Predoctoral Research Position in

**Remote control of drug-loaded magnetotactic bacteria and internalization in glioblastoma cancer cell lines**

Magnetotactic bacteria contain nanometer sized magnetic crystals (magnetosomes) generally composed of magnetite, Fe$_3$O$_4$, that act as internal compass, allowing the bacteria to “sense” the Earth’s magnetic field and navigate accordingly. Since their discovery in 1975, the main interest on these bacteria has been focused on the extraction and use of the magnetosomes for different kinds of biomedical applications, including cancer treatment, due to the high crystallinity and intrinsic biocompatibility of the magnetosomes. However, very recently a few groups have started investigating the possibility of using the bacteria as a whole, instead of the isolated magnetosomes, for more innovative applications.

Since the magnetotactic bacteria can sense magnetic fields, they can be externally detected, manipulated and guided. Moreover, magnetotactic bacteria use the Earth magnetic field guidance in order to find the low oxygen concentration regions in water that they prefer to live. This is ideal for cancer treatment: since the tumor area is low in oxygen, due to the tumor tendency to rapidly outgrow its blood supply, magnetotactic bacteria would be inherently attracted towards these hypoxic regions of the tumor. Therefore, targeting the tumor area with these bacteria becomes easier and more efficient than with nanoparticles.

Despite the evident potential, the research on this area is still very preliminary, with only a few labs around the world starting to work on specific problems, such as modeling the movement of the bacteria inside the blood vessels or studying their functionalization with anticancer drugs. Therefore, in order to push forward the implementation of the magnetotactic bacteria in medicine, it is necessary to develop an ambitious research project that contemplates all the steps of the clinical realization process, from the mass culture and functionalization of the bacteria, to their final tests in drug delivery or hyperthermia for in vivo cancer treatment.

Thus, the main objective of the present project is to use magnetotactic bacteria as micro-robots that can be remotely controlled by external magnetic fields in order to deliver anticancer drugs to glioblastoma cancer cells.
The interdisciplinary nature of the project will have a strong impact on the PhD student’s career, who will gain skills in different areas including magnetism, microbiology, cell biology, electrical engineering, etc. During the project, the student will also participate in a network of different national and international collaborators. Besides, complementary skills in management, communication, transfer of knowledge and teamwork will also be obtained. The acquired knowledge and skills together with high quality publications will facilitate his/her future career.

Our Group is comprised of a mixture of biologists and material physicist that have a long experience in the study of this kind of magnetotactic bacteria, with several papers published in high impact factor journals in the last few years.

**Work Program/Duties/Responsibilities**

A three years full-time position exists for a pre-doctoral researcher within the functional materials and integration research group in BCMaterials, an independent Research Centre in active and functional materials located near Bilbao in the Basque Country, north of Spain.

The selected candidate will develop a PhD within the following research plan (tasks will be assigned depending on the background of the candidate, either more Biology related or more Materials Science and Electronic Engineering related):

- Culture different species of magnetotactic bacteria
- Functionalize the bacteria with tumor ligands and anticancer drugs for drug delivery
- Analyze the interaction of MTB with glioblastoma cancer cell lines
- Develop and implement a homemade setup composed of a microfluidic chip + magnetotaxis platform + hyperthermia system + optical microscope for in-situ monitorization, magnetic control, and heat release activation
- Carry out in-vitro drug-delivery tests in glioblastoma cancer cells

After the three years period, he/she must fulfil the requirements to obtain a PhD degree on Materials Science and Technology at the University of the Basque Country. For the successful candidate, the position represents an excellent opportunity to develop both
collaborative and personal scientific research exploiting the capabilities of functional materials preparation, processing, characterization and applications of BCMaterials, under the supervision of internationally recognized scientists.

Contacts and Communication

Under the PhD and project supervision, the successful candidate will interact extensively with other researchers in the group, as well as with researchers from other partners of the international collaborations of the BCMaterials. External representation will involve secondments/visits in other research organizations, as well as presentations of their scientific work at the project meetings and scientific conferences.

Personal Skills and Attributes

The position requires

- Academic degree with a qualification equal or higher than 6.5
- A motivated candidate with a Master on Materials Science, Physics, Microbiology or related areas.
- Previous experience in magnetic materials characterization, electromagnetic engineering and/or microbiological techniques is desirable.
- Fluent English and good interpersonal and presentation skills are also required.

Application

The position will be open until a successful candidate is appointed. Apply by sending,

- Academic records of your degree.
- Curriculum vitae.
- Contact details for 2 referees.

to jobs@bcmaterials.net