In this approach, the quasi-concomitant injection of the inactive agent and of the active one is required to increase the global amount of agents present in the blood and consequently to prolong their blood half-life. Such strategy, which expressly relies on a probability-based approach, necessarily requires the association of the active agent with a targeting agent in order to achieve its successful accumulation on the target site by conferring said active agent an advantage over the inactive one. In addition, due to the quasi-concomitant injection, a specific design of the inactive carrier may be required depending on the intended use of the active composition.

As apparent from the prior art and despite of a long medical need, the improvement of compounds (including therapeutic, prophylactic as well as diagnostic compounds) which cannot be efficiently used in patients due to their unacceptable toxicity or to their unfavorable pharmacokinetics parameters remains a concern.

SUMMARY

In one aspect, there is provided a pharmaceutical composition comprising the combination of (i) a biocompatible nanoparticle and of (ii) a pharmaceutical compound of interest, wherein the longest dimension of the biocompatible nanoparticle is between about 4 nm and about 500 nm, and the absolute surface charge value of the biocompatible nanoparticle is of at least 10 mV (|10 mV|) for use in a therapeutic, prophylactic or diagnostic method in a subject in need thereof, the therapeutic, prophylactic or diagnostic method comprising a step of administering the pharmaceutical compound of interest to the subject and a distinct step of administering the nanoparticle, said nanoparticle being administered to the subject between more than 5 minutes and about 72 hours before or after the pharmaceutical compound of interest.

DETAILED DESCRIPTION

The present invention now allows optimization of the efficiency of a compound of interest (herein also simply identified as "the compound") whatever its intended use in the context of therapy, prophylaxis or diagnostic. The composition herein described which is a combination of (i) a biocompatible nanoparticle and of (ii) at least one compound of

interest, optimize the at least one compound of interest pharmacokinetic parameters, and, as a consequence, now renders possible the development of therapeutic compounds which could not have been developed otherwise due for example to their unacceptable toxicity.

A typical composition of the invention (herein generally identified as "pharmaceutical composition") is a composition comprising the combination of (i) a biocompatible nanoparticle and (ii) at least one compound ("the compound of interest"), wherein the longest dimension of the biocompatible nanoparticle is typically between about 4 nm and about 500 nm, and the absolute surface charge value of the biocompatible nanoparticle is of at least 10 mV.

A preferred ~~objet~~ object of ~~a~~ the invention is a pharmaceutical composition comprising the combination of (i) a biocompatible nanoparticle and of (ii) a pharmaceutical compound of

CLAIMS

1. A pharmaceutical composition comprising the combination of (i) a biocompatible nanoparticle and of (ii) a pharmaceutical compound of interest, wherein the longest dimension of the biocompatible nanoparticle is between about 4 nm and about 500 nm, and the absolute surface charge value of the biocompatible nanoparticle is of at least 10 mV (|10 mV|) for use in a therapeutic, prophylactic or diagnostic method in a subject in need thereof, the therapeutic, prophylactic or diagnostic method comprising a step of~~for~~ administering the pharmaceutical compound of interest ~~in a~~to the subject ~~in need thereof, wherein~~and a distinct step of administering the nanoparticle, ~~and the compound of interest are to be administered in a~~said nanoparticle being administered to the subject ~~in need of said compound of interest,~~ between more than 5 minutes and about 72 hours ~~one from each other~~before or after the pharmaceutical compound of interest.

2. The pharmaceutical composition according to claim 1, wherein the nanoparticle has an absolute surface charge value of more than |10 mV|, said charge being a negative charge.

3. The pharmaceutical composition according to claim 1 or 2, wherein the nanoparticle is an organic nanoparticle.

4. The pharmaceutical composition according to claim 3, wherein the nanoparticle is selected from a lipid-based nanoparticle, a protein-based nanoparticle, a polymer-based nanoparticle, a co-polymer-based nanoparticle, a carbon-based nanoparticle, and a virus-like nanoparticle.

5. The pharmaceutical composition according to claim 1 or 2, wherein the nanoparticle is any inorganic nanoparticle and the longest dimension of said nanoparticle is below about 7 nm.

6. The pharmaceutical composition according to claim 1 or 2, wherein the nanoparticle is an inorganic nanoparticle, the longest dimension of said nanoparticle is of at least 10 nm, and the inorganic material of the nanoparticle is selected from (i) one or more divalent

metallic elements selected for example from Mg, Ca, Ba and Sr, (ii) one or more trivalent metallic element selected for example from Fe and Al, and (iii) one or more tetravalent metallic element comprising Si.