

Transferencia Génica Asistida por Nanopartículas Magnéticas: aplicaciones pasadas, presentes y futuras en nuestro laboratorio.

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Becaria Postdoctoral CONICET

La Plata, 31 de Agosto de 2016

INIBIOLP
Biochemistry Research Institute of La Plata

IFLP Instituto de
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UNIVERSIDAD NACIONAL DE LA PLATA

INTEMA

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Nucleic Acid Delivery

Over-expression

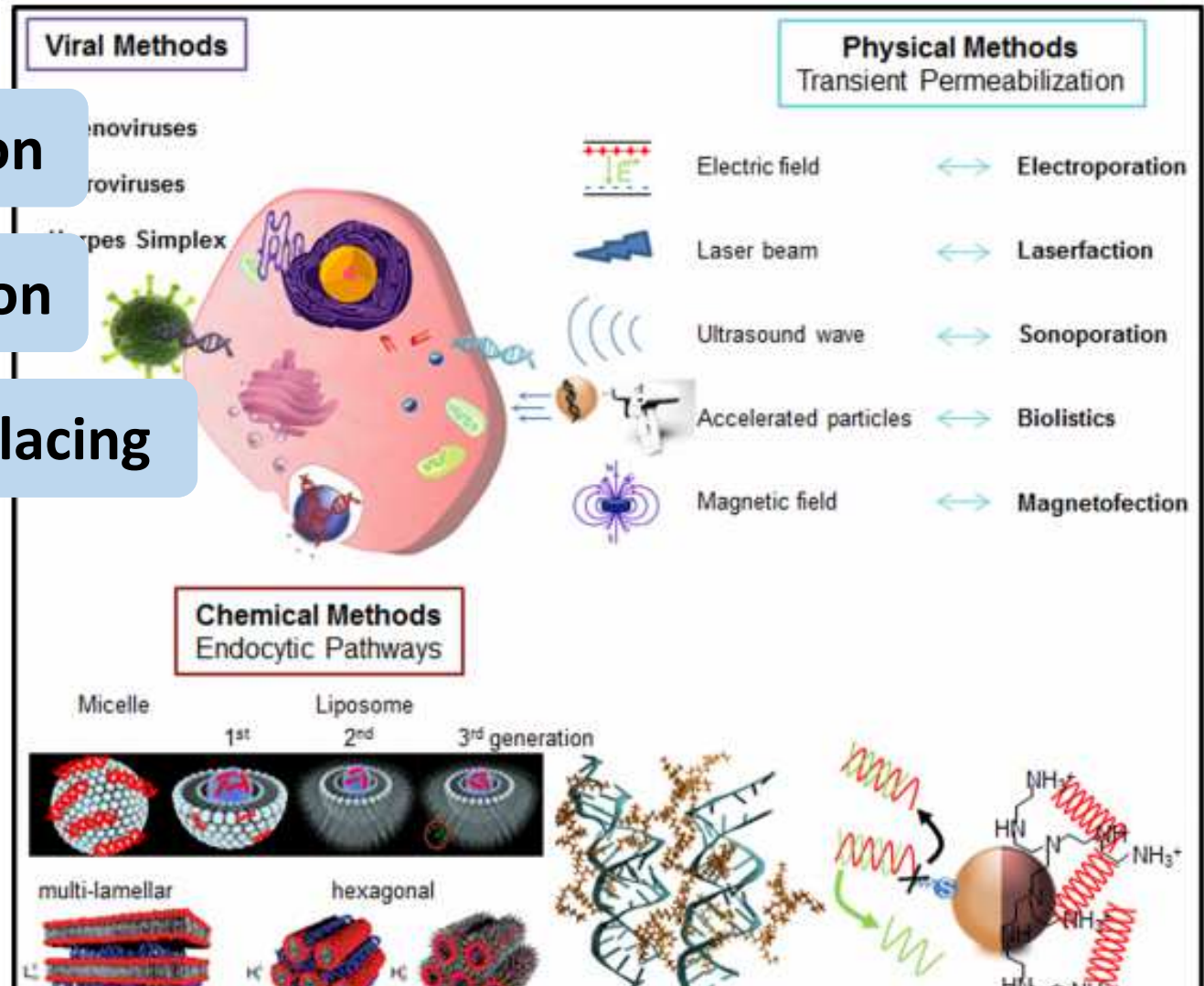
Down-regulation

Repairing/Replacing

Efficient

Safe

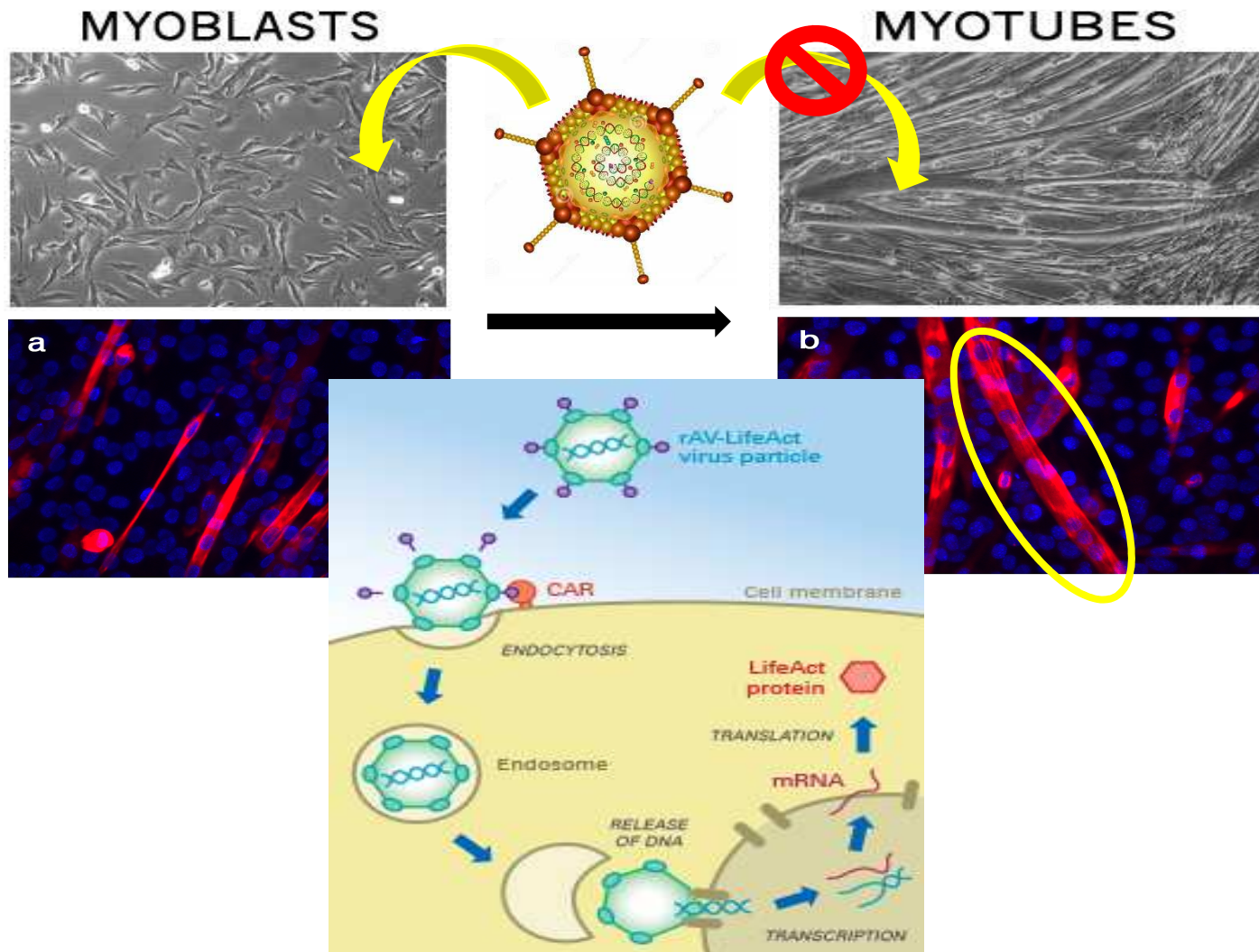
Affordable

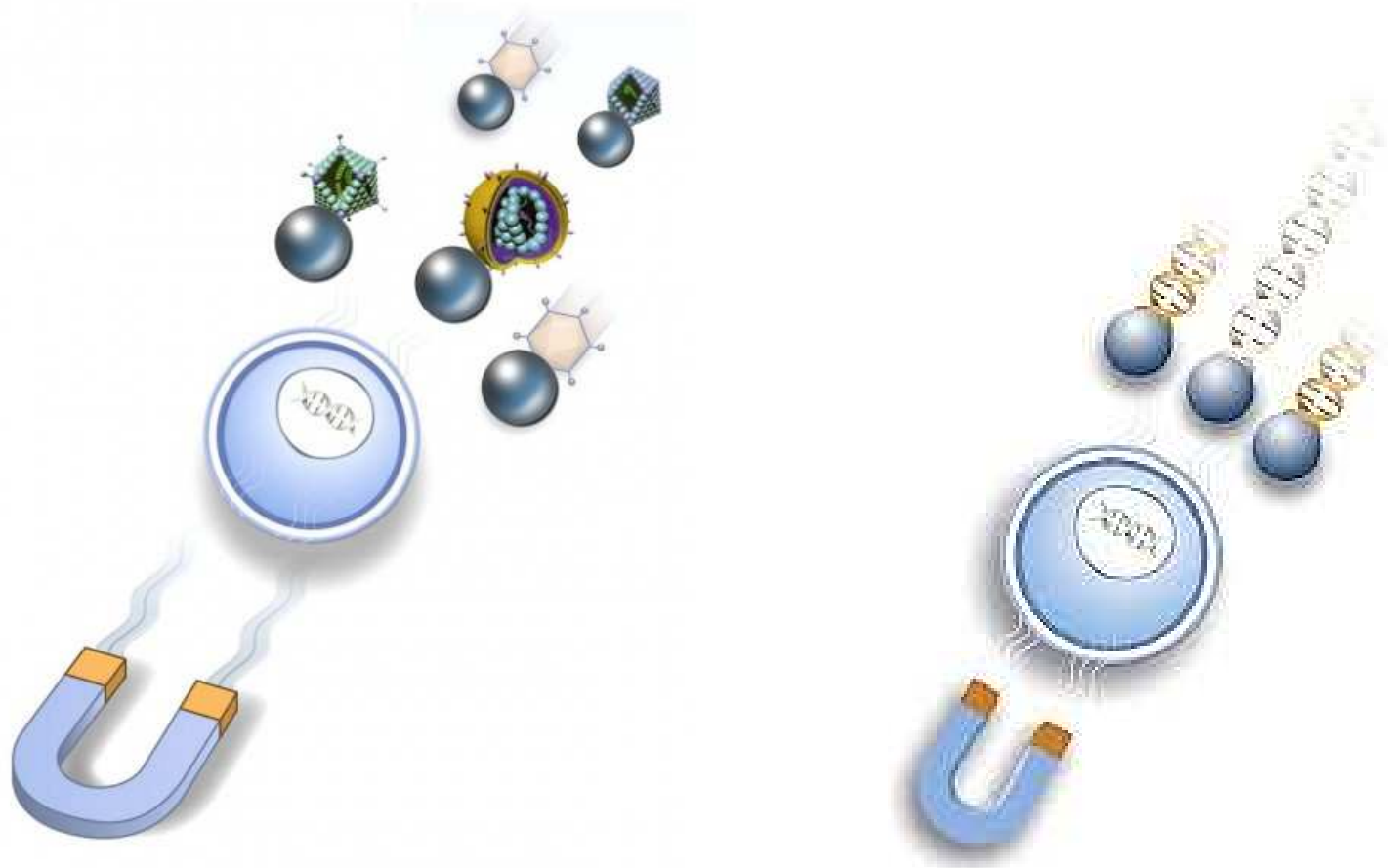


Transport to target cell and uptake mechanism

Skeletal Muscle – In Vitro

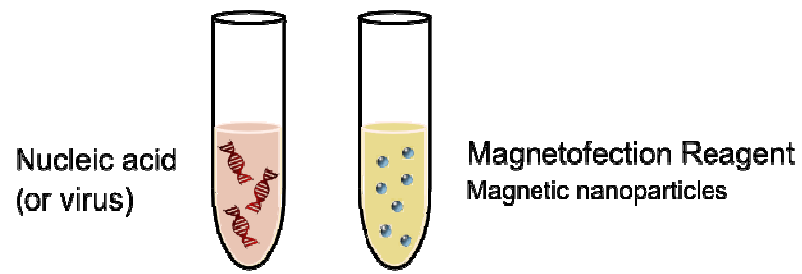
Línea celular de musculo esquelético murino (C2C12)



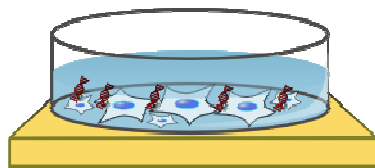


*We have defined **magnetofection** as **nucleic acid delivery** under the **influence of a magnetic field** acting on nucleic acid vectors that are associated with **magnetic (nano)particles**.*

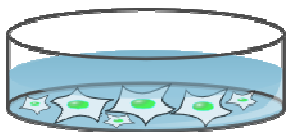
Plank C. et al 2011



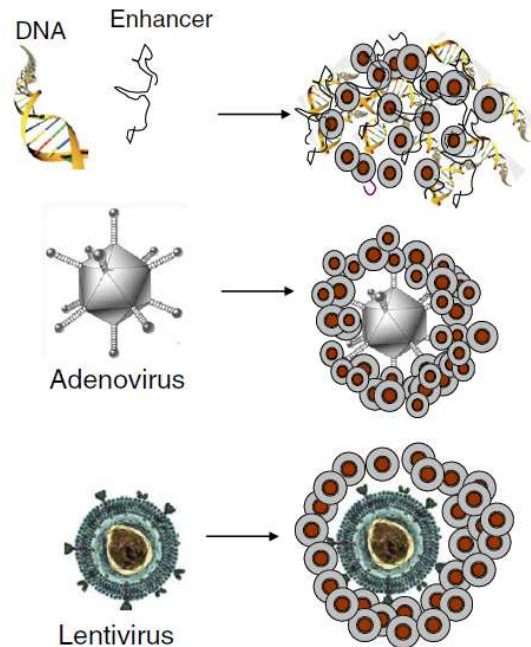
Nucleic acid + Nanoparticles complexes



Magnetic Plate: 20min



Assay 12/72h



ELECTROSTATIC BOND



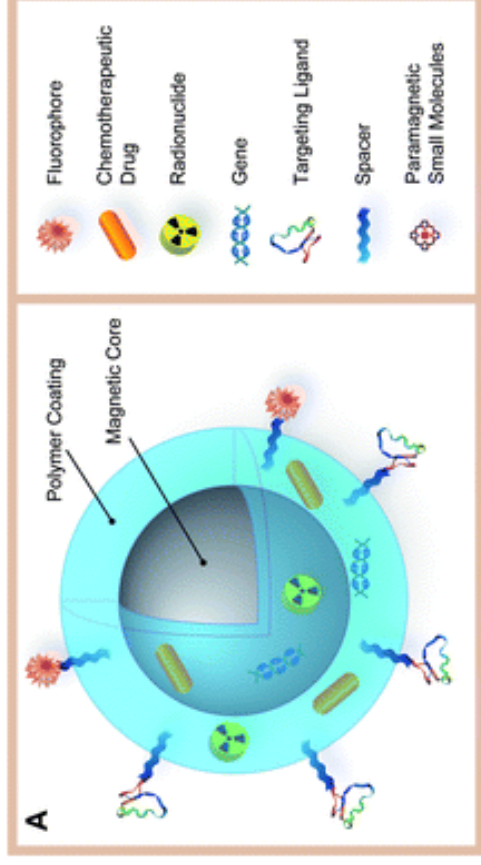
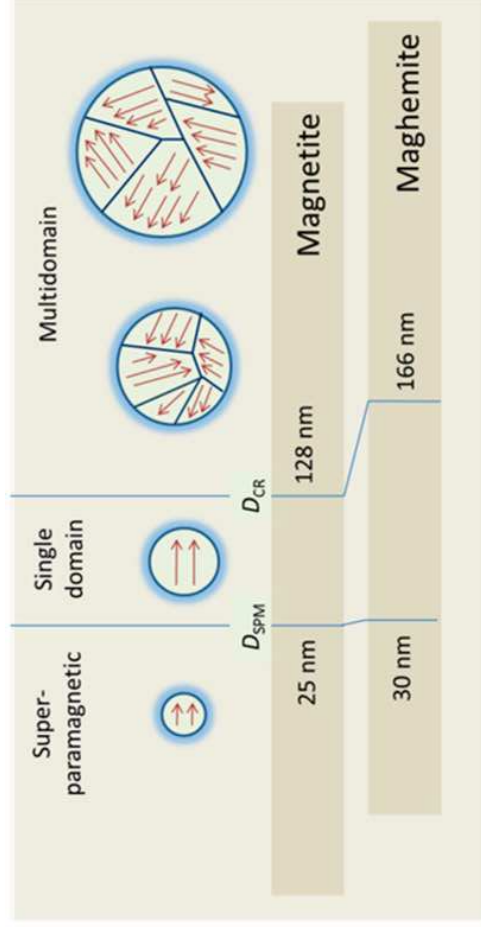
MAGNETICALLY-INDUCED SEDIMENTATION



RECEPTOR-INDEPENDENT ENDOCYTOSIS



LYSOSOMAL ESCAPE AND EXPRESSION



Nanoparticle size / nm

Table 1

Physicochemical characteristics of core-shell-type iron oxide MNIPs.

Characteristics

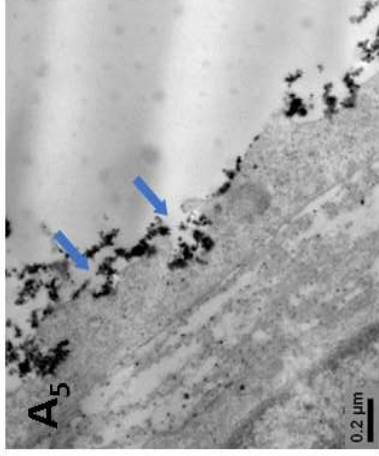
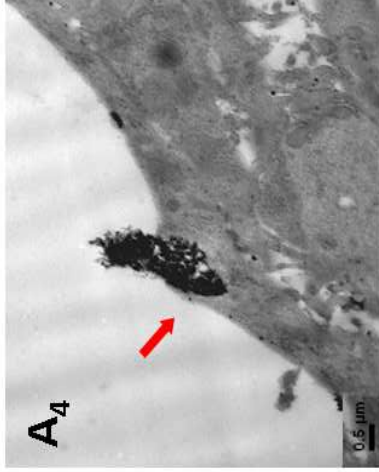
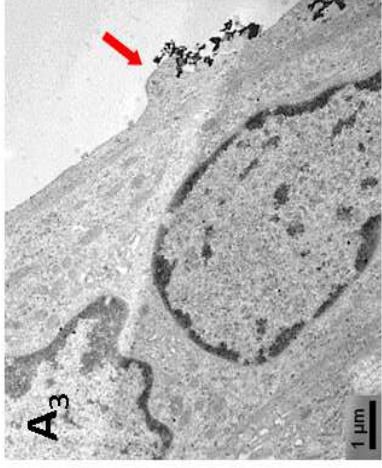
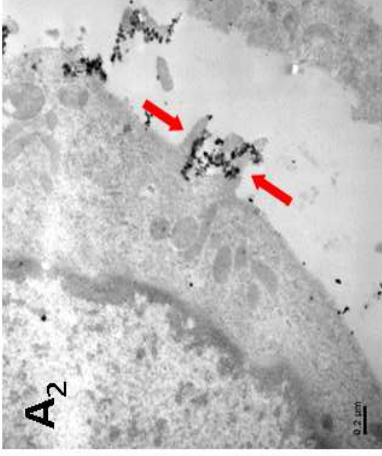
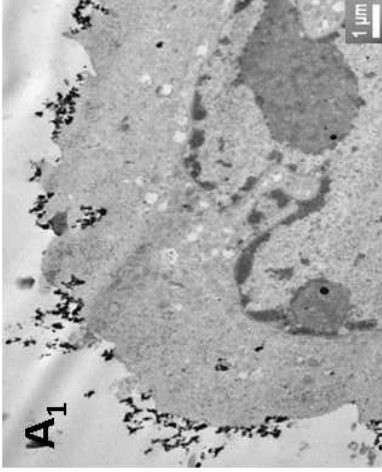
Characteristics	Core-shell-type MNIPs	
	SO-Mag2	PB-Mag1
Average crystallite size of the core, $\langle d \rangle$ (nm)	11	12
Saturation magnetization of the core, M_s ($A\ m^2/kg$ of Fe)	118	73
Average iron weight per particle, P_{part}^{Fe} (g of Fe/particle) ^a	2.8×10^{-18}	3.4×10^{-18}
Effective magnetic moment of the particle, m_{eff} ($A\ m^2$) ^b	3.3×10^{-19}	2.4×10^{-19}
Iron content of the particle (g of Fe/g dry weight)	0.50	0.47
Stabilizer content of the particle (g/g dry weight)	0.31	0.35
Shell composition	Product of hydrolysis and condensation of TEOS, THPMP and PEI-25 ^{Br}	Fluorosurfactant ZONYL FSA and PEI-25 ^{Br}
Mean hydrodynamic diameter of the particles in ddH ₂ O, D_h (nm) ^c	101 ± 26	64 ± 10
Polydispersity index of the particles in ddH ₂ O, P _I ^c	0.18 ± 0.02	0.37 ± 0.02
Zeta potential of the particles in ddH ₂ O, ξ (mV) ^c	+37.6 ± 2.0	+41.3 ± 3.2

^a Calculations account for magnetite structure and crystallite size of the core of the particles.

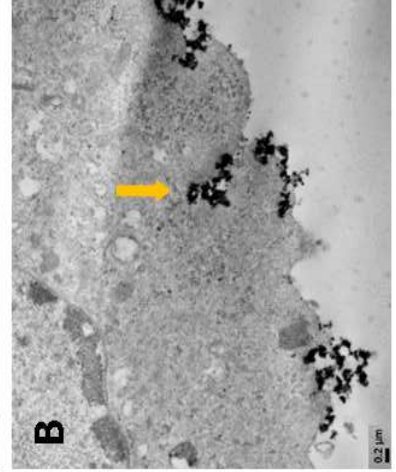
^b Calculated on the basis of the core crystallite size and magnetization in a magnetic field of 0.213 T.

^c Each value represents the mean ± SD ($n = 50$).

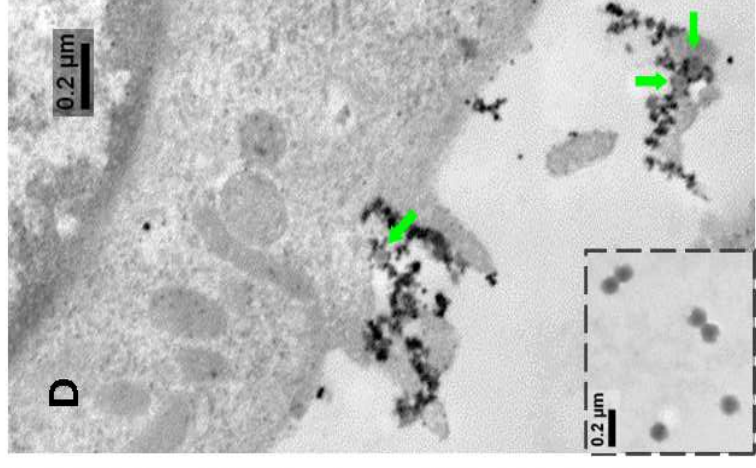
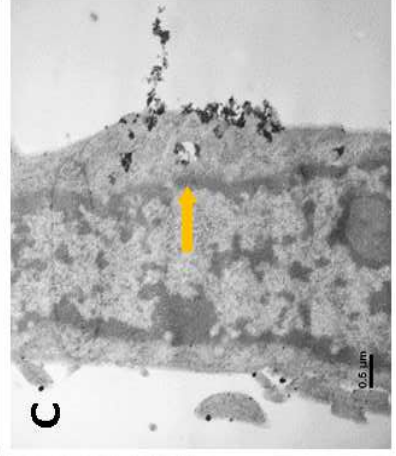
15 minutes

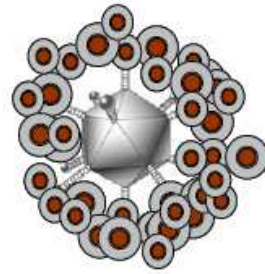
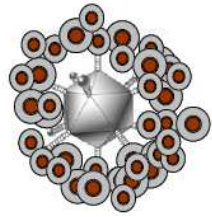


30 minutes



60 minutes





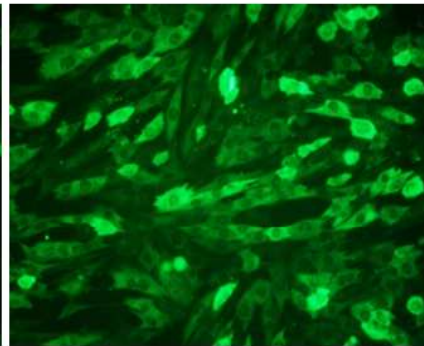
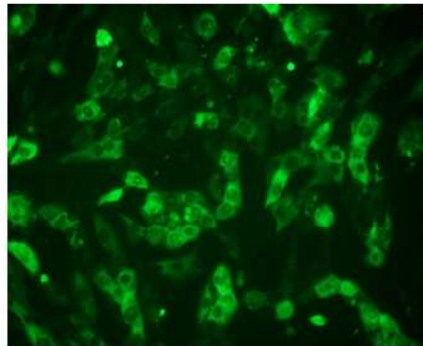
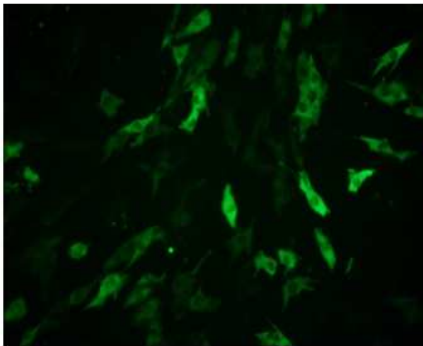
A

RAAd-GFP

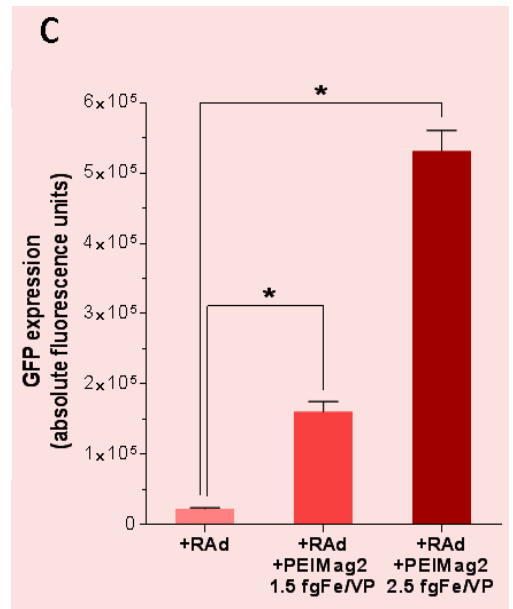
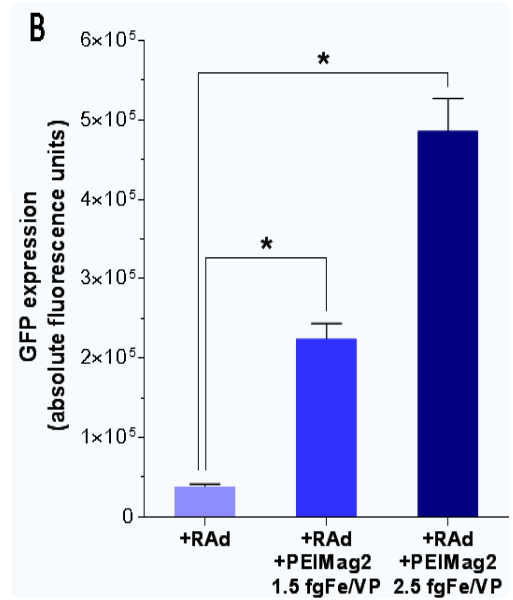
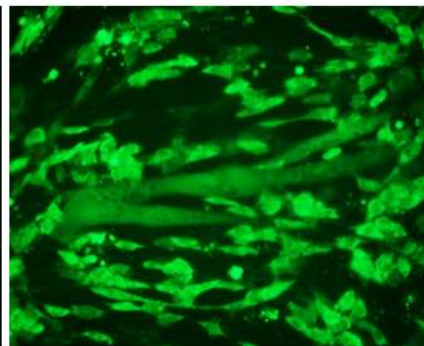
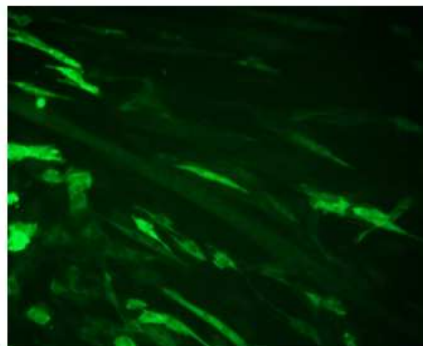
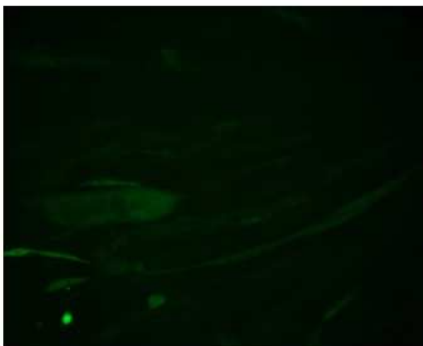
**RAAd+PEIMag2
1.5 fgFe/VP**

**RAAd+PEIMag2
2.5 fgFe/VP**

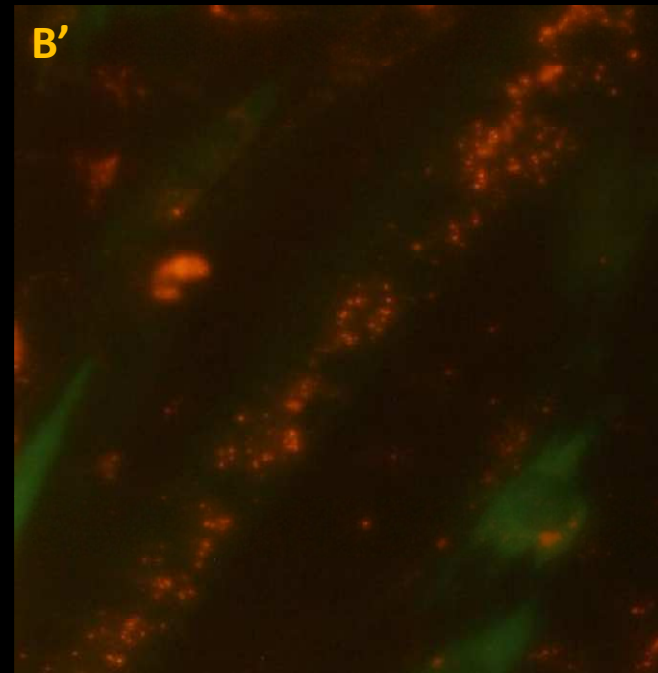
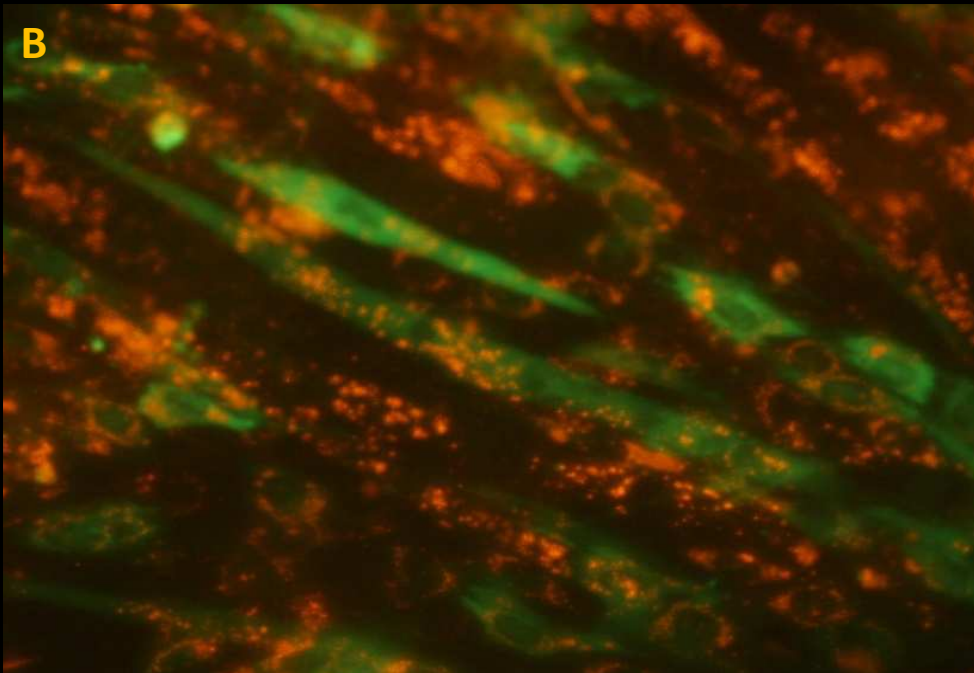
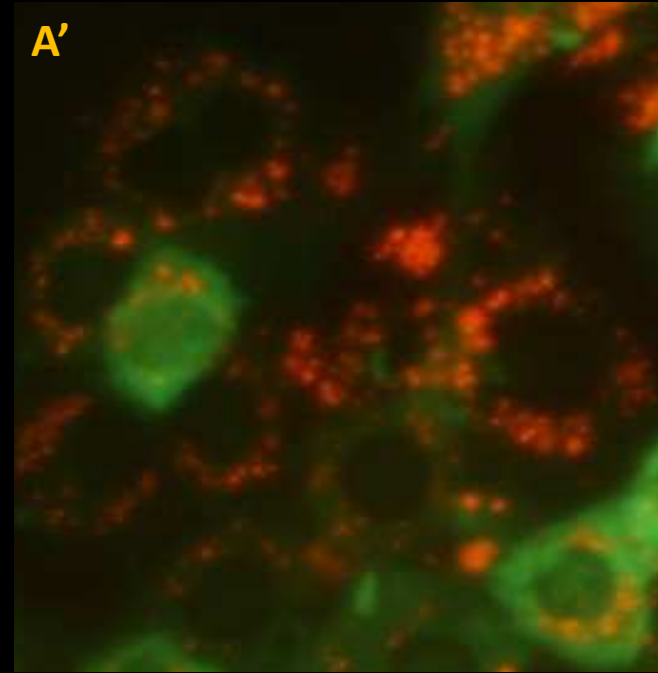
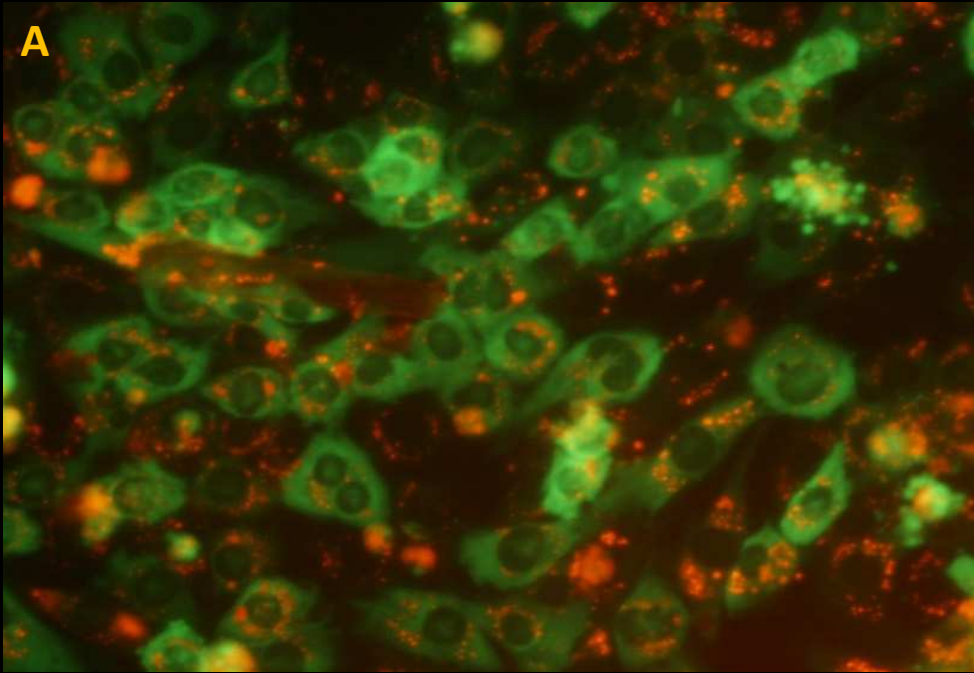
Myoblasts



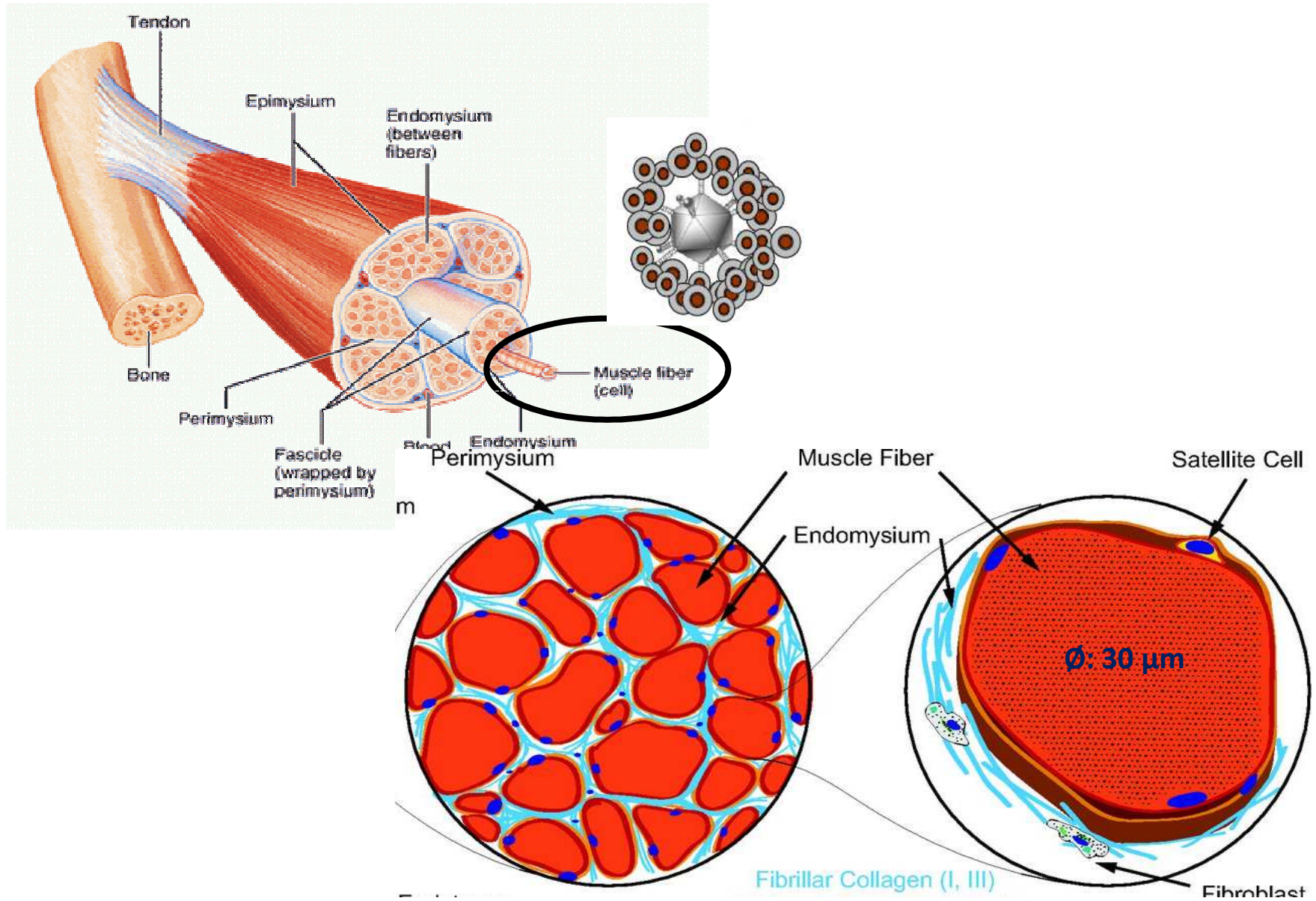
Myotubes

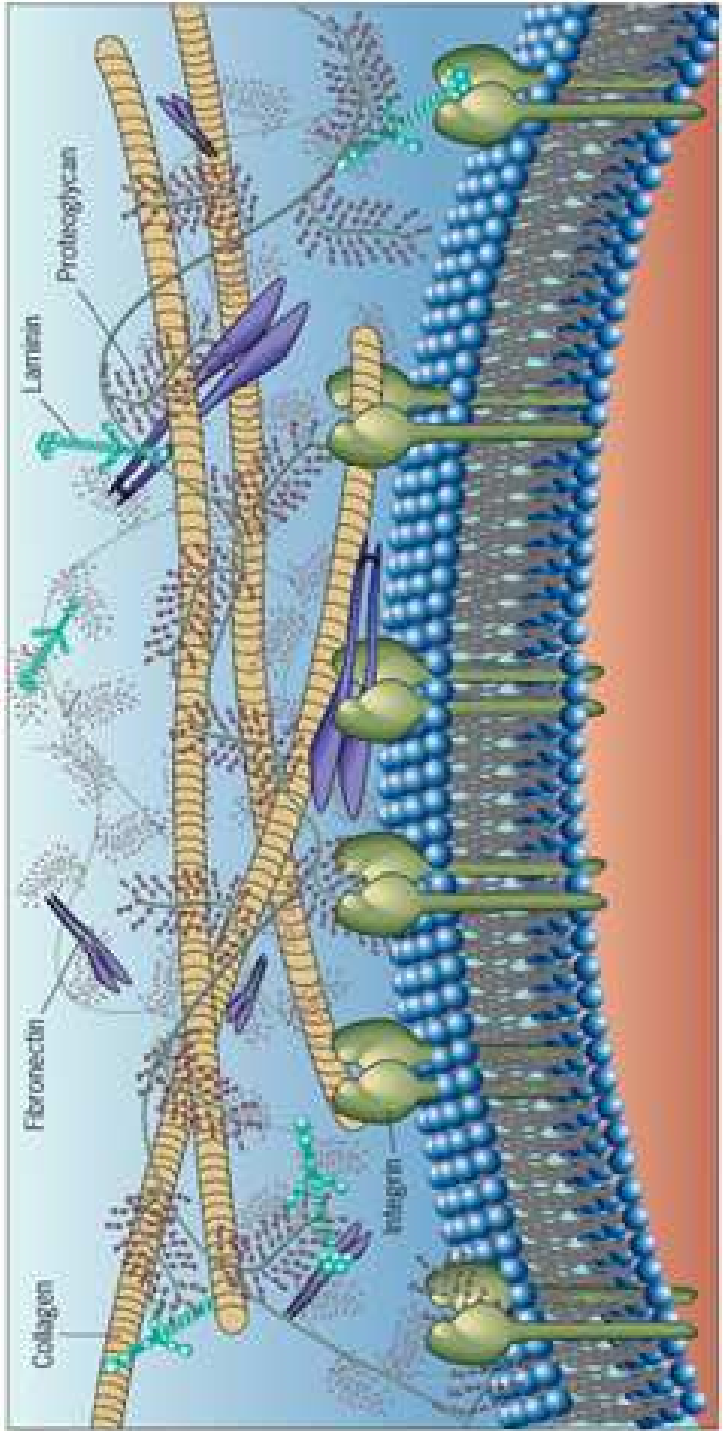
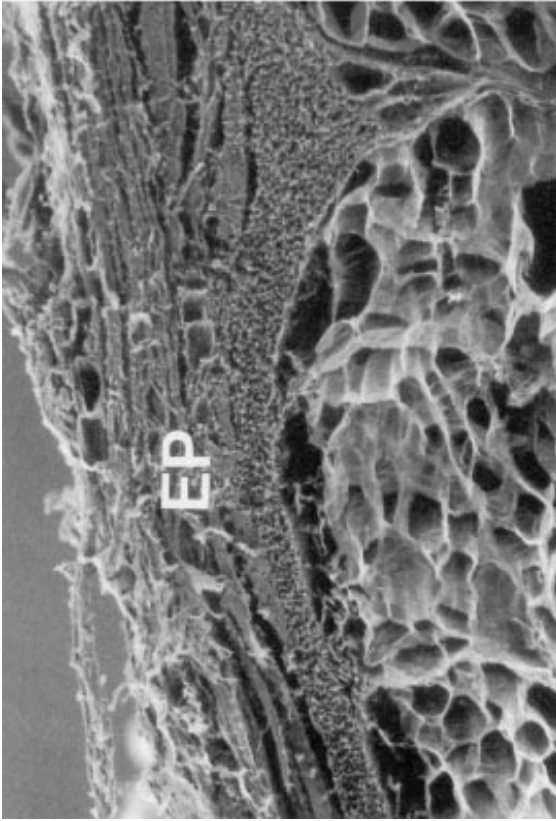
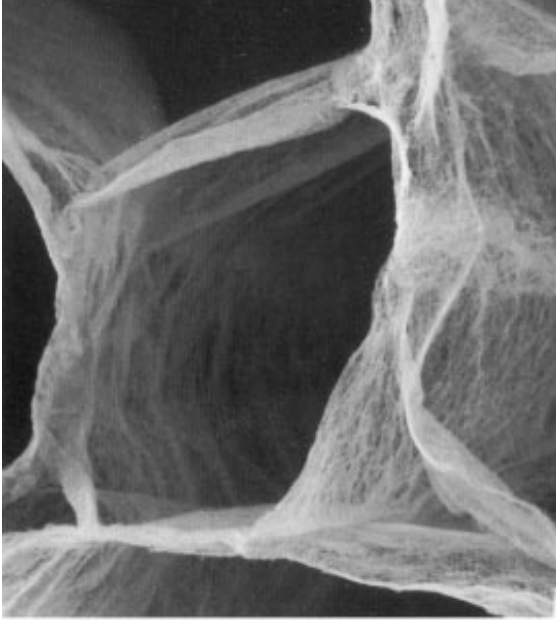


Pereyra AS, et al. 2016 J. Nanomed. Nanotech

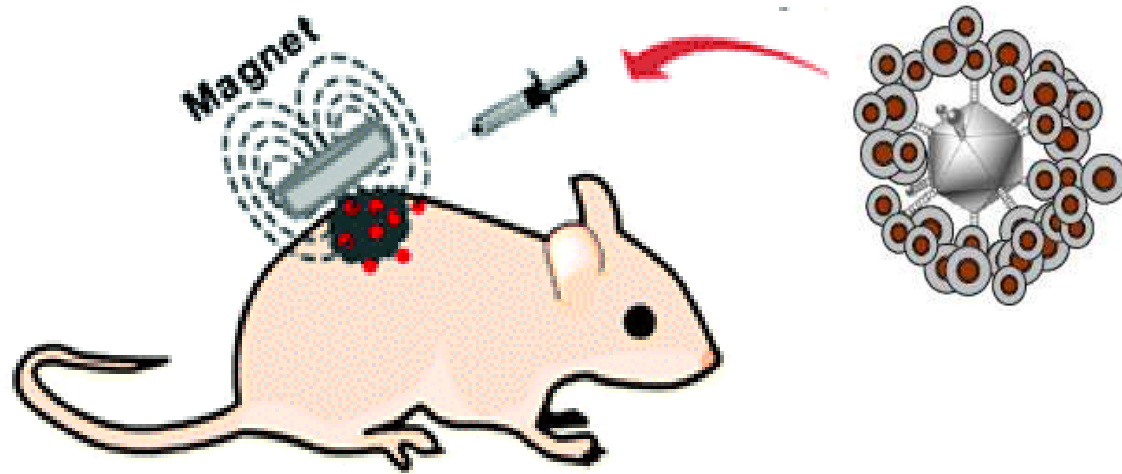


Skeletal Muscle –In Vivo





Ongoing Project: Optimization of *in vivo* Magnetofection



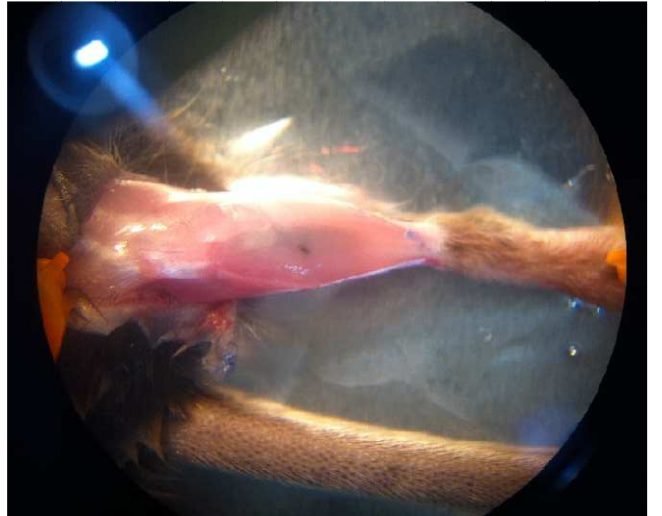
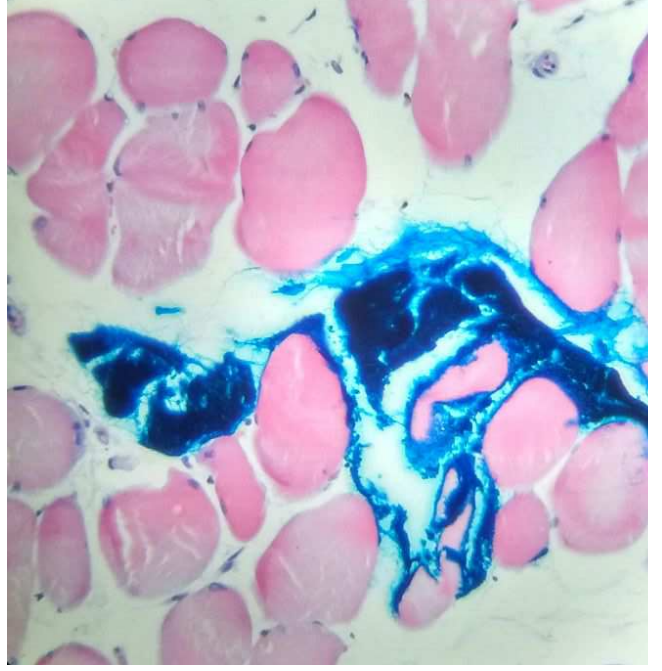
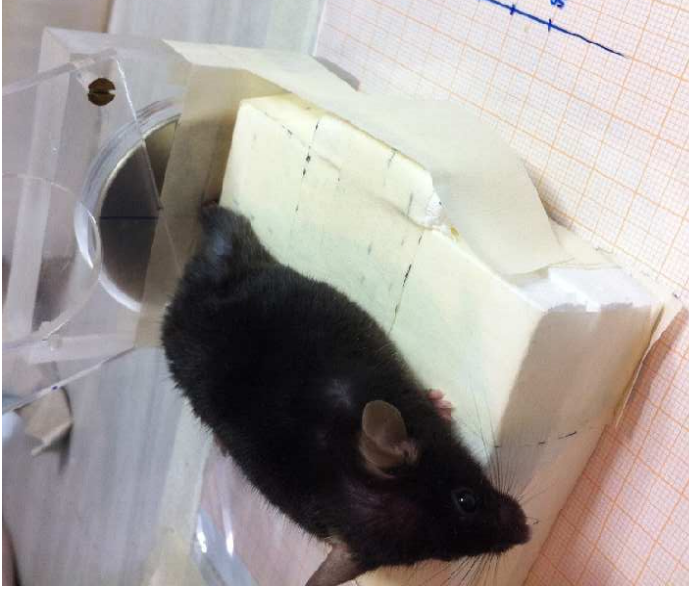
Tissue



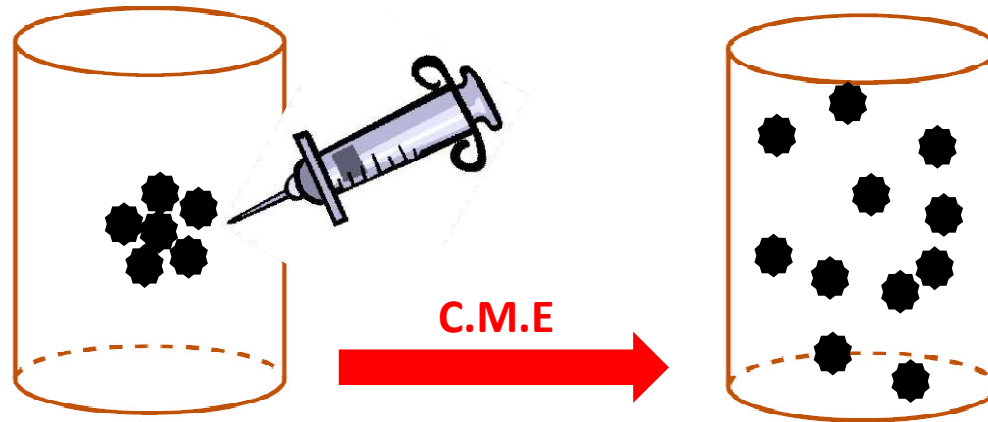
MNPs



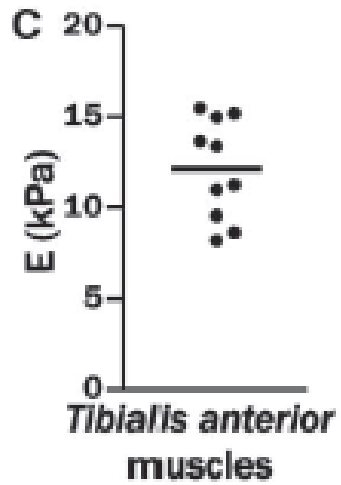
Magnet



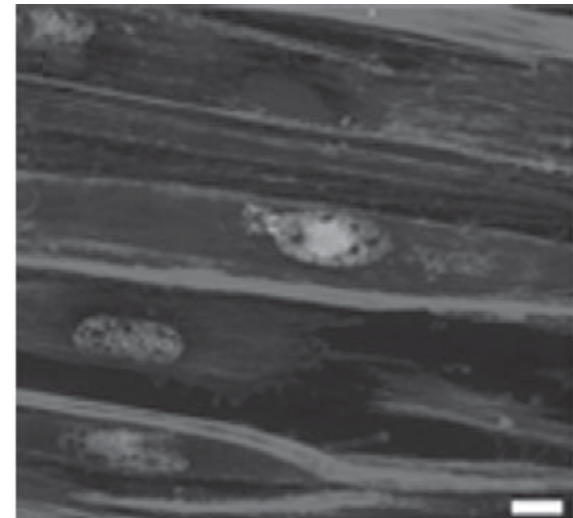
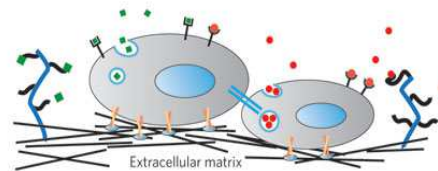
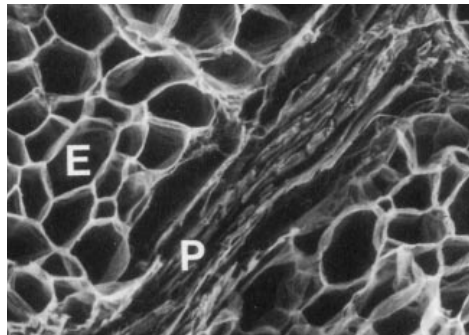
Fantomas de Músculo Esquelético



Módulo Elástico



Estructura 3D y Funcionalización con ECM y Celulas



Gracias y buen resto del curso!

