

# Porphyrin-lipid radiotheranostics for the management of neck metastases

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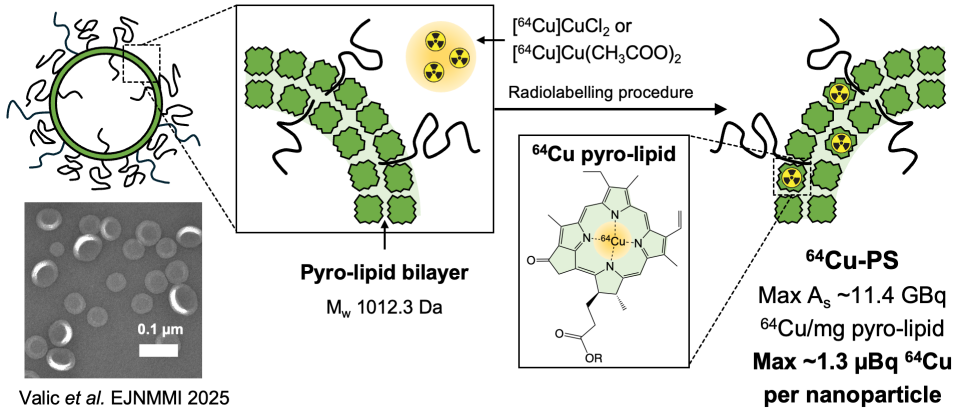
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## Summary of findings:

- Mouse model of tongue cancer was created with ≥ 80% incidence of neck disease by 7 days post-implantation
- <sup>64</sup>Cu-PS provided excellent PET image contrast for the tongue tumour and neck lymph nodes at 24 h post-IV injection
- Uptake and retention of <sup>64</sup>Cu-PS post-IV injection was significantly greater in metastatic pN+ lymph nodes than in benign pN0 nodes
- IT injected <sup>64</sup>Cu-PS provided prolonged particle retention and radiation exposure in tumour-draining neck lymph nodes

## Intro to porphyrin-lipid radiotheranostics

PORPHYSONES (PS) are nontargeted nanoparticles assembled from ~68,000 pyro-lipid building blocks per particle and capable of chelating Copper (Cu) radiometals: positron-emitting <sup>64</sup>Cu and β<sup>-</sup> emitting <sup>67</sup>Cu.



Valic et al. EJNMMI 2025

## Research motivation & objective

Radiolabelled nanoparticles are routinely used for mapping the sentinel lymph nodes in the necks of oral cancer patients during neck dissection. Beyond lymphoscintigraphy, using nanoparticle radiotheranostics to image and treat neck disease in oral cancers is underexplored.

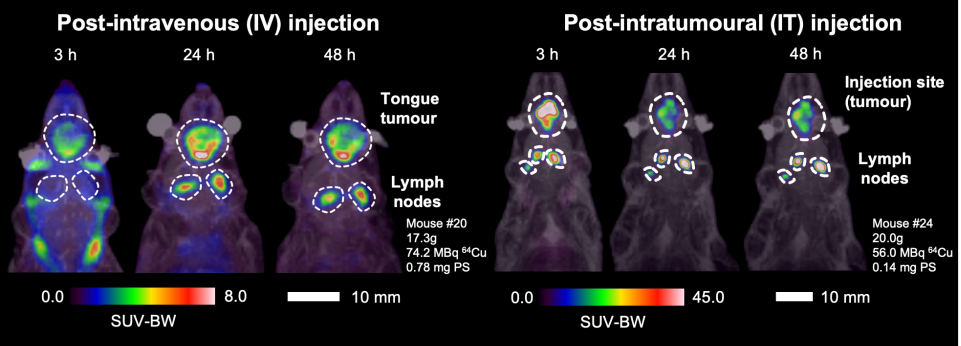
We propose a novel radiotheranostic strategy for managing neck metastases with <sup>64</sup>Cu and <sup>67</sup>Cu-PS to accurately diagnose and selectively treat neck disease with greater precision and fewer side effects than surgery or external beam radiation.

## Characterisation of syngeneic orthotopic MOC oral cancer model in female C57/BL6 (immune competent) mice

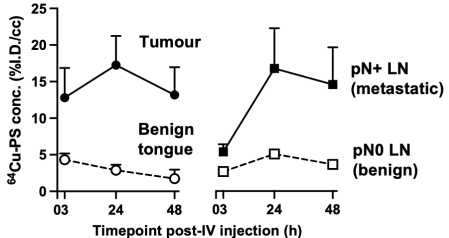
Cervical lymph node metastasis	Incidence rate†
Unilateral spread	≥ 60%
Bilateral spread	≥ 20%
Overall	≥ 80%

†7 days post-implantation  
Valic et al. Theranostics 2026 (accepted)

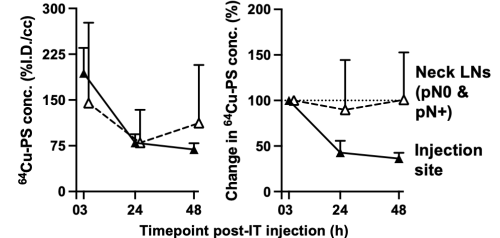
## Serial PET/MR imaging of <sup>64</sup>Cu-PS pharmacokinetics in orthotopic MOC2 tongue cancer models



## <sup>64</sup>Cu-PET contours (IV injection)



## <sup>64</sup>Cu-PET contours (IT injection)



IV PK	Tumour	pN0	pN+
C <sub>max</sub> (%I.D./cc)	17.3 ± 3.98	5.12 ± 0.07	16.9 ± 5.56
AUC <sub>48h</sub> (%I.D.*h/cc)	681 ± 89	188 ± 7	613 ± 108
MRT (h)	97.6 ± 12.5	92.8 ± 28.0	193 ± 38.4

Mean ± S.D.

IT PK	Injection site	Neck LNs
C <sub>max</sub> (%I.D./cc)	194 ± 41.6	144 ± 132
AUC <sub>48h</sub> (%I.D.*h/cc)	4,657 ± 506	4,662 ± 1,991
MRT (h)	105 ± 82.5	>200 (incalculable)

Mean ± S.D.

## Future vision: <sup>64</sup>Cu & <sup>67</sup>Cu-PS radiotheranostic pair

