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Hassan M. Rashed, Rehab N. Shamma, Hanan A. El-Sabagh



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## **Preparation of $^{99m}\text{Tc}$ -Levetiracetam intranasal microemulsion as the first radiotracer for SPECT imaging of the Synaptic Vesicle Protein SV2A**

Hassan M. Rashed<sup>1</sup>, Rehab N. Shamma<sup>2</sup>, Hanan A. El-Sabagh<sup>1</sup>

<sup>1</sup>Department of Labeled Compounds, Hot Labs. Center, Egyptian Atomic Energy Authority, Cairo, Egypt

<sup>2</sup>Department of Pharmaceutics and Industrial Pharmacy, Faculty of Pharmacy, Cairo University, Cairo, Egypt.

### **Abstract**

Selective receptors imaging using gamma emitting radiopharmaceuticals allows accurate diagnosis and follow up of many brain related disorders. Levetiracetam, a selective SV2A receptor antiepileptic, was successfully radiolabeled using  $^{99m}\text{Tc}$ . Different conditions affecting the labelling process were studied and optimum radiochemical yield of 89.8% was obtained.  $^{99m}\text{Tc}$ -levetiracetam was effectively formulated and characterized as microemulsion with particle size of  $16.34 \pm 5.58$  nm and polydispersity index of  $0.382 \pm 0.05$ . Parallel biodistribution studies were performed comparing brain targeting efficiency of I.V  $^{99m}\text{Tc}$ -levetiracetam solution, I.N  $^{99m}\text{Tc}$ -levetiracetam solution and I.N  $^{99m}\text{Tc}$ -levetiracetam microemulsion. Brain radioactivity uptake and brain/blood uptake ratio for I.N  $^{99m}\text{Tc}$ -levetiracetam microemulsion were higher than the other two routes at all time intervals. Such results present  $^{99m}\text{Tc}$ -levetiracetam microemulsion as the first SPECT tracer for imaging SV2A receptor.

### **Key Words**

Radiopharmaceuticals, Receptor Imaging, Levetiracetam, Microemulsion.

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