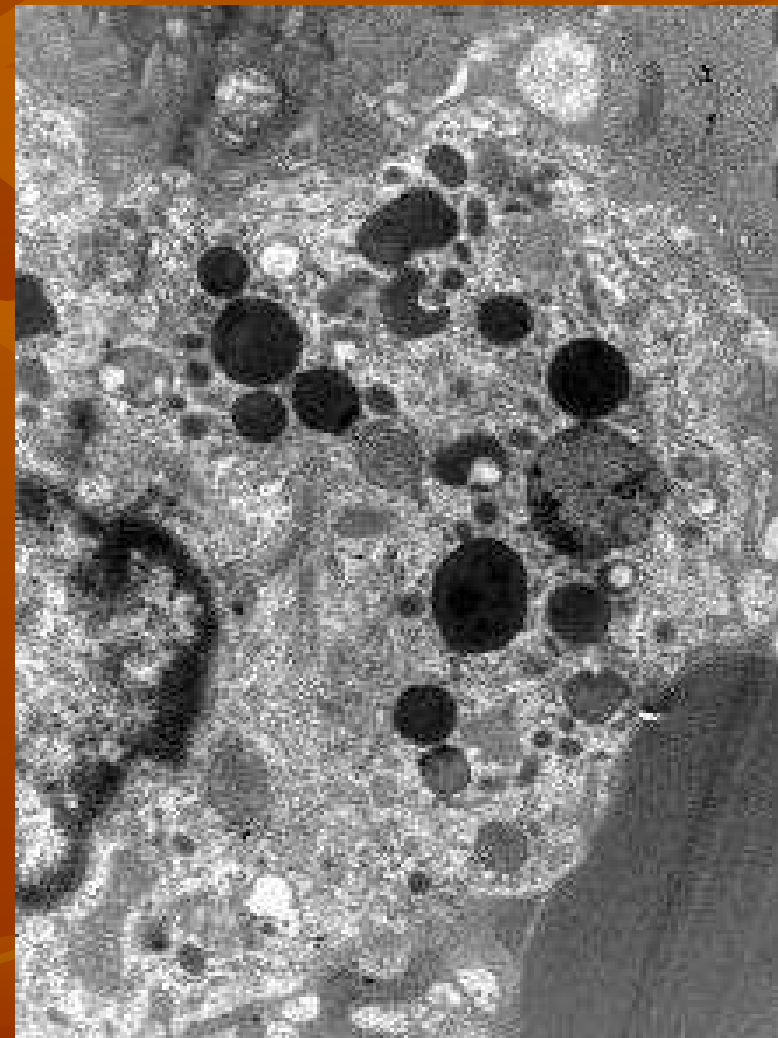
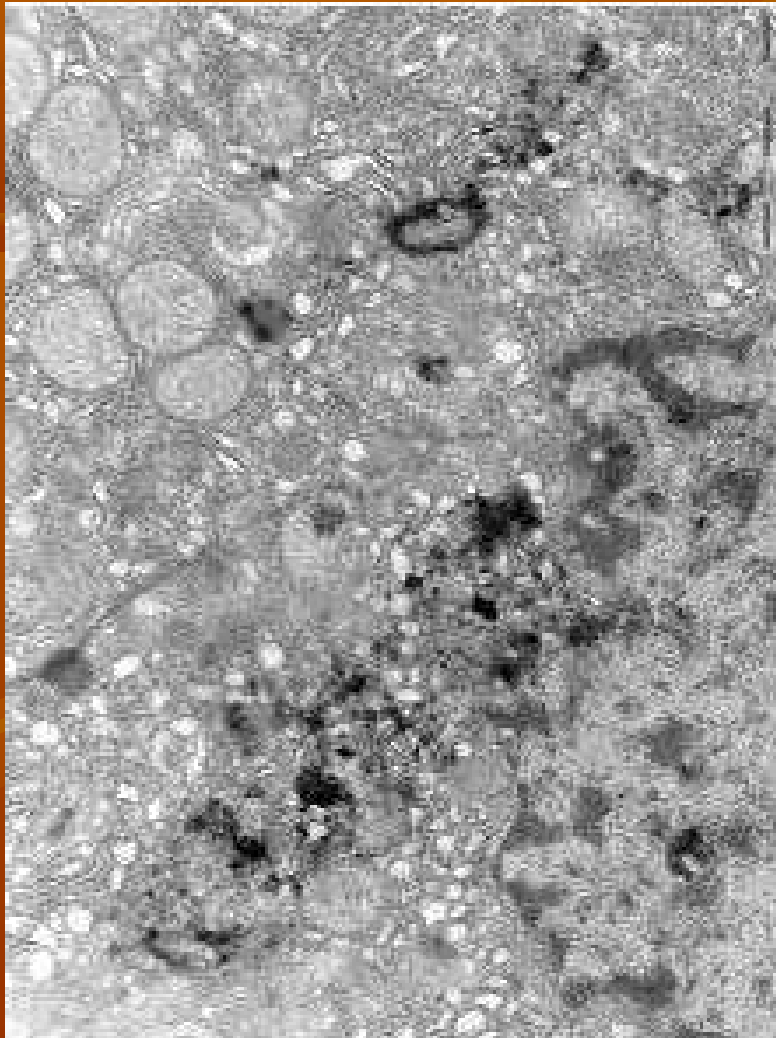
In unele celule Kupffer, prezenti corpusculi electron-densi (agregate TiO₂~Pt ?!)



TiO₂~Fe – CELULA EUCARIOTA

Uneori TiO₂~Fe in relatie cu organite celulare si nucleu.

In unele celule Kupffer, prezenti corpusculi electron-densi



CONCLUZII

- Prezenta TiO_2 dopat sau nedopat in animalele de experienta (*Mus musculus*), a indus usoare modificari citotoxice la nivelul ficatului, efectul fiind dependent de metal (Ag, Fe, Pt).
- TiO_2 nedopat, afecteaza metabolismul lipidic.
- Prezenta suspensiei $\text{TiO}_2 \sim \text{Pt}$ in timpul iradierii animalelor, a indus un efect radioprotector, caracterele ultrastructurale fiind aproape normale la hepatocite, celule Kupffer, Ito.
- Iradierea-X, apar structuri tip LNB's ($\text{TiO}_2 \sim \text{Ag}$)
- $\text{TiO}_2 \sim \text{Me}$ interactioneaza cu celula eucariota, particulele fiind prezente la nivelul REG, mitocondrie si in nucleu.
- Excesul de TiO_2 extras din circulatia generala, este acumulat/degradat in celula Kupffer.

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MULTUMIRI

Autorii multumesc d-lor

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(INC-DEMC - Timisoara)**

**pentru contributia la prepararea
nanoparticulelor $\text{TiO}_2 \pm \text{Me}$.**