

## Cyclotron produced gallium-68 chloride [<sup>68</sup>Ga]GaCl<sub>3</sub> as an alternative to <sup>68</sup>Ge/<sup>68</sup>Ga generators

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The <sup>68</sup>Ga isotope is usually eluted from the <sup>68</sup>Ge/<sup>68</sup>Ga generator and is therefore readily available in PET (Nuclear Medicine) laboratories which do not have a cyclotron in place. The characteristics of the <sup>68</sup>Ga isotope that this possesses make it a desirable radionuclide for PET diagnostics and the first widely available PET radioactive metal ion for routine use worldwide. With the help of a chelator, it can be easily attached to a biologically active molecules, which makes it suitable for conjugation with various biomolecules using bifunctional chelators and various macromolecules. Additionally, the selection of the chelator enables one compound to be radiolabelled with different radiometals. Thanks to this, it is possible to widely use (PET, SPECT, MRI, multimodal PET/SPECT/CT and therapy) of the compound only through the exchange of the radiometal with minimal changes in biological behavior. This facilitates patient-centered care, from diagnosis to molecular imaging to treatment, e.g. possible combination with <sup>177</sup>Lu or <sup>90</sup>Y isotopes as a theranostic pair. Due to serious disadvantages of <sup>68</sup>Ge/<sup>68</sup>Ga generators, such as a very high purchase cost, short expiry date of the generator, low activity of the obtained isotope, low availability on the market and the need to keep a break between successive elutions, the number of PET studies with the use of <sup>68</sup>Ga based radiopharmaceuticals do not meet the market demand [1], hence recently attempts have been made to obtain this valuable isotope using medical cyclotrons by irradiating of liquid (solution of <sup>68</sup>Zn salts) [2] or solid target made of metallic <sup>68</sup>Zn [3][4].

The paper presents the method of obtaining [<sup>68</sup>Ga]GaCl<sub>3</sub> via a solid target technology in a medical cyclotron at the VOXEL Radiopharmaceuticals Production Center in Kraków, in quality compliant with the requirements of the European Pharmacopoeia and Good Manufacturing Practice (GMP). This method leads to obtain much greater activities, allowing for the subsequent distribution of the <sup>68</sup>Ga isotope. The above method may be an attractive alternative to <sup>68</sup>Ge/<sup>68</sup>Ga generators and in the future, by increasing the availability of the <sup>68</sup>Ga isotope, may contribute to changing the cancer diagnosis strategy.

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