Subject: Prostate Endovascular Plasma Therapy

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Abstract (up to 10 lines):

The plasma team at the Pascal Institute has developed, in collaboration with two other Auvergne teams, a process allowing selective treatment of prostate cancer tumors, LNCaP and PC3. The promising results, obtained ex-vivo, were published in the journal "Clinical Plasma Medicine" (doi.org/10.1016/j.cpme.2020.100098). The present subject consists in confirming the ex-vivo results on mouse models. This very multidisciplinary and experimental subject combines the disciplinary fields of biology, plasma physics and medical imaging.

Skills:
Biologist or physicist (ideally trained in plasma physics) enthusiastic about the multidisciplinarity of the subject. Candidate attracted by experimental research possessing the rigors and communication qualities essential for this subject.

**Keywords:**
Plasma torch, Cancer, Imaging, Biological analyzes

**Description (up to 1 page):**

In the last ten years, the range of application of cold atmospheric plasma (CAP) technologies has been widely developed for extended plasma medicine. The Plasma team from Institut Pascal have developed a CAP to treat cancer tumors. First results obtained *ex vivo* show the apoptosis ignition in treated cells derived from prostate cancer metastasis, whereas, the non-tumor cells are preserved. The next step is to study the plasma effects in more realistic conditions, i.e., *in vivo*. Altogether, this project aims to validate the proof of concept of using this new CAP for translational applications.

This project is organised between three complementary teams from UCA in plasma physics, preclinical models of prostate cancer, acquisition of anatomical images and will be organised as follow :

- **Studying plasma treatment of prostate xenografted tumour on mice** to provide data necessary to decipher the molecular mechanisms inducing the cell death of the exposed cells.

- **Designing a specific plasma torch to treat the surgical margins after tumor ablation.** That will allow the study of recurrence of cancer after plasma cleaning of the neighboring area of an ablated prostate tumor, grafted onto a kidney.

- **Modelling of the behaviour of treated cancer tissues** in order to follow mice cancer evolution and treatment by anatomical micro-imaging analysis using Magnetic Resonance Imaging and Computed Tomography on treated tissues.

The expected results are the illustration of the selective effect of CAP treatment of prostate tumors in *in vivo* conditions, a provision of plasma treatment as a cleaning complementary mean of treating prostate cancer by ablation, a better understanding of the apoptosis pathways generated by the plasma treatment and of the behaviours of tissues. On top of that, a turnkey CAP device to treat *in vivo* tumors using endovascular treatments will be designed and optimized for operating rooms’ conditions. It might be patented.

**Références (up to ½ page):**
How to candidate?

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