Workshop on **S**ignatures of **M**an-Made **I**sotope **P**roduction Remote 2

Dr. Paul R.J. Saey | 25-27 May 2021 | Worldwide

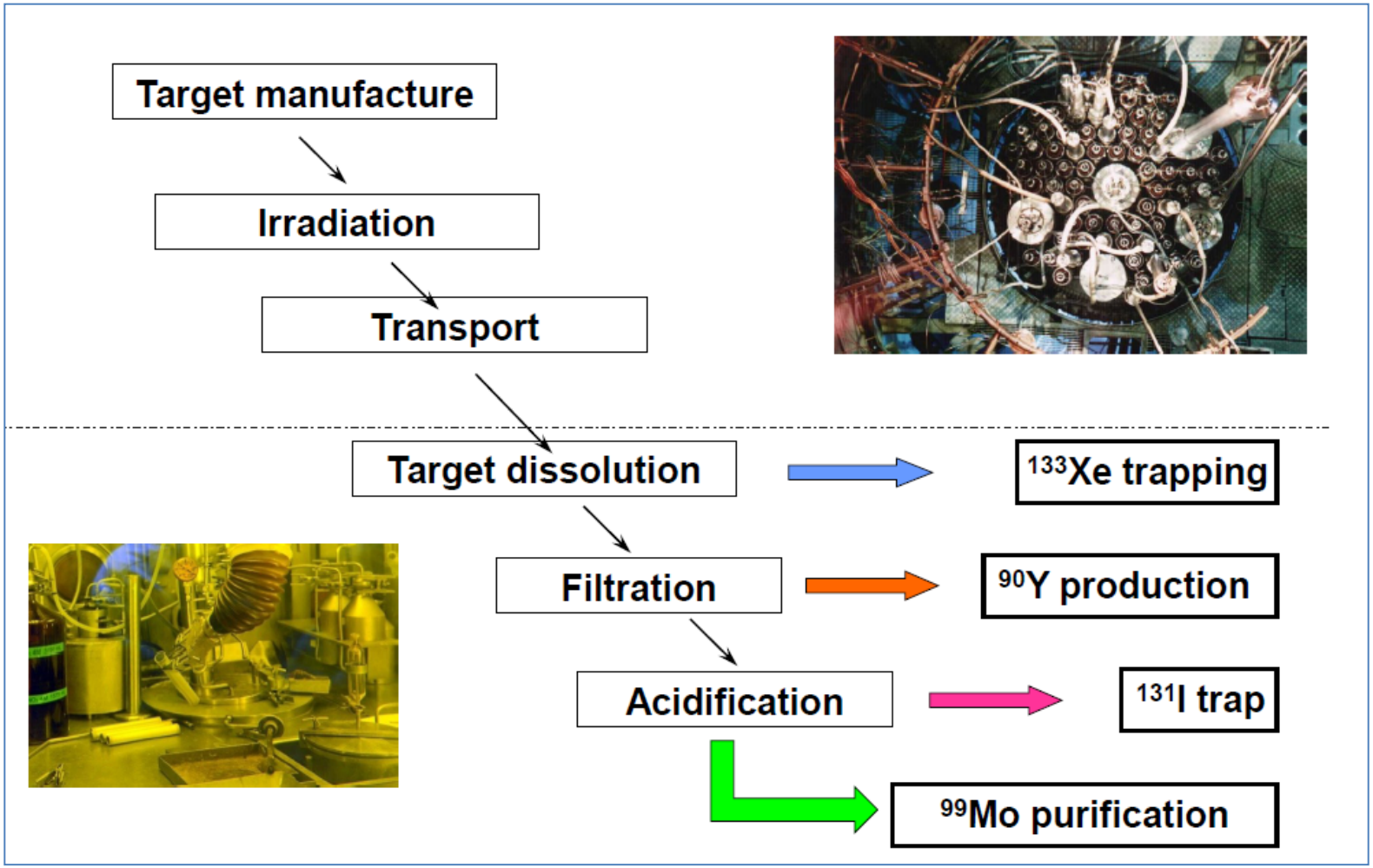
AGENDA

- Introduction
- Producers vs. monitoring community
- WOSMIP is born
- 2009 - 2021

Introduction

- Medical and industrial isotopes are fundamental tools used in science, medicine and industry
- Principal use in diagnosis (~30 million procedures per year) and therapy (~3 million treatments per year)
- ^{99m}Tc, daughter of ^{99}Mo, is by far the most heavily utilized
- Broad applications:
  - Function of heart, liver, thyroid, blood flow
  - Prostate, breast and bone tumour detection
- Main production of ^{99}Mo is reactor based, i.e. fission of ^{235}U
- In this process, fission gases like xenon and krypton are released into the atmosphere

A common technique for ^{99}Mo production



Some physics… the root of “The Problem”

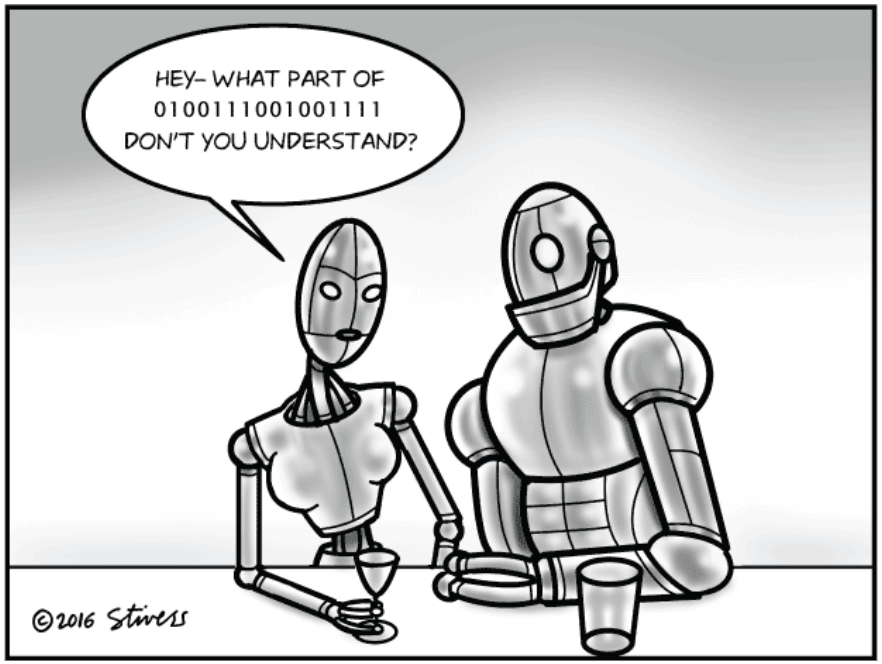
- During fission of ^{235}U in a nuclear reactor, thermal (slow) neutrons are used, whereas during a nuclear explosion the fission is induced by fast neutrons

- There is little time for complex activation build-up in a nuclear explosion (**microseconds**) - there is sufficient time for production of many activation products during fission based isotope production (**days**) or in a nuclear power reactor (**several months**)

- These differences produce different radionuclide abundances

⇨ Therefore that isotopic ratios of these fission products can be used for source identification, but **a good and detailed understanding of the processes is needed**…

Bringing two communities together



We think in solutions, not in problems 😉

- Bring two communities (isotope production and the monitoring communities) together to better understand each other concerns;
- Find solutions to try to solve the concerns by:
  - Discussing the scientific issues
  - Confidence building measures
  - Developing solutions
- Discuss ways to mitigate the effects of isotope production on the monitoring community without disrupting the supply of isotopes
- to better understand the isotopic and chemical signatures created through isotope production mechanisms.

WOSMIP I July 2009, Strassoldo, Italy

July 1-3, 2009, Strassoldo, Italy: more than 70 professionals from the medical isotope production and the international monitoring communities from 16 countries came together! The workshop was hosted and organized by PNNL.

Impacts of medical isotope production on the international monitoring system were discussed:

- Medical and industrial isotopes are fundamental tools
- Large amounts of isotopes are produced every year at locations across the globe using a variety of means
- They release detectable amounts of radioisotopes into the atmosphere

Conclusion of WOSMIP I

- WOSMIP presented the first opportunity for the communities to come together to discuss the impacts their missions have on each other and provided a forum to foster communication and build a stronger collaboration and information sharing between scientists

- It resulted in a better understanding of the isotopic and chemical signatures created through isotope production mechanisms and the trace quantities that are detected in the environment

- The workshop was very successful with a number of positive outcomes!


Contents lists available at SciVerse ScienceDirect

Journal of Environmental Radioactivity

journal homepage: www.elsevier.com/locate/jenvrad

The Workshop on Signatures of Medical and Industrial Isotope Production – WOSMIP; Strassoldo, Italy, 1–3 July 2009

K.M. Matthews [a,*], T.W. Bowyer [b], P.R.J. Saey [c], R.F. Payne [b]

WOSMIP II June 2011, Strassoldo, Italy

- As an increasing volume of monitoring data from around the world became available, specific measurement campaigns took place in close cooperation with several medical isotope producers (Belgium, South-Africa, Indonesia, etc.)

- There was no doubt anymore on the influence of the emissions on the IMS and the seriousness of the issue was very clear

- The Fukushima nuclear event overshadowed the issue somewhat by introducing another set of source-term variables.

First **Wozzie** Awards

- Benoît Deconninck, IRE, Belgium
- A.A. Sammy, Expert, Germany

WOSMIP III June 2012, Strassoldo, Italy

Cooperation between the medical isotope production community and the monitoring community increased:

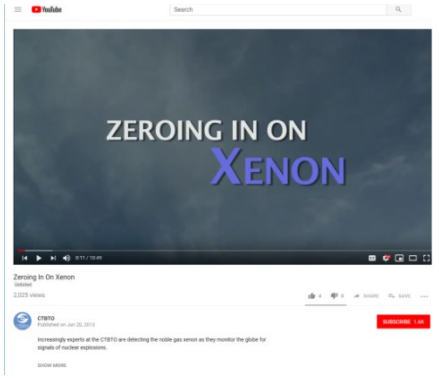
- Information exchange of some producers with the monitoring community
- First concrete experiments were conducted by the Belgian Nuclear Research entre SCK-CEN at IRE

Wozzie:

Richard Decaire,
Nordion,
Canada

WOSMIP IV November, 2013 Vienna, Austria

The workshop brought together 82 experts from 25 countries



SCK wins European Star Award for work on Emission Reduction presentation at S&T 2013

Five Pledge Signatories with the CTBTO Executive Secretary

WOSMIP V May 2015, Brussels, Belgium

- 14 current or prospective medical isotope producers attended and shared detailed information on current and future MIP

- One of the key findings: It was shown that a $5x10^9$ Bq/day release limit released from MIP did not significantly interfere with monitoring, when investigated using ATM

Wozzie:

Emmy Hoffman, ANSTO, Australia

WOSMIP VI November 2016
San Carlos de Bariloche, Argentina

- 81 participants from 27 countries
- Main discussions focused on:
  - alternative xenon sources (nuclear power plants, research reactors, production, handling, and use of medical isotopes, industrial isotopes, etc.)
  - production processes and facilities
  - exchange of stack release data
  - R&D efforts toward radioxenon emission reduction

Wozzie:

C. Gueibe & J. Camps, SCK, Belgium

WOSMIP VII December 2018 Sydney, Australia

- 91 participants from 19 countries
- Discussions focused on:
  - background sources of man-made isotopes
  - research to reduce the radioxenon impact on the IMS
  - current and planned ^{99}Mo production activities
  - global radioxenon stack measurements

Wozzie:

Anders Ringbom, FOI, Sweden

WOSMIP Remote 1

Between April – June 2020

WOSMIP VIII in Stockholm, Sweden, had to be canceled, so we went remote!

- 22 online presentations
- From 13 different institutes or companies
- 2 virtual tours

Thank you for your attention!

Welcome to the **Wo**rkshop on **S**ignatures of **M**an-Made **I**sotope **P**roduction Remote 2