

WIR SCHAFFEN WISSEN – HEUTE FÜR MORGEN



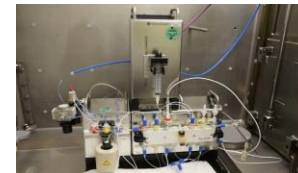
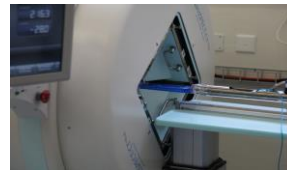
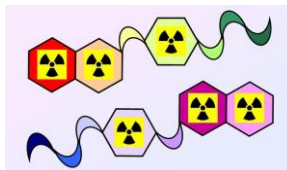
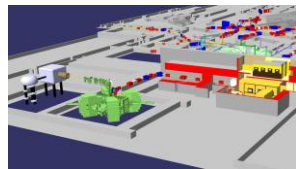
# Radionuclide development at PSI for nuclear medicine applications

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**Radionuclide  
Development**

**Radionuclide  
Production/  
Maintenance**

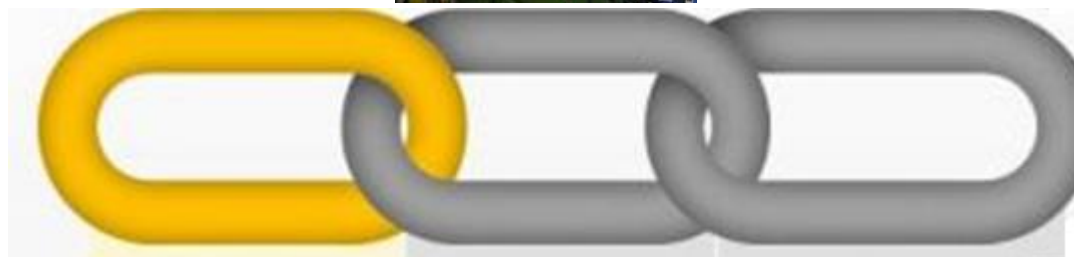
**Nuclide  
Chemistry**

**Pharmacology**

**Clinical Drug  
Supply**



## LABORATORY OF RADIOCHEMISTRY



**Radionuclide  
Development**

**Isotope and Target  
Chemistry**

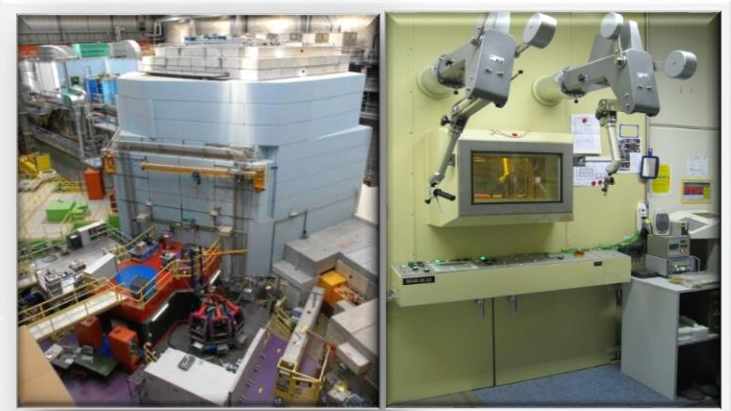
**Heavy Elements**



# Facility as key research infrastructure



**CRS**



**SINQ**  $2 \cdot 10^{13}$  n/cm<sup>2</sup>/s



**IP2**  
**72 MeV**



**WILA**

# PSI Radionuclide Development Group Network



# Radionuclides produced or to be produced at PSI

## $\alpha$ -Therapy

**Tb 149**  
4.2 m    4.1 h  
e<sup>-</sup>    e<sup>-</sup>  
 $\beta^+$      $\alpha$  3.97  
 $\alpha$  3.99     $\beta^+$  1.8  
 $\gamma$  796;     $\gamma$  352;  
165...    165...

ISOLDE

## Auger-e<sup>-</sup> Therapy

**Er 165**  
10.3 h  
e<sup>-</sup>  
no  $\gamma$

**Tm 167**  
9.25 d  
E  
 $\gamma$  532...  
m

## $\beta$ -Therapy

**Tb 161**  
6.90 d  
 $\beta^-$  0.5; 0.6...  
 $\gamma$  26; 49; 75...  
e<sup>-</sup>

**Er 169**  
9.392 d  
 $\beta^-$  0.4...  
 $\gamma$  (8, 110...)  
e<sup>-</sup>

**Yb 175**  
4.185 d  
 $\beta^-$  0.5...  
 $\gamma$  396, 283  
114...

**Sc 47**  
3.35 d  
e<sup>-</sup>  
 $\beta^-$  0.4; 0.6  
 $\gamma$  159

**Cu 64**  
12.7 h  
e<sup>-</sup>;  $\beta^-$  0.6  
 $\beta^+$  0.7...  
 $\gamma$  (1346)  
 $\alpha$  ~270

## PET ( $\beta^-$ )

**Tb 152**  
4.2 m    17.5 h  
ly 283;    e<sup>-</sup>  
160...     $\beta^+$  2.8...  
e;  $\beta^+$ ...     $\gamma$  344;  
 $\gamma$  344;    586;  
411...    271...

ISOLDE

**Sc 43**  
3.89 h  
 $\beta^+$  1.2...  
 $\gamma$  373...

**Sc 44**  
2.44 d    3.92 h  
ly 271  
e<sup>-</sup>  
 $\gamma$  (1002;  
1261;  
1157)     $\beta^+$  1.5...  
 $\gamma$  1157...

## SPECT ( $\gamma$ )

**Tb 155**  
5.32 d  
e<sup>-</sup>  
 $\gamma$  87;  
105;...  
180, 262

ISOLDE



## A Unique Matched Quadruplet of **Terbium Radioisotopes** for PET and SPECT and for $\alpha$ - and $\beta^-$ -Radionuclide Therapy: An In Vivo Proof-of-Concept Study with a New Receptor-Targeted Folate Derivative

Cristina Müller<sup>\*1</sup>, Konstantin Zhernosekov<sup>\*1,2</sup>, Ulli Köster<sup>3</sup>, Karl Johnston<sup>4</sup>, Holger Dorrer<sup>2,5</sup>, Alexander Hohn<sup>1</sup>, Nico T. van der Walt<sup>6</sup>, Andreas Türler<sup>2,5</sup>, and Roger Schibli<sup>1,7</sup>

Nuclear Medicine and Biology 41 (2014) e58–e65

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journal homepage: [www.elsevier.com/locate/nucmedbio](http://www.elsevier.com/locate/nucmedbio)

Future prospects for SPECT imaging using the radiolanthanide **terbium-155** – production and preclinical evaluation in tumor-bearing mice

Pharmaceuticals 2014, 7, 353-365; doi:10.3390/ph7030353

OPEN ACCESS

**pharmaceuticals**

ISSN 1424-8247

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Article

## Folate Receptor Targeted Alpha-Therapy Using **Terbium-149**

Cristina Müller<sup>1,\*</sup>, Josefine Reber<sup>1</sup>, Stephanie Haller<sup>1</sup>, Holger Dorrer<sup>2,3</sup>, Ulli Köster<sup>4</sup>, Karl Johnston<sup>5</sup>, Konstantin Zhernosekov<sup>2</sup>, Andreas Türler<sup>2,3</sup> and Roger Schibli<sup>1,6</sup>

Müller et al. *EJNMMI Research* (2016) 6:35  
DOI 10.1186/s13550-016-0189-4

EJNMMI Research

PRELIMINARY RESEARCH

Open Access

Preclinical in vivo application of **<sup>152</sup>Tb-DOTANOC**: a radiolanthanide for PET imaging

Cristina Müller<sup>1\*</sup>, Christiaan Vermeulen<sup>1</sup>, Karl Johnston<sup>2</sup>, Ulli Köster<sup>3</sup>, Raffaella Schmid<sup>1</sup>, Andreas Türler<sup>4,5</sup> and Nicholas P. van der Meulen<sup>1,4\*</sup>

Müller et al. *EJNMMI Radiopharmacy and Chemistry* (2016) 1:5  
DOI 10.1186/s41181-016-0008-2

EJNMMI Radiopharmacy and Chemistry  
a SpringerOpen Journal

LETTER TO THE EDITOR

Open Access

## Alpha-PET with **terbium-149**: evidence and perspectives for radiotheragnostics

Cristina Müller<sup>1\*</sup>, Christiaan Vermeulen<sup>1</sup>, Ulli Köster<sup>2</sup>, Karl Johnston<sup>3</sup>, Andreas Türler<sup>4,5</sup>, Roger Schibli<sup>1,6</sup> and Nicholas P. van der Meulen<sup>1,4\*</sup>

Dalton Transactions

ROYAL SOCIETY OF CHEMISTRY

PAPER

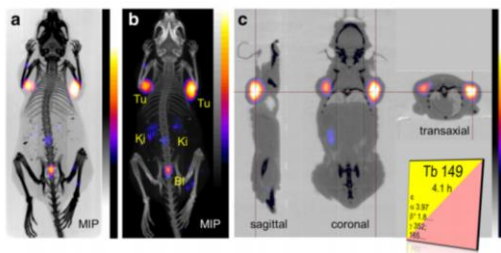
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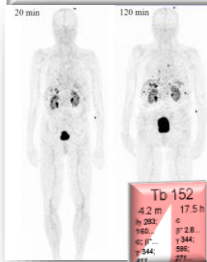
Cite this: *Dalton Trans.* 2017, 46, 14638

Clinical evaluation of the radiolanthanide **terbium-152**: first-in-human PET/CT with **<sup>152</sup>Tb-DOTATOC**

Richard P. Baum<sup>a,†</sup>, Aviral Singh<sup>\*,†</sup>, Martina Benešová<sup>b,c</sup>, Christiaan Vermeulen<sup>b,d</sup>, Silvano Gnesin<sup>d</sup>, Ulli Köster<sup>e</sup>, Karl Johnston<sup>f</sup>, Dirk Müller<sup>g</sup>, Stefan Sentfleben<sup>g</sup>, Harshad R. Kulkarni<sup>h</sup>, Andrea<sup>h</sup>, Schibli<sup>b,c</sup>, John O. Prior<sup>i,d</sup>, Nicholas P. van der Meulen<sup>b,d</sup> and Cristina Müller<sup>a,b,c</sup>



**First PET image with <sup>149</sup>Tb**



**First human study with <sup>152</sup>Tb**

# Radionuclides produced or to be produced at PSI

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165... 165...

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 $\gamma$  26; 49; 75...  
e

**Yb 175**  
4.185 d  
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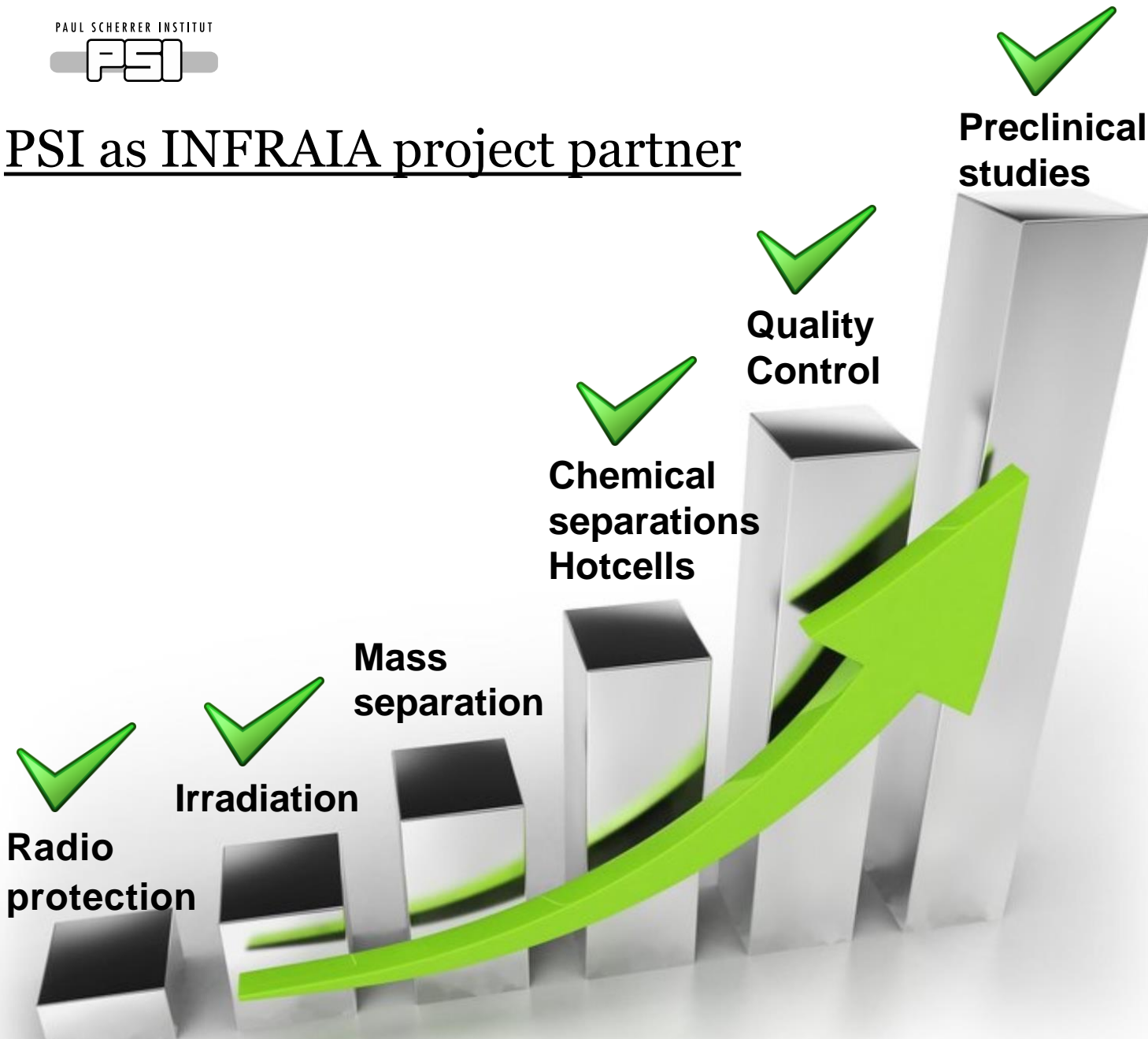
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1157)  $\gamma$  1157...

## SPECT ( $\gamma$ )

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5.32 d  
e  
 $\gamma$  87;  
105;...  
180; 262

# PSI as INFRAIA project partner





*Thank you for your attention*

