# Supplementary Information

## Magnetophoretic transport of functionalised iron-oxide nanoparticles through biomimetic hydrogels and extracellular matrix

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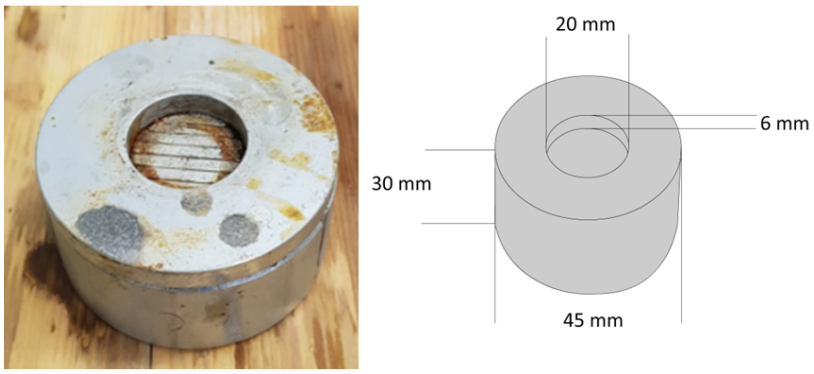


**Figure S1.** Left, photograph of the GIAMAG magnet. Right, the dimensions of the magnet, note that it provides magnetic force ($B.\nabla B$) of *c.*260 $T^2.m^{-1}$ at the pole face.

**Figure S2.** Image of progress of the NMR front through 0.3 %w/v agarose.

**Table S1.** Magnetophoretic velocities ($v_{exp}$) for low and very high magnetic field gradients for 8 nm PEG1000-MNP, Arg-MNP, and Cit-MNP suspensions[a] through Agarose($H_2O$) and Agarose(PBS) as the isotonic condition.

| | ***Low gradient*** | | ***Very high gradient*** | |
|---|---|---|---|---|
| ***Surface chemistry*** | Agarose($H_2O$) (Hypotonic) | Agarose(PBS) (Isotonic) | Agarose($H_2O$) | Agarose(PBS) (Isotonic) |
| | $v_{exp}$ (mm $h^{-1}$)[b] | $v_{exp}$ (mm $h^{-1}$) | $v_{exp}$ (mm $h^{-1}$) | $v_{exp}$ (mm $h^{-1}$) |
| *PEG1000* | 0.37 (±0.02) | 0.37 (±0.02) | 4.69 (±0.37) | 4.72 |
| *Arginine* | 0.35 (±0.01) | 0.31 (±0.02) | 4.73 (±0.15) | 4.75 |
| *Citrate* | 0.63 (±0.02) | 0.67 (±0.04) | 5.35 (±0.07) | 5.43 |

[a] PEG1000-MNPs from Batch 2, $d_{TEM}$ 8.9±0.8 nm ($d_{hyd}$ 24.1 nm, PDI 0.16); Arg-MNPs (28.0 nm, 0.16); Cit-MNPs (12.1 nm, 0.17).

[b] Values taken from [12]; n=4; $R^2$>0.98 for all data sets.

**Table S2.** $v_{exp}$ values for PEG-MNP, Arg-MNP and Cit-MNP suspensions through agarose($H_2O$); agarose($ISF_{syn}$); agarose-collagen($ISF_{syn}$), and; ECM under a low magnetic field gradient.

| ***Surface chemistry*** | ***$v_{exp}$***[a] *(mm $h^{-1}$)* | | | |
|---|---|---|---|---|
| | Agarose($H_2O$)[b] | Agarose($ISF_{syn}$) | Agarose-collagen($ISF_{syn}$) | ECM |
| *PEG1000* | 0.37 (±0.02) | 0.37 (±0.02) | 0.32 (±0.02) | 0.27 (±0.03) |
| *Arginine* | 0.35 (±0.01) | 0.32 (±0.01) | 0.16 (±0.02) | 0.22 (±0.02) |
| *Citrate* | 0.63 (±0.02) | 0.68 (±0.03) | 0.46 (±0.03) | 0.41 (±0.02) |

[a] 8 nm MNPs are from Batch 2. Suspensions were at ~1 mg $mL^{-1}$; agarose 0.3 %w/v (high EEO), n=4 ; $R^2$>0.98

[b] Data from Table S1.

**Figure S3.** Left, PEG1000-MNPs in agarose/collagen ISF during magnetophoretic transport (after the front has reached the bottom of the vial, hence the spreading). Right, the same gel after all the deposit has passed through.

**Figure S4.** Selected images of agarose($H_2O$) and agarose-collagen($H_2O$) surface morphologies examined using SEM (Hitachi S-3400N) after freeze-drying samples at -58 °C for 48 h in a lyophiliser. Prior to lyophilisation, the gels were immersed in liquid nitrogen. Samples were gold-sputtered for analysis.