



**COST EMF - MED (Action BM1309):
European network for innovative uses of EMFs in biomedical applications**

STSM Report:

Neuroprotective and neuroregenerative effects of the electrical stimulation of long term amputees. Data analysis and design of research project

Researcher: Fivos Panetsos. email: fivos@ucm.es

Home Institution: Universidad Complutense de Madrid. Contact: Prof. Fivos Panetsos. email: fivos@ucm.es

Host Institution: Seconda Università degli Studi di Napoli. Contact: Prof. Michele Papa

STSM Reference: ECOST-STSM-BM1309-090515-060480

STSM dates: FROM 09th May 2015 TO 15th May 2015

Abstract:

We have studied slides of brains of control, amputated and neuroprosthetic animals reacted for CyO, PV, Calb and ChAT. We have identified regions of interest for the neuroprotective effects of the neurostimulation and we decided to perform an extensive study of cortical areas S1, S2, M1, M2, thalamic nuclei VPM and PoM, brainstem ST complex and the NBM in the basal forebrain. We have also performed a complete analysis of Ret-positive ganglia of the above mentioned animals. We have designed a research project to present either to ERC or FET-Open Call for Proposals.

A. Purpose of the STSM

In the past we had studied the neuroprotective effects of short-term electrical stimulation of the amputated nerve if such stimulation is applied immediately after the amputation. As stated in the proposal the objectives of the present proposal were

1. To study the brains of these animals and obtain preliminary knowledge about the effects of electrical stimulation on the nervous system if applied with a long delay after the amputation
2. To design a research project to be submitted in the frame of Horizon 2020 with other members of this COST Action.

B. Work Description

We transported slides with complete series of 19 rat brains reacted for CyO, PV, Calb and ChAT as well as TrkA-C and Ret reacted ganglia to the Seconda Università degli Studi di Napoli.

We reviewed up-to-date results and bibliography. We studied rat brains under light microscope. We identified brain regions that mainly could be affected by the neurostimulation, we delimited the zones and we decided

to perform an extensive study of the four markers (6-12 months work for a PhD student) as well as of additional markers in not-yet reacted slides.

We studied the slides of the Ret-positive ganglia of the 19 animals and we decided to perform a quantitative evaluation of the effects of the neurostimulation. We designed the sampling procedure and we selected the slides on which to count the Ret-positive neurons. Neuron counting should be carried out by Prof. Papa in June 2015.

We designed a research project on ACh involvement in cognition-related plasticity phenomena triggered by the electrical stimulation of the peripheral nerve of amputated subjects, to present either to ERC or FET-Open Call for Proposals. Detailed state of the art and working methodology should be completed by Fivos Panetsos.

We had a meeting with Profs. Trautteur, Preverte and Donnarumma organized by Prof. Papa on mental processes, neural plasticity and mathematical modeling.

C. Results

We defined brain areas of interest for the study of neuroprotective effects of the neuroprosthetic stimulation.

We agreed and designed the study to be performed in these brains

We studied the changes of Ret expression in trigeminal ganglia under neuroprosthetic stimulation

We have established collaboration with Profs. Papa, Trautteur, Preverte and Donnarumma to mathematically model neural plasticity phenomena.

D. Future collaboration with host institution

We are writing a joint proposal for Horizon2020

We have planned to study together data available from previous experiments publish them and, if possible, plan future research projects.

We have established a new collaboration between Seconda Università degli Studi di Napoli and Universidad Complutense de Madrid (Papa, Trautteur, Preverte, Donnarumma and Panetsos) to mathematically model neural plasticity phenomena.

E. Expected Publications

C. Herrera-Rincon, S. Venteo, M. Papa, P. Carroll, F. Panetsos, Electrical stimulation of amputated trigeminal nerve differentially affects specific trigeminal ganglion neurons, to submit to "The Journal of Neuroscience" on July 2015.

PhD student to identify, C. Herrera-Rincon, M. Papa, F. Panetsos, Effects of neuroprosthetic stimulation of the amputated trigeminal nerve on cortical areas S2, M1, M2, to submit for publication before summer 2016. (title is provisional, authors list could not be complete).

PhD student to identify, C. Herrera-Rincon, M. Papa, F. Panetsos, Effects of neuroprosthetic stimulation of the amputated trigeminal nerve on the subcortical pathway, to submit for publication before summer 2016. (title is provisional, authors list could not be complete).

F. Other Comments

No other comments

Confirmation by the host institution of the successful execution of the STSM:

We confirm that Prof. Fivos Panetsos has performed the research work as described above.

Contact Person of Host
Institution

Prof. Michele Papa



Signature

Name of
researcher

Prof. Fivos Panetsos



Signature