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Effect of serum on intracellular uptake, processing and transfection efficiency of lipoplexes

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Background and Aims: Purpose We investigated whether and to what extent serum influences the mechanism of lipoplex uptake by cells and the subsequent efficiency of transfection.
Methods: Lipofectamine and FuGENE lipoplexes were prepared in presence or absence of serum and incubated with HeLa cells treated with inhibitors blocking different endocytic pathways. Intracellular uptake of YOYO-1 labeled complexes was assayed by flow cytometry. Transfection efficiency was assessed by a bioluminescence assay.
Results and Conclusion: Upon preparation in presence of serum, transfection efficiency of both Lipofectamine and FuGENE complexes was strongly inhibited. Moreover, a major fraction of these complexes co-localised with a marker of the lysosomal compartment. Independent on the carrier used, these complexes were internalized via clathrin-mediated endocytosis and a mechanism involving flotillin-1. By contrast, complexes prepared in absence of serum transfected cells efficiently. The internalization of Lipofectamine complexes prepared in absence of serum was substantially inhibited by blocking either the caveolae-mediated pathway with filipin or clathrin-mediated endocytosis with chlorpromazine. The uptake of FuGENE complexes prepared in absence of serum was diminished only by filipin but significantly increased when the cells were treated with chlorpromazine. Transfection mediated by either of the complexes was strongly diminished by inhibiting the caveolae pathway.

Keywords: Lipoplex; Serum; Uptake; Transfection