Production of [^{11}C] Choline in The University Institute for PET – new perspective in diagnostics of prostate malignancy in R. of Macedonia

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[^{11}C] Choline injection is radiopharmaceutical for oncological PET imaging of tumors which overexpress choline kinase. The most important clinical application of this PET radiopharmaceutical is in prostate cancer that can be visualized precisely, having differentiated localization located in comparison with benign tissue. The uptake of specific radiopharmaceutical remains constant thereafter, allowing better visualization of this kind of tumor. [^{11}C] Choline PET/CT could represent an important imaging modality also in the detection of distant relapses in prostate cancer patients with biochemical recurrence.

The reason to have [^{11}C] Choline in a first line of production is the evidence-based indications including also in a clinical guides:
- Evaluation of equivocal findings on conventional imaging such as possible nodal or metastatic disease in patients with prostate cancer where confirmation or exclusion of distant disease would directly influence patient management
- Suspected recurrence in patients with a rapidly rising prostate-specific antigen (PSA) and inderteminate or equivocal conventional imaging where the results would directly influence patient management.

According to the short half-life of ^{11}C radionuclide ($t_{1/2}$=20.4 min), the production of [^{11}C] Choline must be performed in PET facilities with on-site cyclotrons and should be as fast as possible to reduce the loss of activity due to decay.
The University Institute for Positron Emission Tomography in Skopje is equipped with a cyclotron GE PETtrace 800 for production of ^{18}F, ^{11}C, ^{13}N and option for solid targets. ^{11}C that we are planned to use for [^{11}C] Choline is produced by cyclotron as [^{11}C]CO_2 or [^{11}C]CH_4. ^{11}C radionuclide, produced as a gas in one of these chemical forms, is being transported through stainless steel tube to the GMP production laboratory, where a hot cell for synthesis of [^{11}C] Choline and a hot cell for dispensing are installed. MIP is shielded cell where the methylator and the module for carbon labelling CarbonSynton are placed in. BBST-PC Laminar Flow Hot Cell is equipped with Clio-volumetric dispenser which is designed to dispense both vials and syringes. The automatic compact injector system allows automatic intravenous infusion of radiopharmaceuticals in a radiologically safe manner and with maximum control of all critical parametres such as the flow, the amount and the injection time.

The UI PET Skopje is the first center with all these opportunity in the Balkan region which has full equipment for production of [^{11}C] Choline radiopharmaceutical.
In our country where improving the health care system is one of the national imperatives, introducing [^{11}C] Choline PET/CT as diagnostic procedure, will contribute to the strategy for better management of patients with prostate malignancy.

Keywords
[^{11}C] Choline, cyclotron produced radiopharmaceuticals, PET/CT, PET radiopharmaceuticals, prostate cancer