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Italia-Österreich
European Regional Development Fund

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Interreg V-A Italia-Austria
2014-2020
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2014-2020

EXOTHERA

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Exosomes for regenerative, immunosuppressive, neuroprotective and oncosuppressive therapies

Pietro Parisse, PhD

MOTIVATION

Exosomes (EV) are small vesicles ensuring transport of molecules between cells throughout the body. EVs contain specific signatures and have been shown to strongly impact on the fate of recipient cells. Their small size (<1µm) plus biological and physical functions make them perfect candidates as therapeutic agents in several fields (e.g. immune therapy, cell-free regenerative medicine, etc).

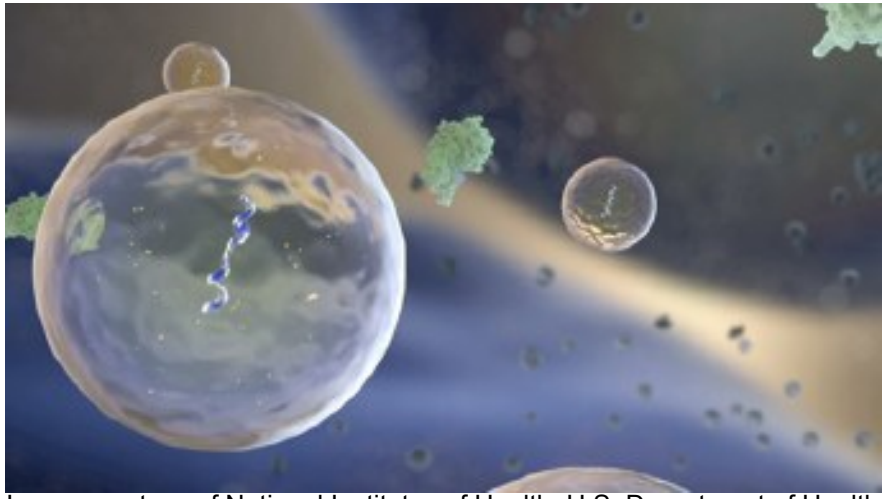
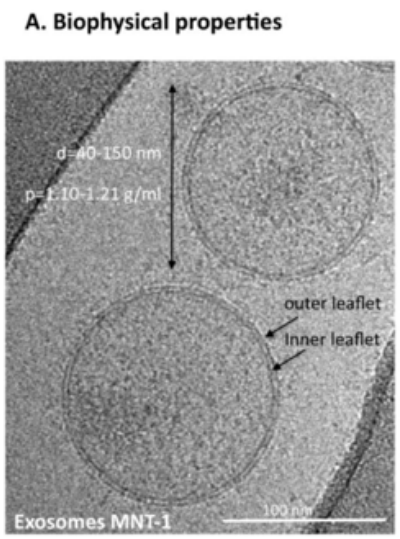
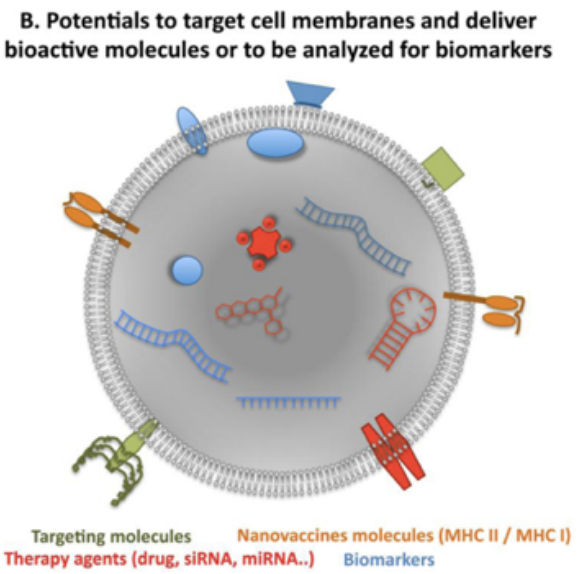


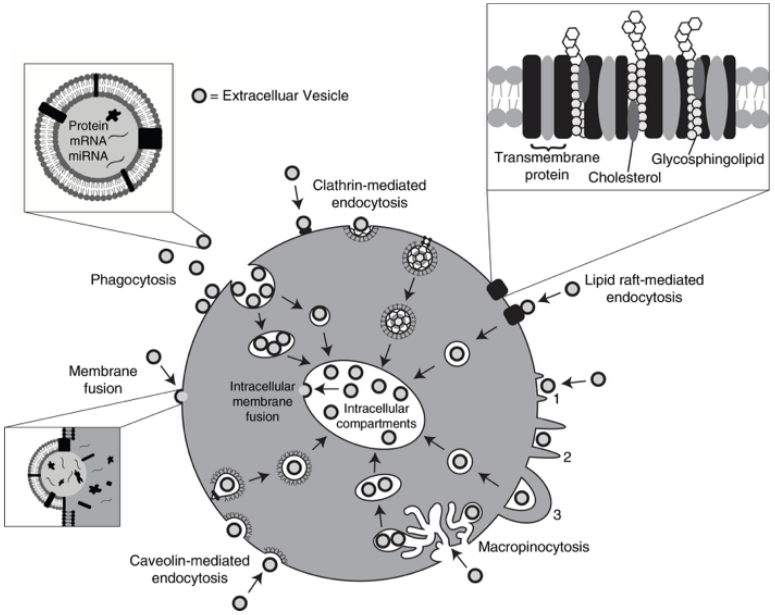
Image courtesy of National Institutes of Health, U.S. Department of Health and Human Services

STATE OF THE ART

Despite their great potential for biomedicine, there is still a lack of standards for EV isolation and quantification. In addition, specific in vitro potency assays are required to better predict their potential therapeutic activity. There is no rational set of criteria available so far to design synthetic EVs for specific clinical tasks.





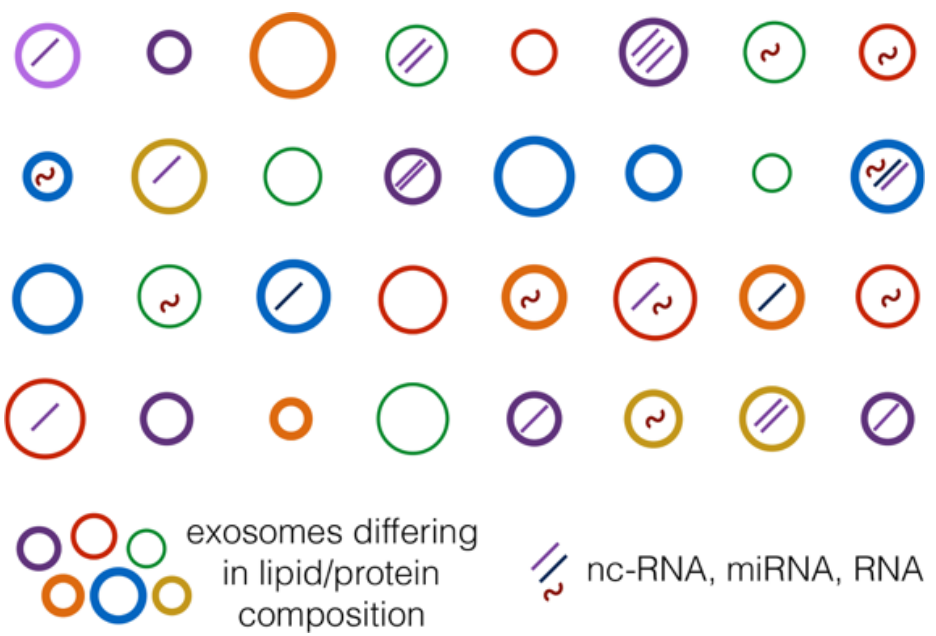


OPEN QUESTIONS

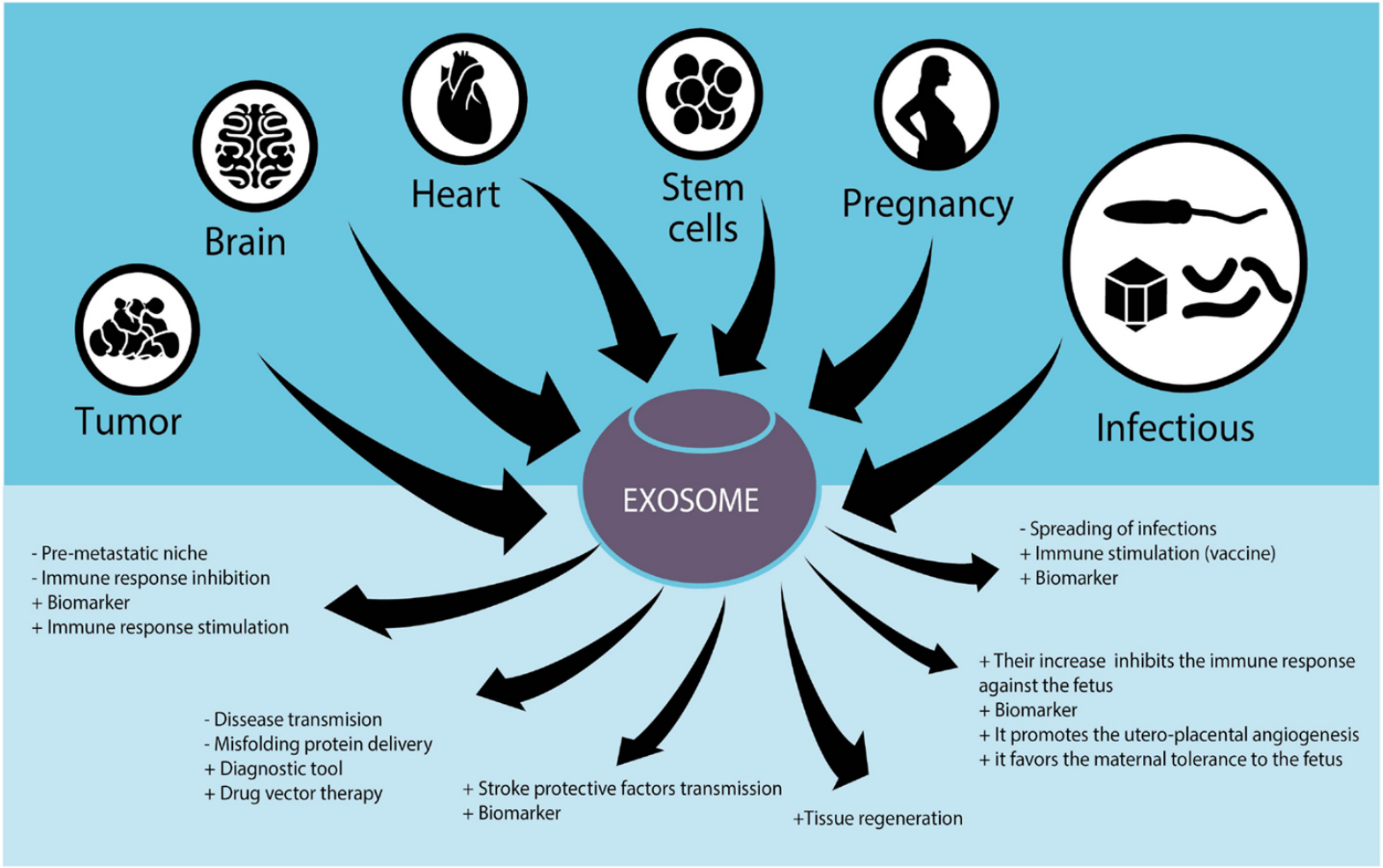
(i) Do exosomes deriving from different cells differ in terms of both biophysical properties and molecular content?

(ii) What are the mechanisms of exosome recognition/internalization and how are they correlated with the functionality of these vesicles?

(iii) What are the effects of these processes on different target cells?



EXOSOMEs FOR THERAPY



De Toro et al Front. Immunol., 04 May 2015 | https://doi.org/10.3389/fimmu.2015.00203

OBJECTIVES

Our strategic plan has 4 main objectives:

1. identification of therapeutically active EVs in 3 clinical fields;
2. development of new technology platforms for multimodal therapeutic determination of EVs;
3. design of clinical trials for EV testing in the treatment of glioblastoma (oncosuppressive EV), non-union bone fractures (regenerative EV) & spinal cord injury (immunomodulatory and neuroprotective EV);
4. development and establishment of a joint research program for the production of therapeutic EV following Good Manufacturing Practice (GMP, necessary for pharmaceutical production of investigational new drugs) criteria in Italy and Austria.

RELEVANCE FOR THE PROGRAMME AREA…

1a) Capacity building for research and innovation in key sectors of regional economies through cross border collaboration of research institutions.

RIS3 regional strategic trajectories are specifically devoted to Smart Health and in particular development of technological platforms for diagnostic applications and for innovative therapies and production of technologies for cell therapies, gene therapies and small molecules.

Regenerative medicine and oncology are cost-intensive and very competitive fields of research. Their development at regional level can be hampered by lack of communications and networking strategies. To overcome structural and financial deficits in the field, technology and specific knowledge will be exchanged among partners as well as other transnational stakeholders.

…AND BEYOND PROGRAMME AREA

EUSALP EU STRATEGY FOR THE ALPINE REGION

The EUSALP initiative has a strong accent on fostering sustainable growth and promoting innovation in the Alps (Action 1) and in particular, in developing innovation and research capabilities and transfer them into practice.

1. Excellent science: collaborative, interdisciplinary project to develop innovative therapies to improve health.
2. Societal challenges: it deals with innovative therapies, coming from multi-disciplinary collaborations, for extremely severe diseases (e.g. Glioblastoma and spinal cord injury).

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PROJECT PARTNERS

EXOTHERA integrates a set of expertise coming from complementary scientific areas in a multidisciplinary approach.

Lead Partner: Elettra Sincrotrone Trieste → biophysical and biochemical characterization

Elettra Sincrotrone Trieste

PARACELSUS
MEDIZINISCHE PRIVATUNIVERSITÄT

Project partner 1: Paracelsus Medical University –Salzburg →GMP production of EV and stem cells;

Project partner 2. Università degli studi di Udine → regenerative medicine, molecular/cellular oncology

UNIVERSITÀ DEGLI STUDI DI UDINE
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ASSOCIATE PARTNERS

3 clinical associated partners offer a continuous supervision and feedback on the the design of real EV-based therapeutic assays in the clinical framework of oncosuppression, immunomodulation, neuroprotection and regenerative medicine.

Associate Partner 1: Neurological Unit of Azienda Sanitaria Universitaria Integrata di Trieste

Associate Partner 2: the Department of Blood Group Serology and Transfusion Medicine, University Hospital, Salzburger Landeskliniken GesmbH

Associate Partner 3: Neuro-surgery and Pathological Anathomy of Azienda Sanitaria Universitaria Integrata di Udine.

REGIONE AUTONOMA FRIULI VENEZIA GIULIA
Azienda Sanitaria Universitaria Integrata di Udine

WP ORGANIZATION

WP1
Project management

WP2
Communication
Main tasks: Digital Platform; EXOTHERA Ambassadors; Public events; Focus groups; Technical - scientific sessions

WP3
EV Production
Main tasks: protocols for EV production; protocols of EV isolation; protocols for EV modification; protocols for GMP production of EVs

WP4
Development of technological platform for EVs' characterization
Main tasks: Definition of physico-chemical characteristics of EVs' subpopulations; Definition of protocols of EVs' uptake

WP5
In vitro/in vivo test of EV subpopulations
Main tasks: In vitro tests of EVs; In vivo tests of EVs; Correlation of results

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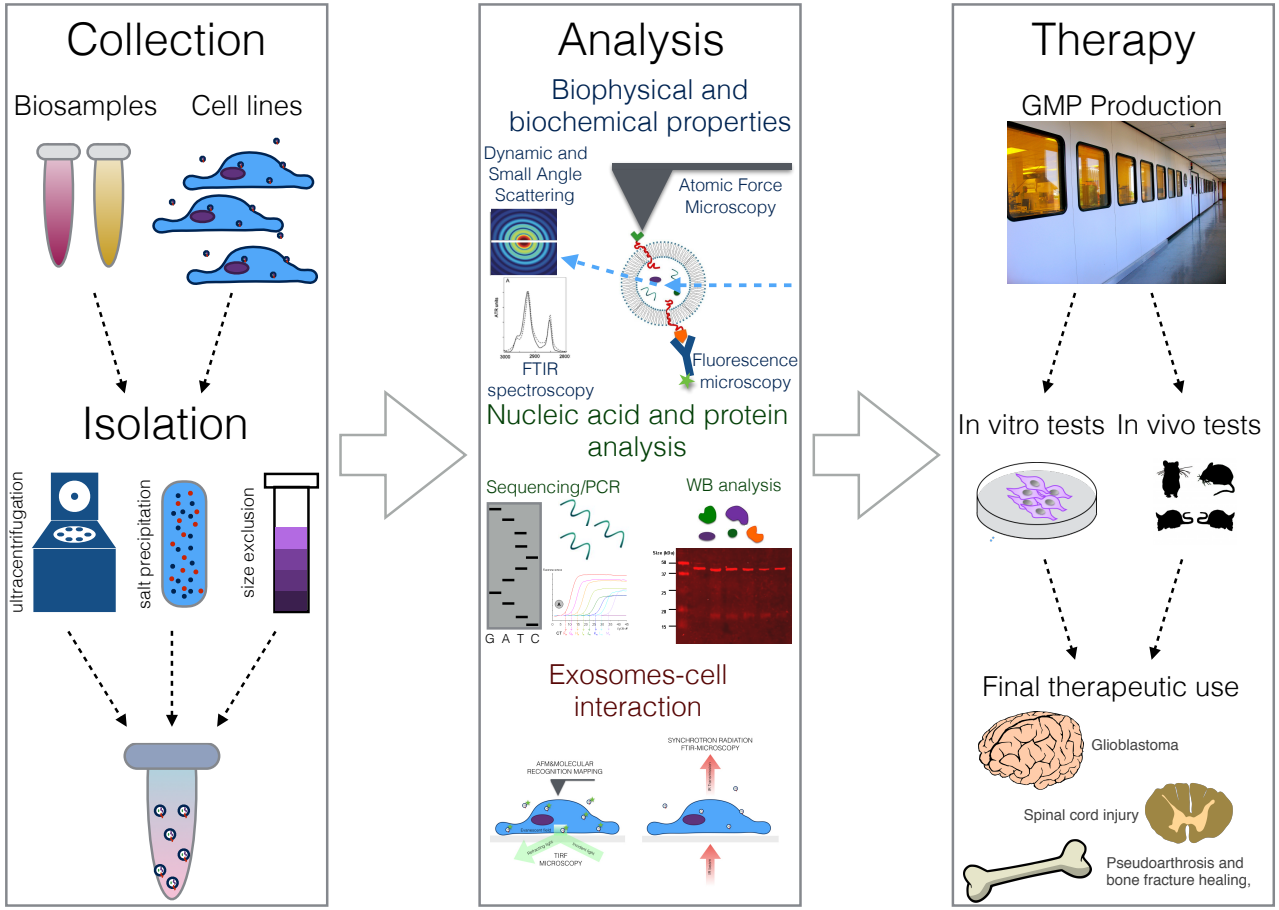
SCIENTIFIC APPROACH



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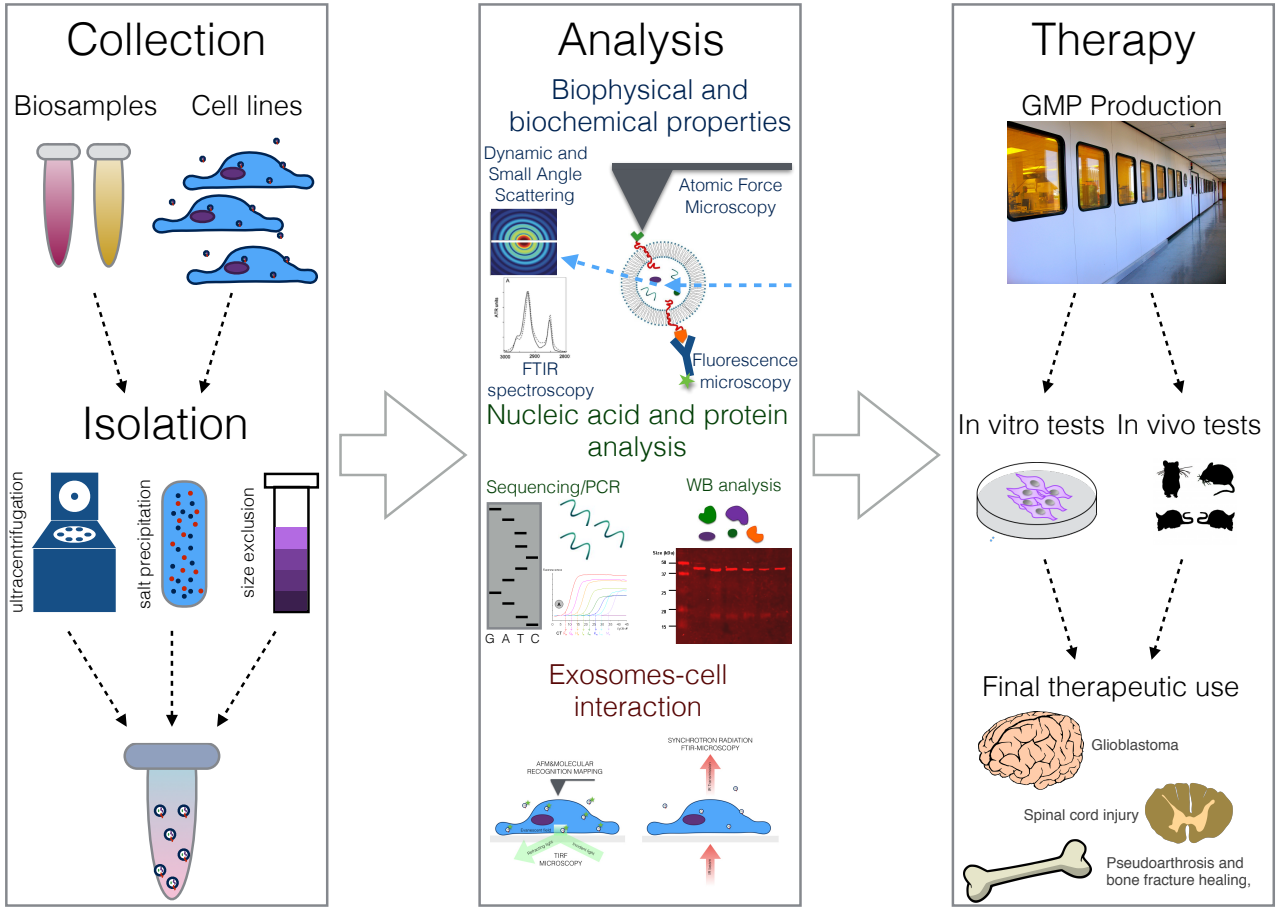
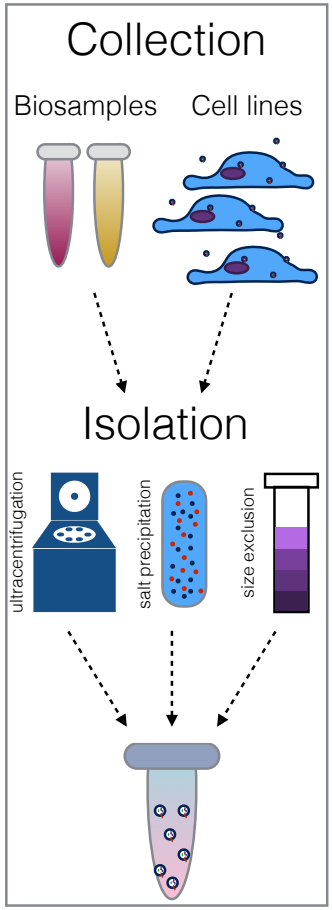
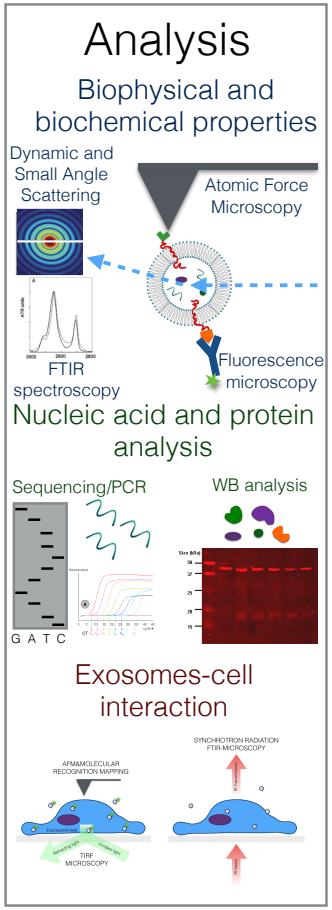
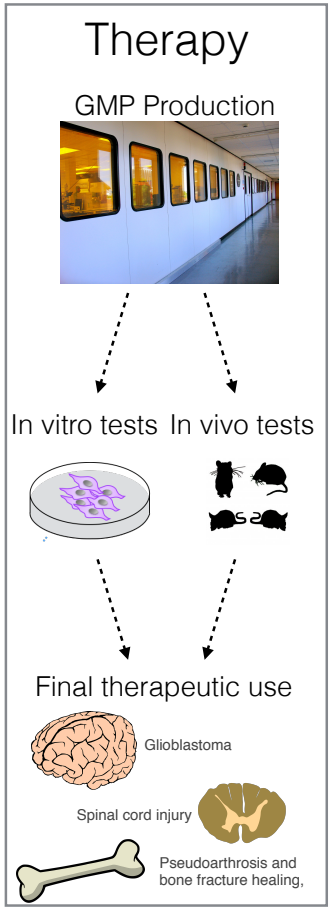


Development of a technology platform for standardized determination of therapeutically active EV.

SCIENTIFIC APPROACH







Correlation of the biochemical and physicochemical characteristics of EV with in vitro and in vivo test results to predict the therapeutic potential of EV for future targeted use for the treatment of non-union bone fractures and glioblastoma, and acute neuroprotective intervention in spinal injury.

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ACTUATION

Exchange of technological and regulatory knowledge for GMP compliant production of therapeutic EV for clinical testing

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ACTUATION

Improvement of interregional exchanges and complementary knowledge transfer between the partners

ACTUATION

Exchange of personnel with the aim of mutual training and to strengthen transregional cooperation over the period of the project also

WEBSITE

Reachable from the Elettra homepage or at the address

https://www.elettra.eu/Prj/EXOTHERA

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Grazie!

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