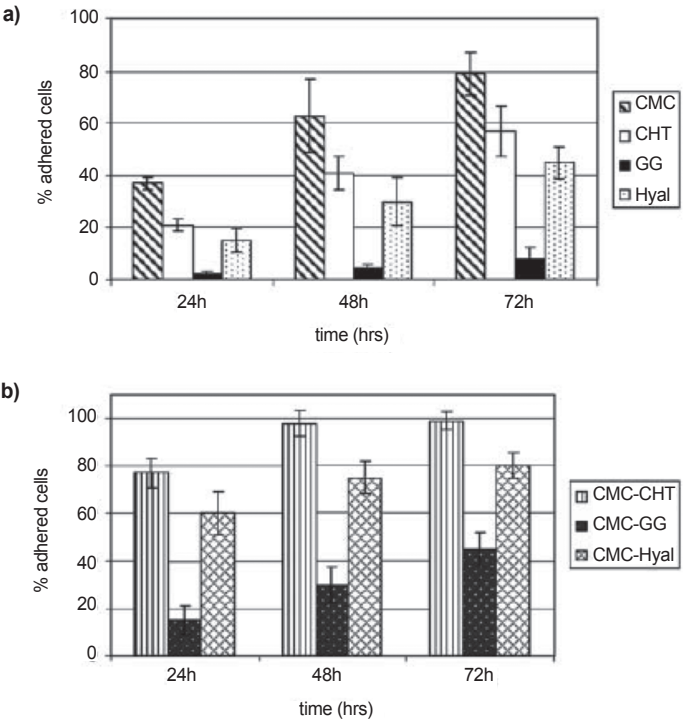

Fig. 10. Percentage of fibroblasts versus time for (a) the native hydrogels and (b) for IPHs (Barbucci et al. 2011).

Hybrid hydrogels with magnetic nanoparticles

Modern science has recently learned how to synthesize a bewildering array of artificial materials with structures engineered at the atomic scale. The smallest particles contain tens or hundreds of atoms, with dimensions on the scale of nanometers, hence nanoparticles (NP). They have the ability to enter, translocate within, and damage living organisms. This ability depends primarily on their small size, which allows them to penetrate physiological barriers and travel within the circulatory systems. Moreover, for several years while nanoparticles have been studied as therapeutic tools, magnetic nanoparticles (MNPs) were applied extensively for local delivery of pharmaceuticals via magnetic drug targeting and via attachment of high affinity ligands. The rationale in cancer treatment for magnetic micro- and nanoparticle based targeting lies in the potential to reduce or eliminate the side effects of chemotherapy drugs by reducing their systemic distribution as well as the possibility of administering lower but more accurately targeted doses of the cytotoxic compounds used in these treatments.

Recently, significant advances have been achieved in the development of magnetic hydrogels, i.e., the combination of hydrogels with micro- and/or nanomagnetic particles that can quickly respond to an external magnetic field, enabling their enhanced