Nanobubbles and use thereof.

KEYWORDS

- ❑ NANOBUBBLES
- ❑ DIAGNOSTIC
- ❑ THERANOSTIC
- ❑ ULTRASOUND IMAGING
- ❑ CAVITATION & SONOPORATION
- ❑ DRUG TARGETING
- ❑ BLOOD BRAIN BARRIER (BBB)
- ❑ LOW FREQUENCY FOCUSED ULTRASOUNDS (FUS).

AREA

- ❑ PHARMACEUTICAL

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Patent Type
Patent for invention.

Ownership
Sapienza University of Rome 100%.

Inventors
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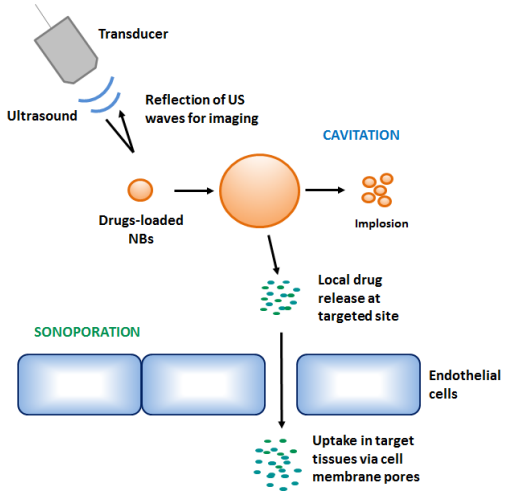
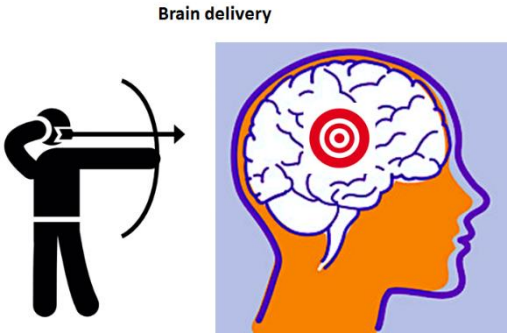
Industrial & Commercial Reference
Pharmaceutical and/or diagnostic industries.

Time to Market
Scale-up, pre-clinical and clinical studies are needed – 24/36 months.

Availability
Cession, Licensing, Research, Development, Experimentation and Collaboration.





Abstract
Nanobubbles, characterized by the presence of a lipophilic bilayer that surrounds a gaseous core, are able to deliver both hydrophilic and lipophilic molecules or drugs and can be further modified by adding on their surface targeting agents such as: polypeptides, polynucleotides, antibodies or antibodies fragments.
Nanobubbles are able to bypass the limitations of the UCAs also if a pediatric or veterinary use will be proposed.

Another important application of nanobubbles is in the therapeutic approach, in fact nanobubbles can act as cavitation nuclei able to be activated by low frequency focused ultrasounds (FUS) to enhance biological membranes crossing by drugs or genetic material.

Nanobubbles and use thereof.

Technical Description

A fundamental part of the invention is the finding of suitable components able to form a lipophilic bilayer quite stable in order to avoid gas leakage and to obtain nanometric dimensions with a high homogeous distribution.

Another important application of nanobubbles is in the therapeutic approach, in fact nanobubbles can act as cavitation nuclei able to be activated by low frequency focused ultrasounds (FUS). Cavitation by FUS destroys bubbles and, at the same time, causes the pore formation in biological membranes.

These pores are characterized by dimensions of 300 nm and half life of 20-50ms. This phenomen is better known as: sonoporation, it is very useful to enhance cellular uptake or biological membranes crossing by drugs or genetic material.

Technologies & Advantages

Nanobubble structure is able to deliver both hydrophilic and lipophilic molecules. Nanobubbles can be further modified by adding on their surface targeting agents such as: polypeptides, polynucleotides, antibodies or antibodies fragments.

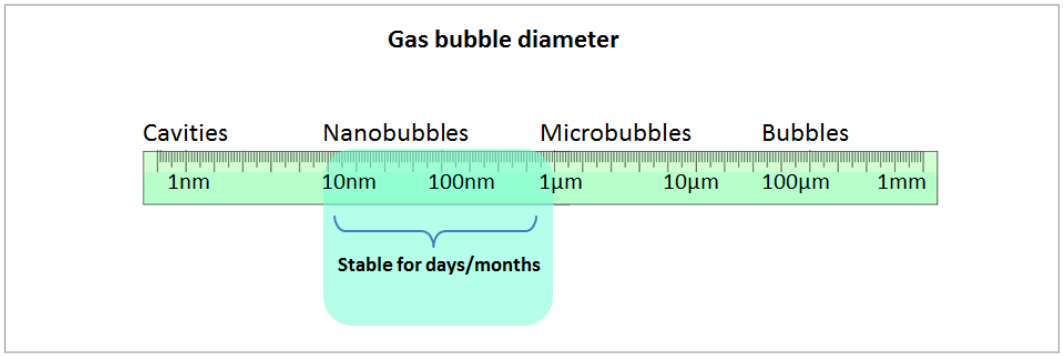
Nanobubbles are able to bypass the limitations of the UCAs currently on market, because they are stable during time, very homogenueos in size and morphology; all these characteristics are fundamental if a pediatric or veterinary use will be proposed. In particular small dimensions avoid microembolisms formation in particular if nanobubbles are administered to small animals.

The possibility to co-deliver lipophilic and hydrophilic therapeutic agents, make these nanobubbles very appealing in diagnostic, therapeutic and theranostic applications.

Applications

Nanobubbles can be applied in diagnostic as ultrasound contrast agents, especially in pediatric and veterinary ultrasound imaging.

Another important application of nanobubbles concerns the therapeutic approach, in fact nanobubbles, able to deliver and target drugs, can act as cavitation nuclei able to be activated by low frequency focused ultrasounds (FUS) to enhance biological membranes crossing by drugs or genetic material, with particular attention to Central Nervous System (CNS) diseases.



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