PRISMAP
The European Medical Radionuclide Programme

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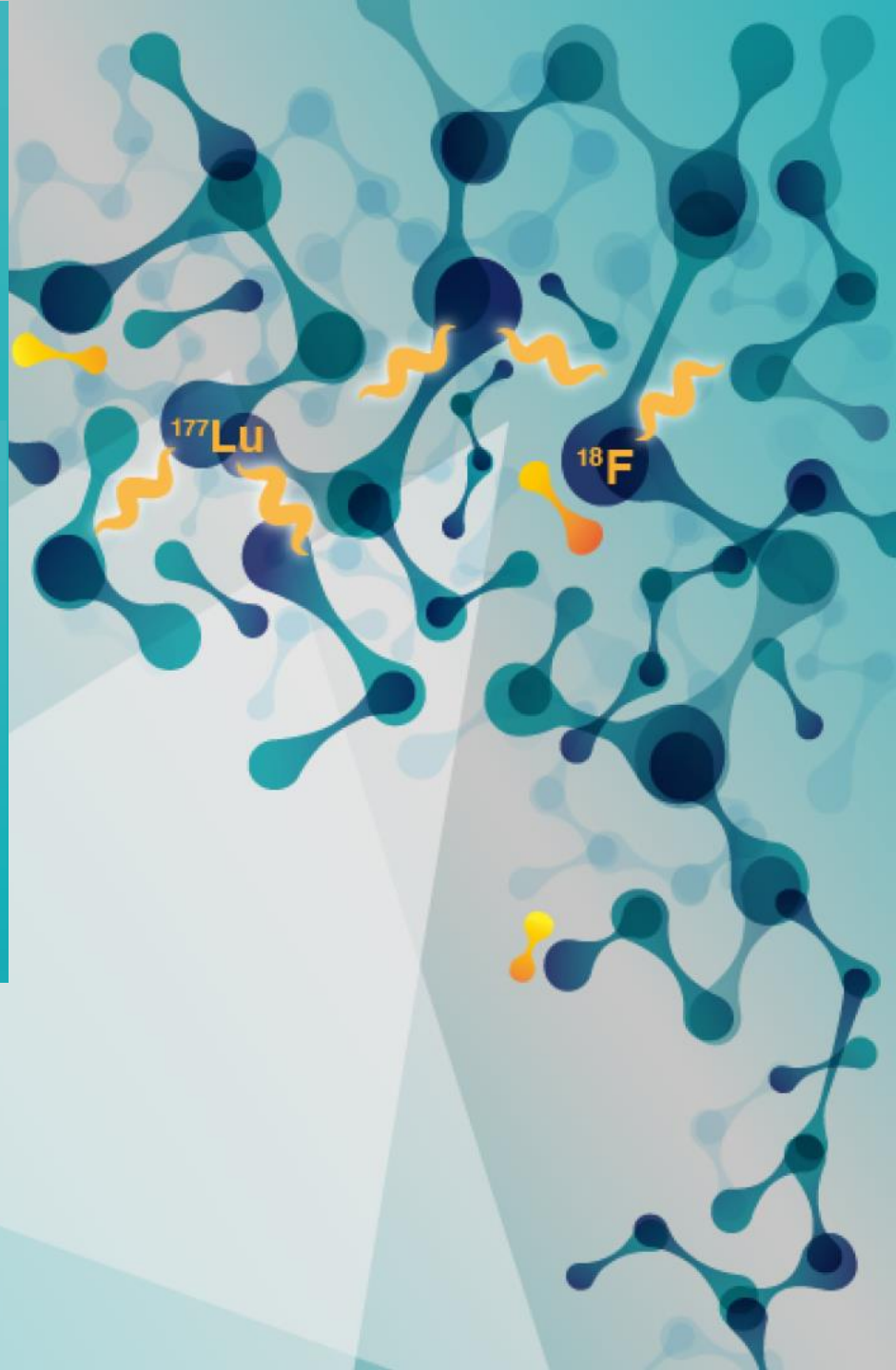
European Medical Radionuclides Programme

LATVIJAS UNIVERSITĀTE

CERN



PRISMAP 23 partneri, 13 valstis

2021-2025

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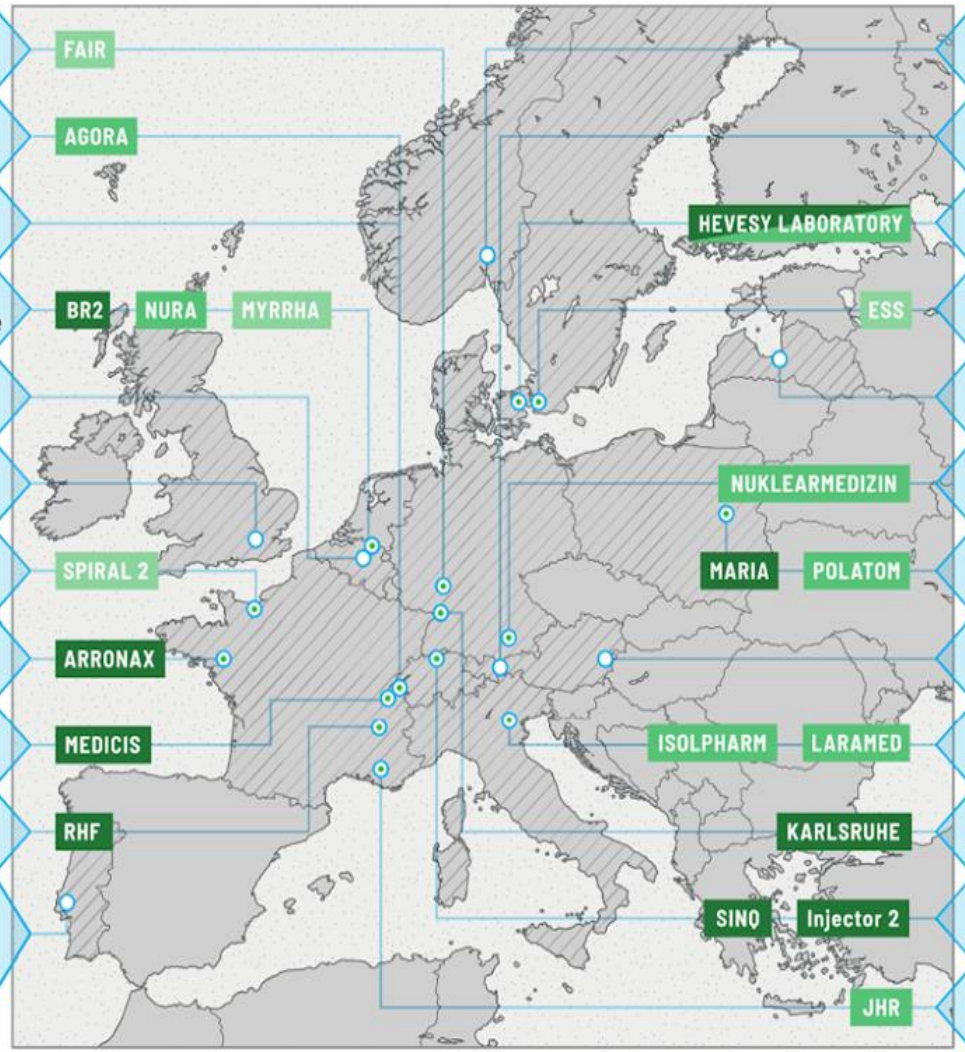
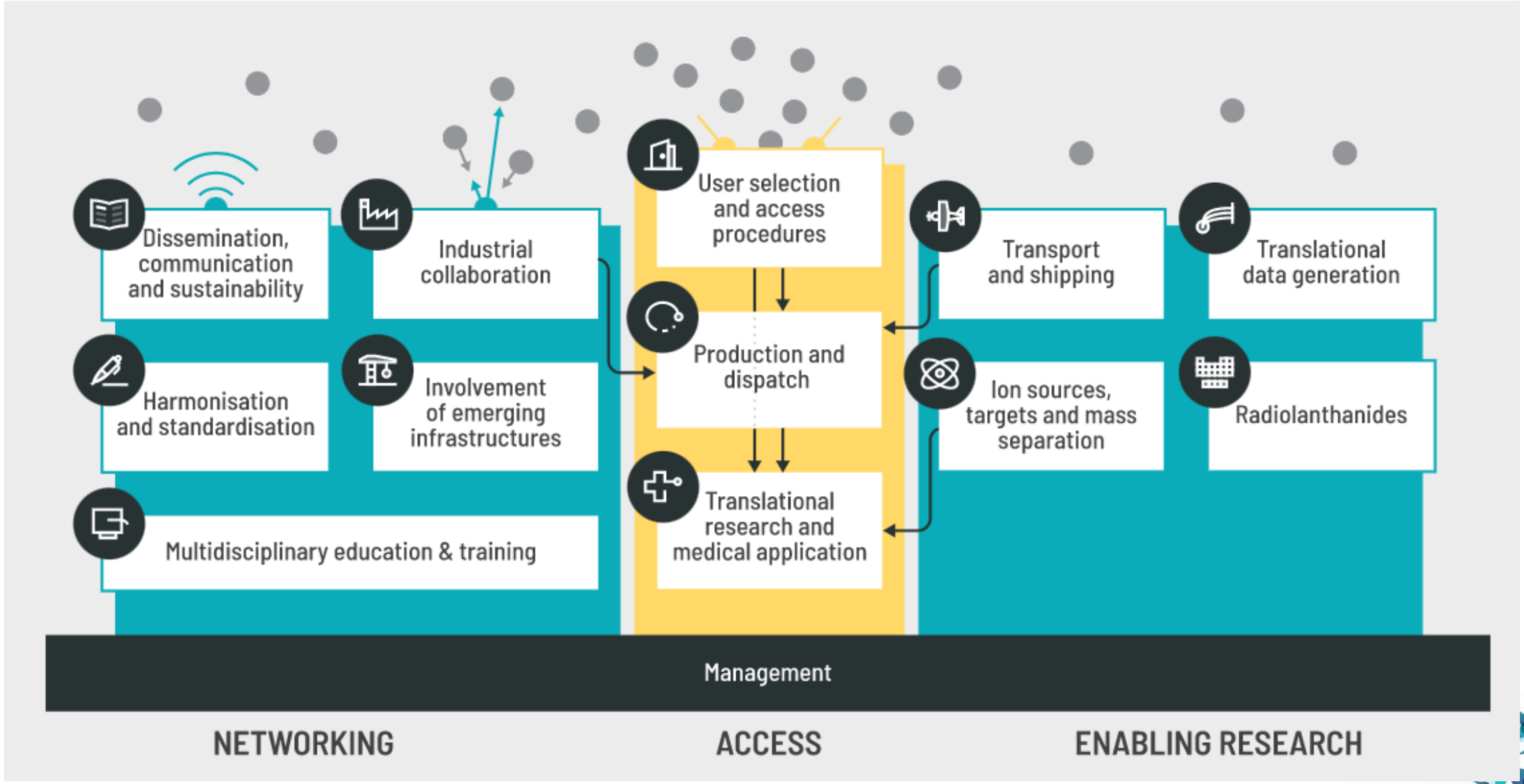
GSI	GSI Helmholtzzentrum für Schwerionenforschung GmbH
CHUV	Centre hospitalier universitaire vaudois
SCIPROM	SCIPROM Sàrl
SCK CEN	Studiecentrum voor Kernenergie / Centre d'étude de l'énergie nucleaire
KULeuven	Katholieke Universiteit Leuven
NPL	National Physical Laboratory
GANIL	Grand Accélérateur National d'Ions Lourds
ARRONAX	Groupement interet public ARRONAX
CERN	European organization for nuclear research
ILL	Institut Max von Laue - Paul Langevin
IST-ID	Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento



Universitetet i Oslo	UiO
Medizinische Universität Innsbruck	MUI
Danmarks Tekniske Universitet	DTU
European Spallation Source ERIC	ESS
Latvijas Universitāte	LU
Klinikum rechts der Isar der Technischen Universität München	TUM
Narodowe Centrum Badań Jądrowych	NCBJ
Entwicklungs- und Betriebs-gesellschaft MedAustron GmbH	MedAustron
Istituto Nazionale di Fisica Nucleare	INFN
Joint Research Centre - European Commission	JRC
Paul Scherrer Institut	PSI
Commissariat à l'energie atomique et aux énergies alternatives	CEA


Dissemination, communication and sustainability
Industrial collaboration
User selection and access procedures
Transport and shipping
Translational data generation
Harmonisation and standardisation
Involvement of emerging infrastructures
Production and dispatch
Ion sources, targets and mass separation
Radiolanthanides
Multidisciplinary education & training
Translational research and medical application
Management
NETWORKING
ACCESS
ENABLING RESEARCH

SADARBĪBA

- Universitātes
- Universitātes slimnīcas
- Pētniecības laboratorijas, Institūti – radiofarmācija, radioķīmija, radiofizika
- Starptautiskas profesionālās organizācijas (EANM, ESR, ESHI etc.)
- Starptautiskas lēmējorganizācijas - IAEA, NuPECC etc.
- Industrijas pārstāvji (NMEU, EFPIA, IBA, ITM etc.)
  - Ciklotronu un RF ierīču ražotāji
  - Atomreaktori
  - Radiofarmācijas kompānijas
  - Detektoru ražotāji
- Gala lietotāji – nukleārā medicīna, molekulāra attēldiagnostika un
- Radioizotopu speciālisti, pētnieki, studenti

IAEA International Atomic Energy Agency

27 EU P Prismap European Medical Radionuclides Programme

NuPECC Nuclear Physics European Collaboration Committee

ESR EUROPEAN SOCIETY OF RADIOLOGY

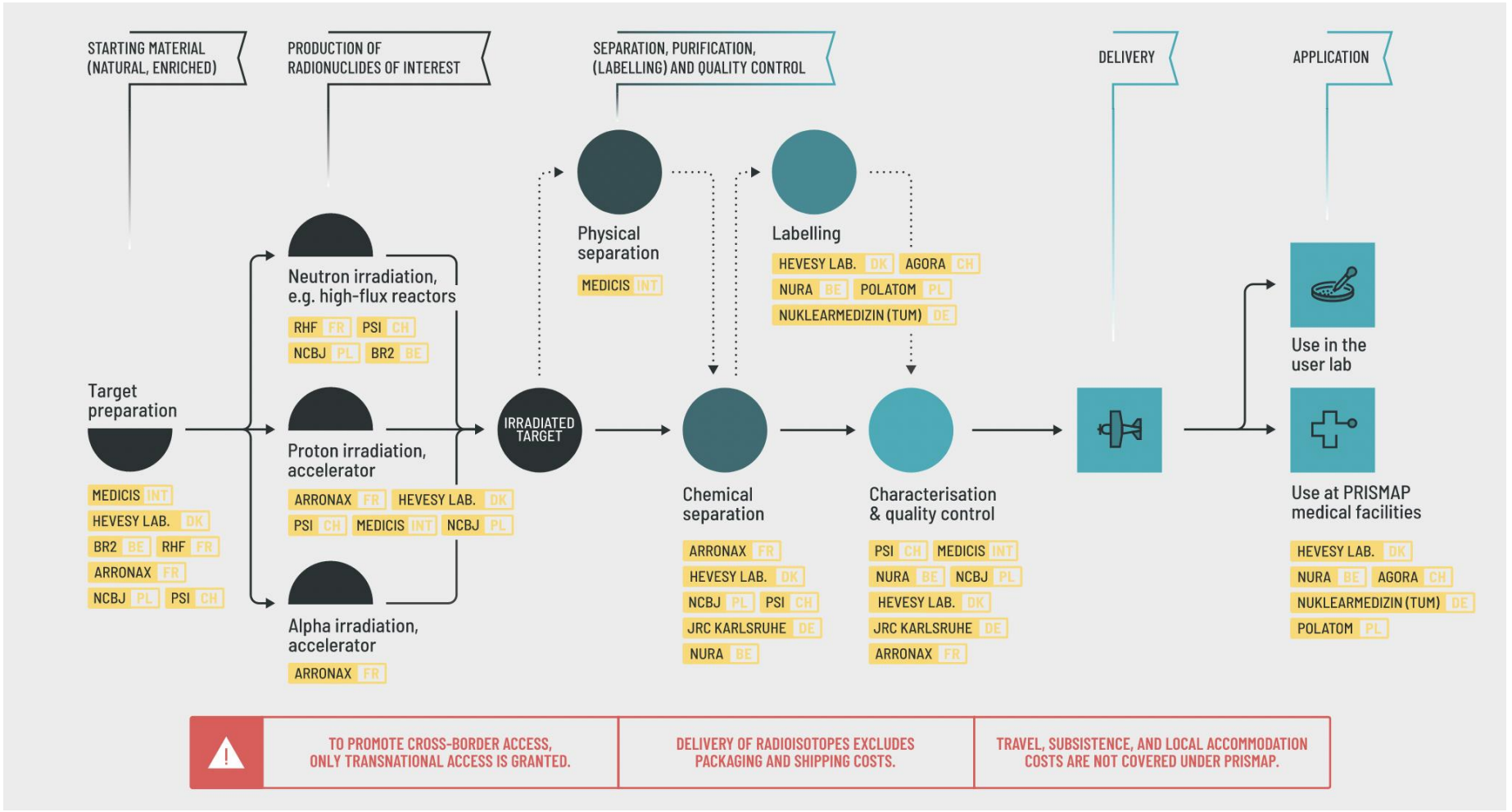
EANM EUROPEAN ASSOCIATION OF NUCLEAR MEDICINE

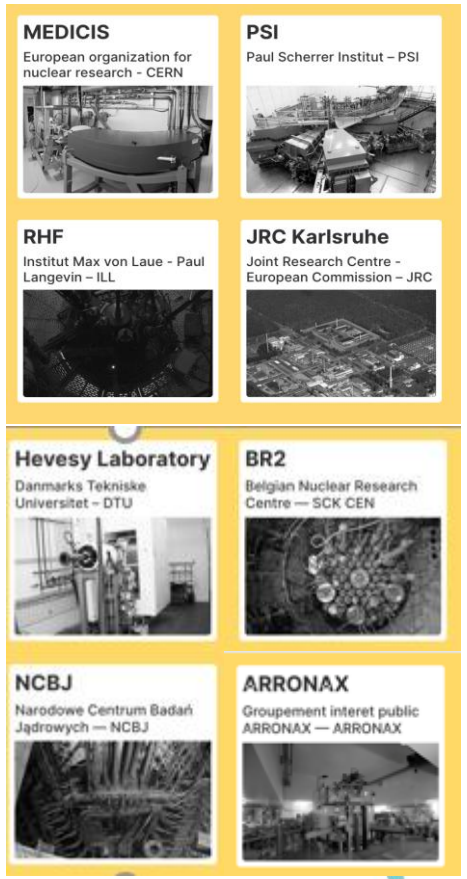
NUCLEAR MEDICINE EUROPE

efpia European Federation of Pharmaceutical Industries and Associations

IFPMA International Federation of Pharmaceutical Manufacturers & Associations

PRISMAP RN ražošana, piegāde

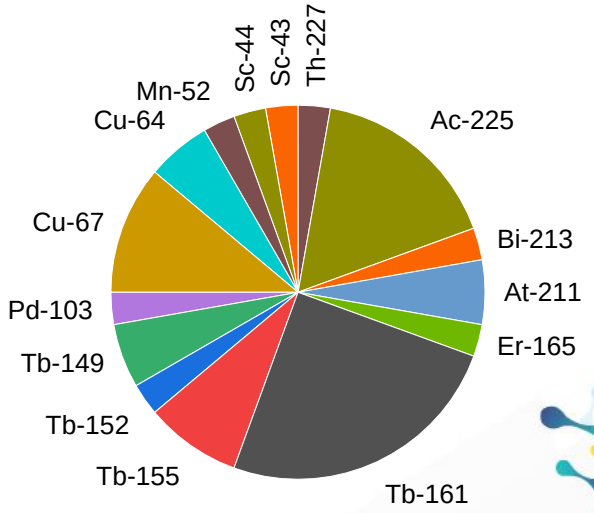




PRISMAP.EU

- Our web interface : https://www.prismap.eu/radionuclides/portfolio/

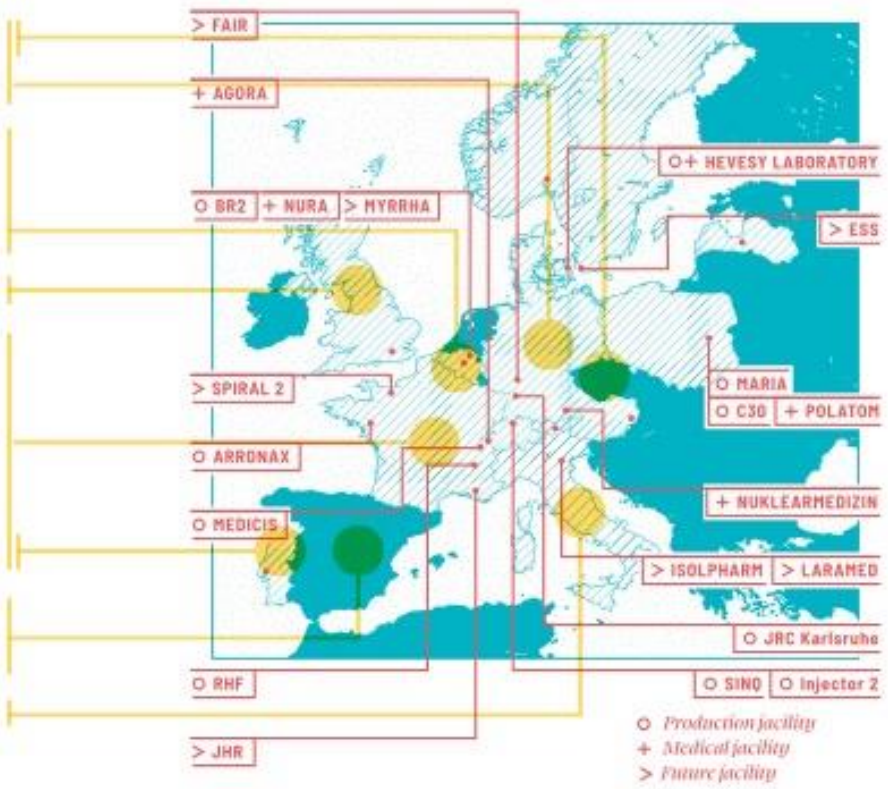
- Nodrošināt pieejamību inovatīviem radionuklīdiem (jaunas tīrības pakāpes) medicīnas pētniecībai un praktiskam pielietojumam
- Radīt vienotu piekļuves tīklojumu pētniecības komūnai
- Sekmēt caurspīdību un vienkāršotāku pieeju regulējumā par loģistiku un licencēšanu, lai sekmētu biomedicīnas pētniecību
- Teranostikas – diagnostikas un ārstēšanas RN pētniecība



Biomedicīnas pētniecības projekti ar PRISMAP atbalstu

www.prismap.eu/access/user-projects

Radiopharmaceutical Cancer Research **Dresden** (/CZ)
Pharmaceutical Radiochemistry TU **Munich**
In vivo cellular & molecular imaging lab (ICMI) VU **Brussels**
Imaging and Pathology KU **Leuven**
Molecular Imaging Center **Antwerp**
Biomedical Engineering and Imaging Science **London**
UGA – Inserm **La Tronche**
Radiopharmacy **Bordeaux**
CEMHTI Radiochemistry **Orleans**
Radiochemistry Hopital Frederic Joliot **Orsay**
Inserm **Montpellier** (/PT)
Radiochemistry unit, Hospital Gregorio Marañón **Madrid**
Fondazione IRCCS Istituto Nazionale dei Tumori **Milano**
Dep Molecular Biotechnology Health Sciences **Torino**

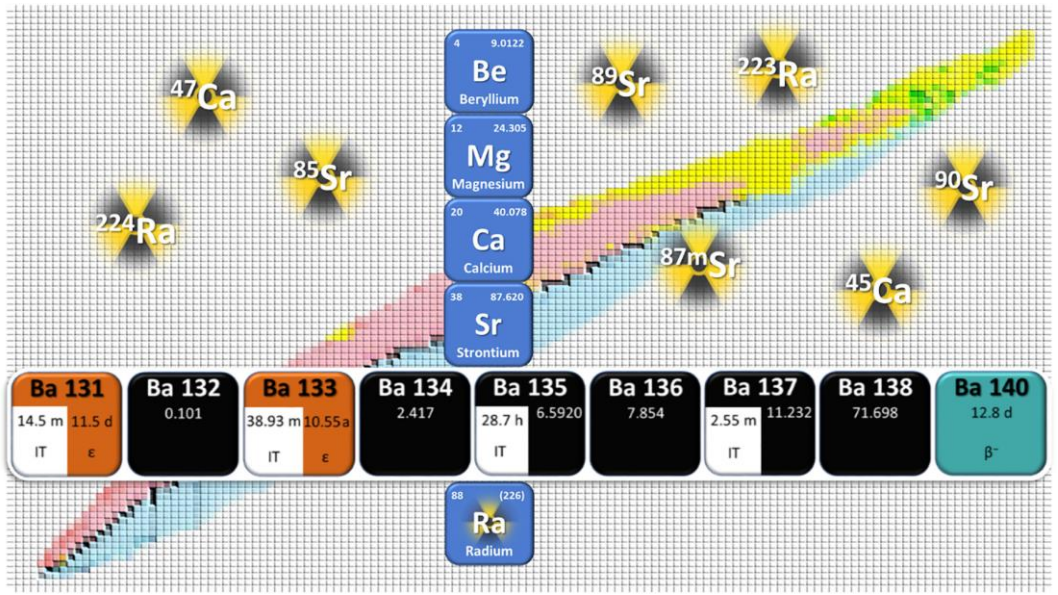


- Terbium-161 over Lutetium-177 more stable GRPR Ligand– A Preclinical Evaluation
- Improved FAP-radiotheranostics for personalized cancer treatment (211At)
- Phantom measurements quantitative 225Ac- (micro)SPECT imaging (213Bi)
- Feasibility of increased 211At production by 210Po assessment
- **Imaging of 165Er**
- Selective oncological theragnostic based on exosomes (161Tb)
- 161Tb-PSMA cell targeting treatment of prostate cancer biochemical recurrence
- Dual 152Tb/149Tb radiolabeling for diagnostic and theranostic applications
- Zebrafish embryo as a novel model to evaluate the efficacy of short range emitters used for targeted radionuclide therapy
- New chelators for complexation of medically useful lanthanide and actinide radioisotopes
- **Targeted radiotherapy of radioresistant cancers – a radiobiological study with advanced cell models**
- **...**

$^{128}Ba/^{128}Cs$ an in-vivo generator to treat osteosarcoma

F. Reissig, K. Kopka and C. Mamat *Nuclear Medicine and Biology 98*

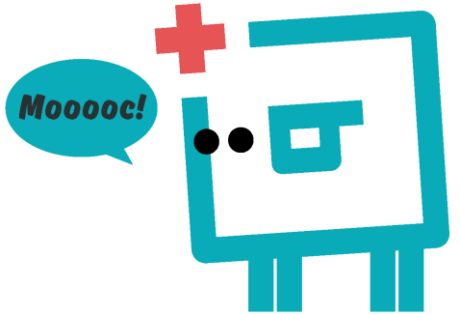
- Theranostics approach by Auger therapy & PET imaging in preclinical osteosarcoma model
- $^{128}Ba/^{128}Cs$ enters the bone matrix as a surrogate of Ca^{2+} like ^{223}Ra and ^{89}Sr. It is metabolized, concentrated secreted through the matrix vesicles by the osteoblast



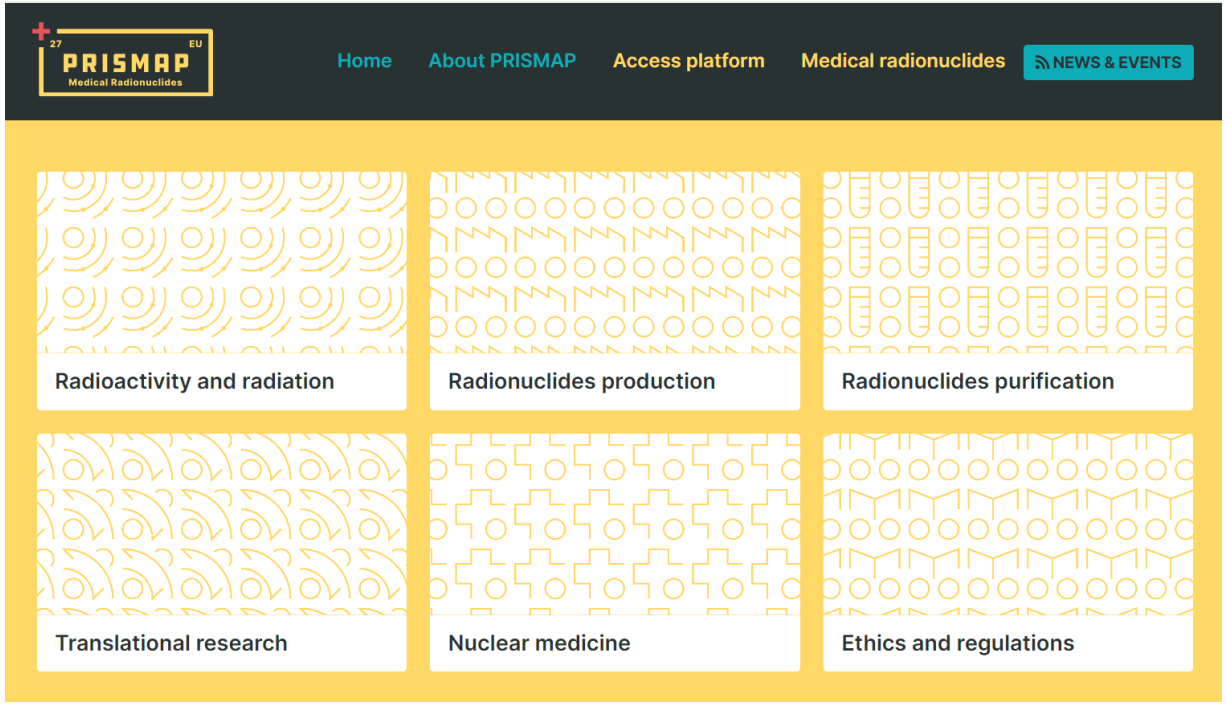
Ba 128	Cs 128
2.43 d	**3.64 m**
ε no β^+ γ 273…	β^+ 2.9… ε γ 443, 527…

Generator system	Half-life	Decay Mode	Emission	Application	Daughter	Half life	Decay mode	Emission	Application
$^{128}Ba/^{128}Cs$	2.4 d	EC	γ, **Auger e$^-$** (2.5-5.7 keV 79.3%)	Auger therapy	^{128}Cs	3.66 m	EC, β+	γ, Auger e$^-$, **β+** (1315.9 keV 53.2%)	PET

D. Viertl et al., MED-028
https://medicis.cern/approved-projects



Izglītības iespējas



- **MOOC** "At the heart of European medical radioactivity" is now fully open and accessible
- School on **radionuclide production**, Leuven (Belgium), 27-31 May 2024
  Mix of lectures, hands on work with ion sources and separators, poster presentations, and an industrial fair
- School on **targeted alpha therapy**, ISI-NucMed, Nantes (France), 1-4 July 2024
  https://isinucmed.univ-nantes.fr/
- School on **medical imaging**, Riga (Latvia), Autumn 2024
  Together with the Baltic Congress of Radiology
  October 2024

https://www.prismap.eu/radionuclides/educational/

Nuclear Decay Data for Day-1 radionuclides

Table 1. PRISMAP day-1 radionuclides.

Radionuclide	Application	Imaging(I)/ Treatment(T)/ Generator(G)	Production reaction
Sc-44/Sc-44m	PET	I	^{44}Ca(p,n); ^{44}Ca(d,2n)
Sc-47	β⁻ therapy, SPECT	I/T	^{46}Ca(n,γ)^{47}Ca(β⁻)
Cu-64	PET	I	^{64}Ni(p,n); ^{64}Ni(d,2n)
Cu-67	β⁻ therapy, SPECT	I/T	^{68}Zn(p,2p); ^{70}Zn(p,α)
Ag-111	β⁻ therapy, SPECT, TDPAC	I/T	^{110}Pd(n,γ)^{111}Pd(β⁻); ^{110}Pd(d,n)
La-135	Auger therapy	T	^{nat}Ba(p,X)
Tb-149	α therapy, PET	I/T	^{nat}Ta(p,spall)
Tb-152	PET	I	^{nat}Ta(p,spall)
Tb-155	Auger therapy, SPECT	I	^{nat}Ta(p,spall)
Tb-161	β⁻ therapy, SPECT	I/T	^{160}Gd(n, γ)
Dy-166	Generator for Ho-166 (β⁻ therapy, SPECT)	G	^{164}Dy(n, γ)(n, γ)
Er-165	Auger emitter	T	^{165}Ho(n, γ)
Tm-165	Generator for Er-165 (Auger therapy)	G	^{nat}Ta(p,spall)
Er-169	β⁻ therapy	T	^{168}Er(n, γ)
Yb-175	β⁻ therapy, (SPECT)	T	^{174}Yb(n, γ)
Pt-195m	Auger therapy, SPECT	I/T	^{194}Pt(n, γ)
Bi-213	α therapy	T	^{225}Ac generator
At-211	α therapy	T	^{209}Bi(α,2n)
Ac-225	α therapy	T	^{229}Th generator; ^{232}Th(p,spall)

Table 20. Summary of nuclear decay data needs for the PRISMAP day-1 radionuclides.

Radionuclide	Recommendations for future studies
Sc-44	▪ New studies of the decay branching ratio of the ε/β^+ decay routes. ▪ Further studies of the half-life may be beneficial to improve the current evaluation dataset.
Sc-47	▪ Absolute gamma-ray emission intensity studies of the 159.381 keV would be of interest to revisit to resolve a bias between values determined from different measurement systems.
Cu-64	▪ Further studies of the decay branching ratio of the β^- decay route is worthy of further scrutiny.
Cu-67	▪ New studies of the half-life would be beneficial to confirm the accuracy of the half-life and to improve the precision. ▪ A new decay data evaluation is required.
Ag-111	▪ A new decay data evaluation is required.
La-135	▪ Further studies of the half-life are needed. ▪ Additional γ-γ coincidence studies would be of use to complete the placement of the gamma transitions in the decay scheme. ▪ Absolute gamma-ray emission intensity studies derived from an absolute standard are needed to improve the precision of these values. ▪ Requirements for improved X-ray and Auger-electron data studies.
Tb-149	▪ Precision measurements of the half-lives of Tb-149 and its decay progenies (Eu-145 and Gd-149) are needed. ▪ New studies are required to improve the precision of the alpha decay branching ratio. ▪ There is a requirement for new studies of the gamma-ray emission intensities to confirm the accuracy of the single study and to improve the precision. ▪ There is also a requirement to improve the gamma-ray emission intensities of the decay progenies.
Tb-152	▪ New γ-γ coincidence and TAGS studies are needed to complete the decay scheme and to confirm the highest energy transition states. ▪ New half-life measurements are needed to confirm the accuracy of two studies in the 1960s and to improve the precision. ▪ Absolute gamma-ray emission intensity measurements are needed.
Tb-155	▪ Further γ-γ coincidence measurements are needed to resolve the placement of 40 gamma transitions. ▪ Absolute gamma-ray emission intensities are required to improve the electron capture branching ratios. ▪ Further studies of the half-life are warranted to expand the evaluation dataset.
Tb-161	▪ Further studies are required of the gamma-ray emission intensities, especially the 25.65 keV gamma ray to improve the beta branching ratio values to the ground state. ▪ A new evaluation of the half-life is required. ▪ There are requirements for further X-ray and internal conversion electron data. ▪ Studies of the Auger-electron emission data is required.
Ho-166	▪ A new evaluation is required to account for new data.
Er-165	▪ Direct measurement of the Auger-electron energies and intensities are required.
	▪ A modern measurement of the half-life would be desirable to confirm measurements made in the 1950s and 1960s.
Er-169	▪ More detailed K X-ray and internal conversion data for the direct population of the 8.41 keV state and the transition to the ground state are recommended. ▪ Further studies of the half-life are recommended.
Yb-175	▪ Further studies of the half-life are desirable to increase the evaluation dataset.
Pt-195m	▪ Definite requirement for absolute gamma-ray emission intensities to improve the precision and confirm the accuracy. ▪ Further data for the internal conversion electron probabilities would be of benefit. ▪ New studies of the half-life using high-purity samples would be beneficial. ▪ Direct measurement of the Auger-electron energies and intensities are required.
At-211	▪ New half-life determinations with complete uncertainty evaluation are required.
Bi-213	▪ No recommendations.
Ac-225	▪ Extensive gamma-ray emission intensity studies and γ-γ coincidence studies are recommended are required.

https://zenodo.org/records/8247129

DELIVERABLE 5.1 - Questionnaire

https://zenodo.org/record/7154340#.Y39OaHZBw2w

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September 30, 2022 Project deliverable Open Access

Deliverable 5.1 - Questionnaire on industrial and clinical key players and needs

Maija Radzina; Edgars Mamis; Laura Saule; Elina Pajuste; Marika Kalnina; Thomas Cocolios; Zeynep Talip; Thierry Stora

This document is a summary of responses received from the public known European industrial manufacturing and research institution and clinical facility representatives. The responses were given to the PRISMAP Consortium questionnaire disseminated in January-August 2022, approaching radionuclides and radiopharmaceutical manufacturers, research institutions and clinical end users in nuclear medicine, with the aim to identify potential stakeholders in the industrial and clinical communities interested by a coordinated approach in Europe such as PRISMAP.

The summary from PRISMAP questionnaire stratifies the feedback from 114 respondents: radionuclide and radiopharmaceutical producers, research facilities and preclinical/clinical end users. In addition, it gives an insight into the location and capabilities of the main isotope-producing cyclotron facilities, many of which are known from the IAEA cyclotron database [2]). The questionnaire was offered with an opportunity to make new research and international collaboration partners, where all parties could benefit from harmonised supply and legislation procedures, expanding network and distribution routes, and subsequently gain visibility within the PRISMAP User Forum map at www.prismap.eu. The questionnaire was focused on the radionuclide use in medicine with emphasis on future needs for specific radionuclides and possible research developments with awareness of legislation, logistics and involved personnel education challenges and future perspectives.

Preview

Page: 1 of 60 Automatic Zoom

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Publication date: September 30, 2022

DOI: DOI 10.5281/zenodo.7154340

Keyword(s): PRISMAP; questionnaire; nuclear medicine; radiopharmaceutical manufacturers; research institutions; clinical end users;

Grants: European Commission:
- PRISMAP - The European medical isotope programme: Production of high purity

Review > EJNMMI Radiopharm Chem. 2023 Oct 12;8(1):27. doi: 10.1186/s41181-023-00211-5.

Novel radionuclides for use in Nuclear Medicine in Europe: where do we stand and where do we go?

Maija Radzina [1 2 3], Laura Saule [4 5], Edgars Mamis [1 2], Ulli Koester [6], Thomas Elias Cocolios [7], Elina Pajuste [1], Marika Kalnina [1], Kristaps Palskis [2 8], Zoe Sawitzki [7], Zeynep Talip [9], Mikael Jensen [10], Charlotte Duchemin [2], Kirsten Leufgen [11], Thierry Stora [2]

Affiliations + expand

PMID: 37823964 PMCID: PMC10570248 DOI: 10.1186/s41181-023-00211-5

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SCIPROM Science, Management & Communication

NEUTRONS FOR SOCIETY