RESULTS AND LESSONS LEARNED FROM 4 YEARS OF TRANSNATIONAL TRANSPORT OF NOVEL RADIONUCLIDES

WP 9 = TRANSPORT and LOGISTICS

Presented (online) at CM9 in Warsaw

18 November 2025 –statistics slide corrected 21 Nov 2025

Mikael Jensen – Hevesy Lab, DTU

WP 9 results are the combined efforts of a teamwork

- Thanks to all the TNA 2 and TNA 3 facilities having organised the transports
- Thanks to Charlotte Duchemin for keeping up the project (and transports) spreadsheet
- Thanks to my fellow WP9 members
- Thanks to my local DTU-Hevesy RSO staff for enabling all the many DTU shipments

Status and results:

- At the time of CM9 (19 November 2025) all transports done (157 in total)):
  Settlement of transport costs with users in progress

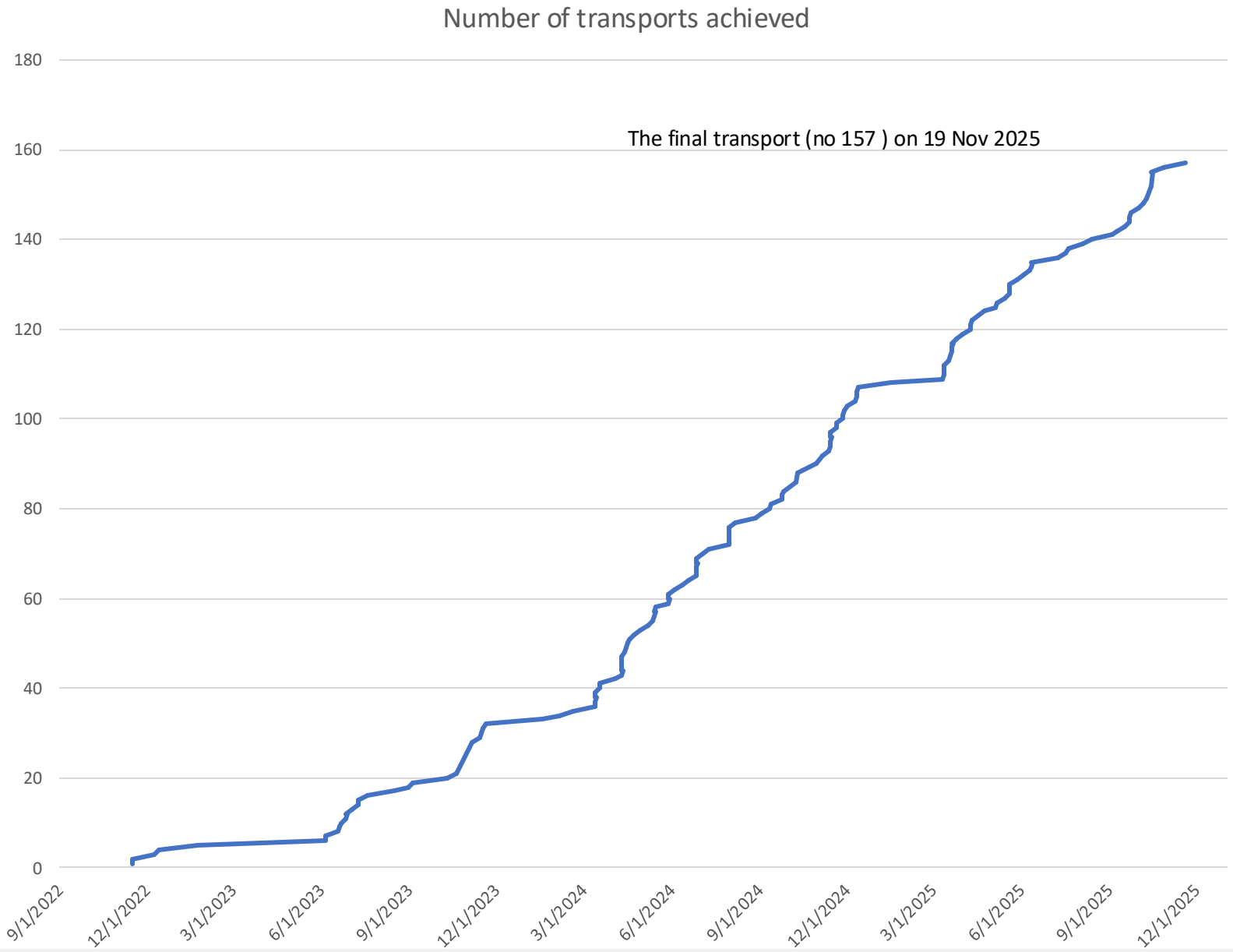
- The final feedback on impact and practicallities from the ”senders” (TNA2 and TNA3) facilities still to be collected.

- No official deliverable from WP9 remains, but experiences may deserve additional actions:

  -Shall we update the ”handbook” D9.1 on the more recent knowledge ?

  -Shall we carry the shipping experience database over to PRISMAP+ ?

Results : 157 transports made to end users



In addition to the end user deliveries:

- Many TNA2 to TNA3 deliveries
- Deliveries for calibration
- Intercomparison deliveries

Lessons learned

- Transport is a key to the PRISMAP mission, because of our TRANSNATIONAL charter
- User projects are almost universally served after transports
- PRISMAP call 1 to call 5 projects have not challenged our half-life limitations.
- PRISMAP combined WP2-WP3 facilities have had limited use up to now
  (The Ag-111 imaging at DTU is such example, but travel costs of PI's had to be subsidised)
- The existing WP2 facilities had transport systems in place, to the benefit of PRISMAP
- Road and air transports (passenger plane) most frequent modalities
- Transport delays are frequent (few hours by road / next flight by air)
- Complete failures (batch is not useful after transport) are few.
- Transports take a lot of effort in preparation – not foreseen in WP2 budgets
- Transports are expensive for the users (users pay – typically 1-3 k€ /batch)

- ”User pays the transport costs” - expensive, but:

- Only one ”excellence selected” project was stopped by user due to transport costs.

Transports take a lot of effort in preparation – not foreseen in WP2/TNA2 budgets

- Finding possible connections (weekdays, departures, production schedules)
- Fitting the experimental cycles (Cell or tumor growth, user staff availability)
- Fitting multiple users on same production batch
- Determining the right packaging type
- Checking end users license
- Arranging (and communicating) the ”final stretch”: Airport or Long Haul Road to User adress
- Arranging the final handover (delivery door, contact persons and phone numbers)
- Arranging the pick-up with sufficient time slack to allow small delays in production,QC
- Preparing package and paperwork

…. Additional ore than 3 k€ per batch, when not trivial routine…

Lessons still being learned:

- Requirements for shorter half-lives as TNA will be demanding.
- Requirements for clinical trials will be demanding (numbers, activity, punctuality).
- Repeated transports have higher success rate (learning by doing).
- Transport and logistics issues should be addressed already at the user project selection step

Lesson learned:

Any reloading hub has a significant chance of delay….

First time around (new radionuclide, new end user) there is a high chance of delay.

Handover from one cargo agent to another is a weak point….. But often cargo agents for radioactive goods must be locally approved.

However, door to door services are often preferred by the ”new” user.

…lost in warehouse…

The PRISMAP transports are being made with the standard methods

- **Most transports can be made as type A –UN2915**

Packages can be expensive, and subject to return transport.

Packages can be single use, but must also be certified as type A.

UN-2908 return is expensive.

Type A package:

Weight/Size/Prize…

Type A testing at Hevesy Lab, examples

A compromise between lead shield weight and size of box

One size does not fit all !

The IAEA rules will be updated - A1/A2

27 EU P Prismap European Medical Radionuclides Programme

We need time (years) and flexibility in implementation.

Avoid type B containers for At-211, Ac-225….

Table 1. Generic A1/A2 values for unspecified radionuclides

Radionuclides	General transport		Exempted levels	
	A1 [TBq]	A2 [TBq]	Concentration [Bq/g]	Activity limit [Bq]
βγ-emitter	0.1	0.02	10	10 000
α-emitter	0.2	0.000 09	0.1	1 000
neutron emitter	0.001	0.000 09	0.1	1 000

A1 limit: Special form :

in general not applicable for radiopharmaceuticals in solution

A2 limit (is lower than A1):

applies to liquids on type A containers

The future A2 values can change or limit clinical supply of some alfa emitters for TAT

WP9 could not move mountains…

- The radioactive transports are heavily regulated
- EU (DGD Energy, ERVI, …) is working in same directions, but slowly.
- Industry is working in same directions… but has benefit of scale.
- Both IAEA and national authorities are collecting denied/delayed boarding.

”Research” and ”Innovative radionuclides” are not generally accepted arguments for changes to the safety codes.

Internal adjustements in PRISMAP+ can lower transport needs and cost. But ”same nation use” still not possible.

Closer integration of ”Production” and ”Chemistry” and ”Translational Use”

No TRANSPORT and LOGISTICS WP in PRISMAP+
But the information will be carried over.

Transportation is still **NOT** trivial

Thank you for your attention