Revised dose calculations for iodide I-123, I-124, I-125 and I-131 for diagnostic procedures in nuclear medicine

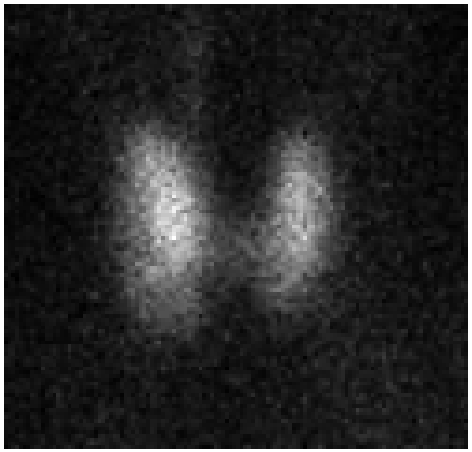
MARTIN ANDERSSON[1], DAVID MINARIK[1], LENNART JOHANSSON[2], SÖREN MATTSSON[1], SIGRID LEIDE-SVEGBORN[1]

[1]MEDICAL RADIATION PHYSICS, DEPARTMENT OF CLINICAL SCIENCES MALMÖ, LUND UNIVERSITY

[2] DEPARTMENT OF RADIATION SCIENCE, UMEÅ UNIVERSITY, SWEDEN

Introduction

Iodide is used to diagnose thyroid diseases such as:



- Thyroid cancer
- Hypothyroidism
- Hyperthyroidism

This is an ongoing study within the ICRP task group 36

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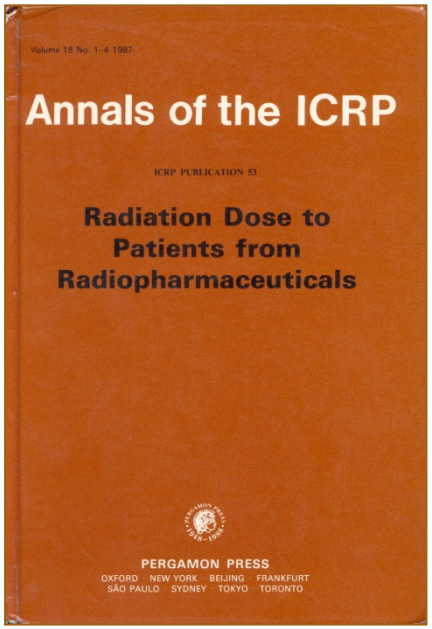
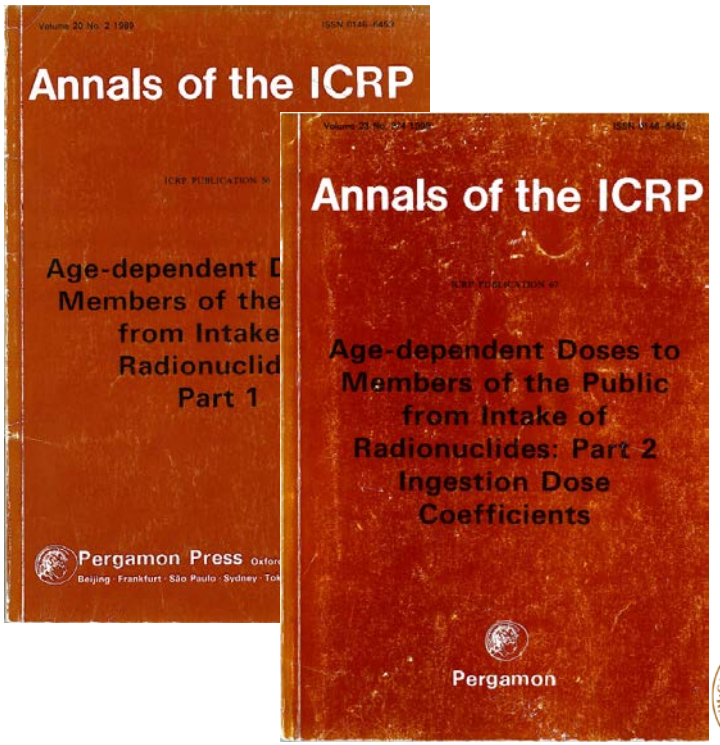
Two different iodide models

ICRP publ. 56 and 63 for occupational workers



ICRP publ. 53 to patients from radiopharmaceuticals



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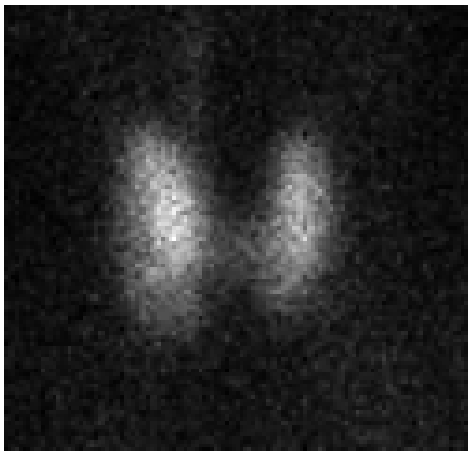
Aim



Recalculate the doses for iodide

that includes:

- Leggett's iodide biokinetic model
- The ICRP standardized biokinetic models
- ICRP/ICRU adult computational reference voxel phantoms
- The ICRP publ. 103 Tissue weighting factors

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Biokinetic model

- Leggett's iodide biokinetic model (2010)

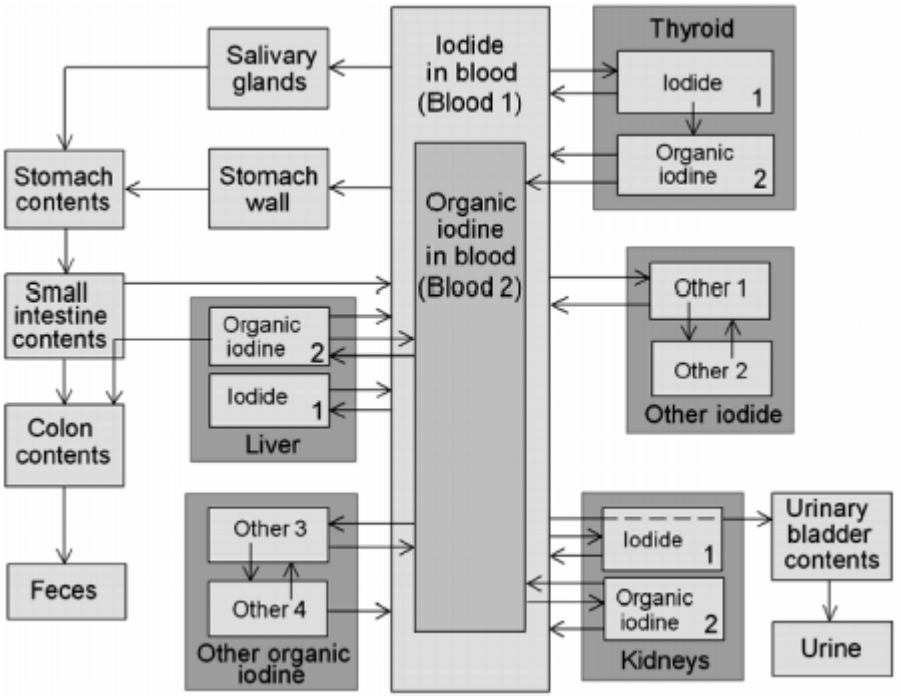

Image: Leggett R W 2010 Radiat. Res. 174 496–516

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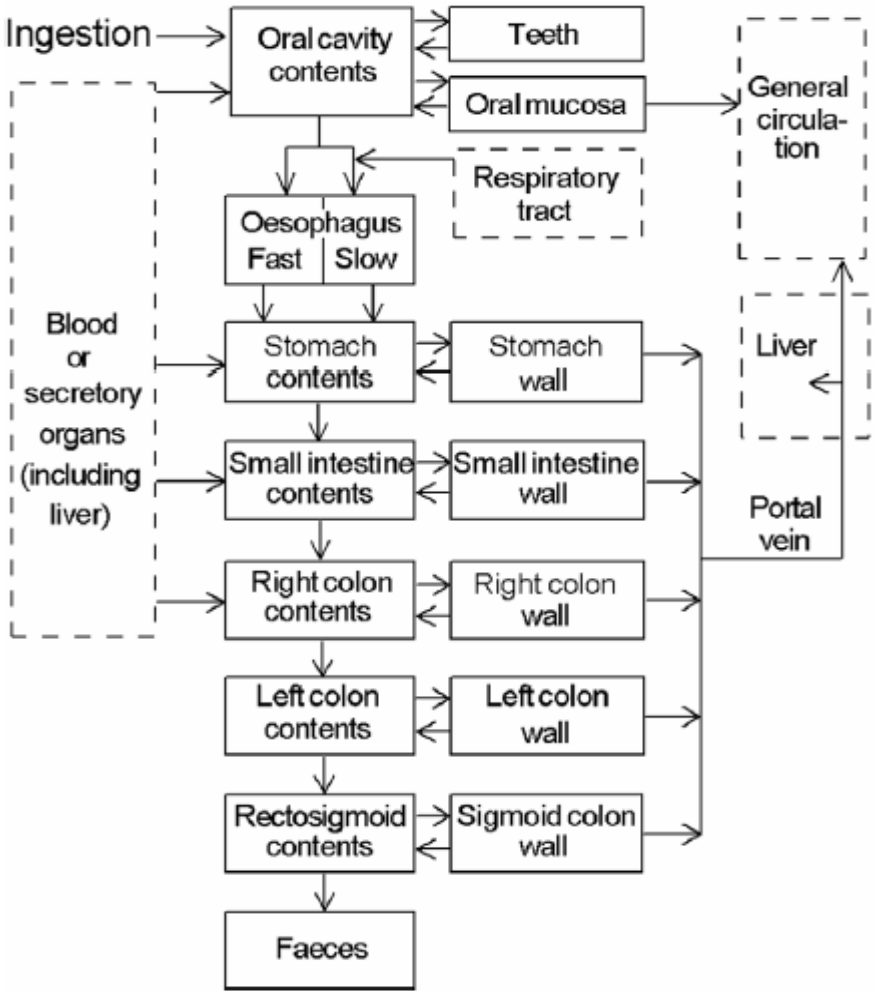
Standardized biokinetic model

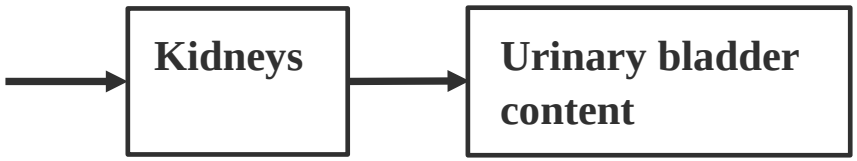
HAT-model (ICRP 100)



Kidney-bladder model (ICRP 30)

Mean transit time through the kidneys of 5 min

Urinary voiding time of 3.5 h



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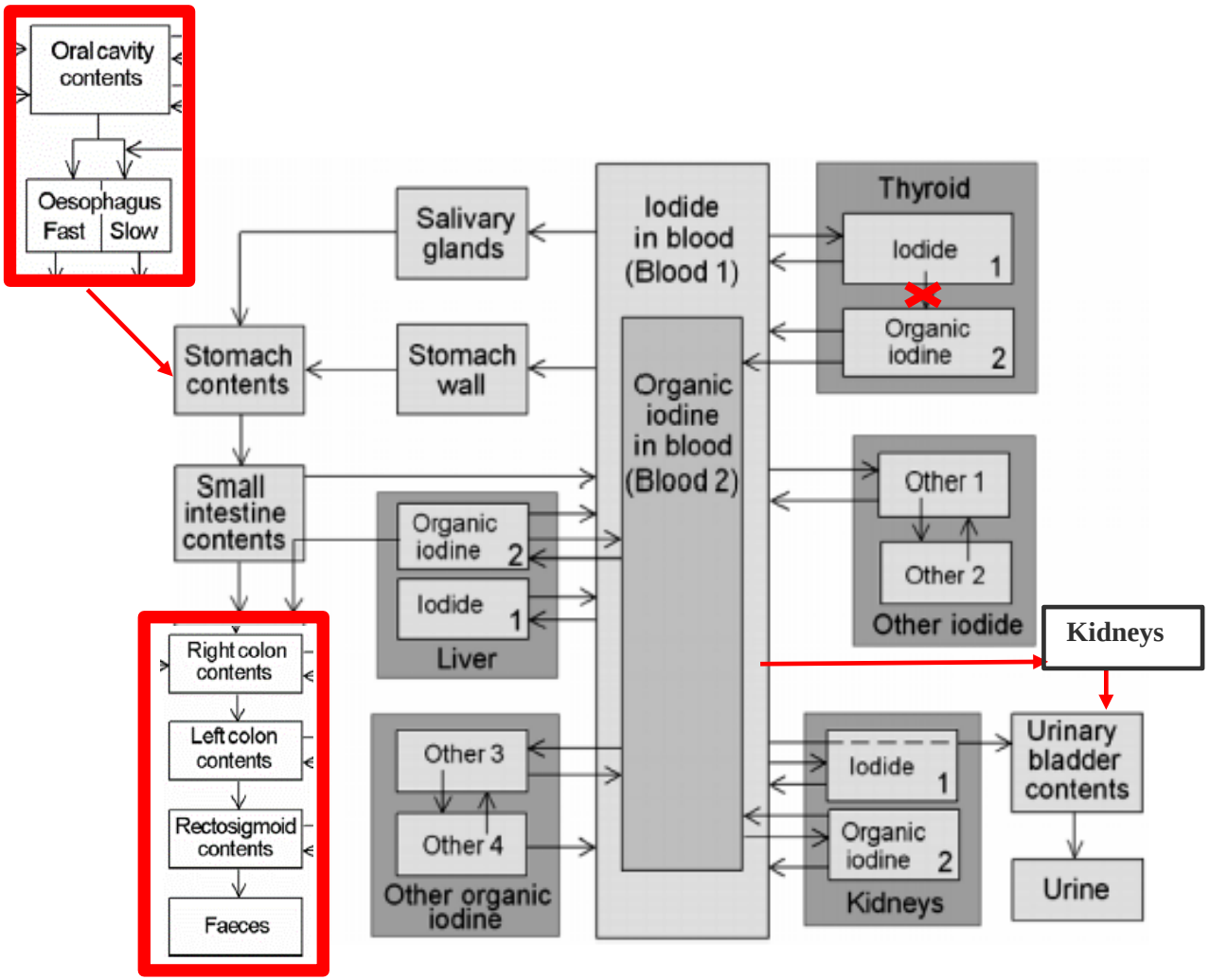
Biokinetic model for iodide



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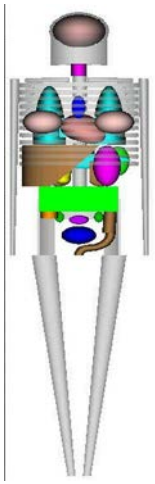
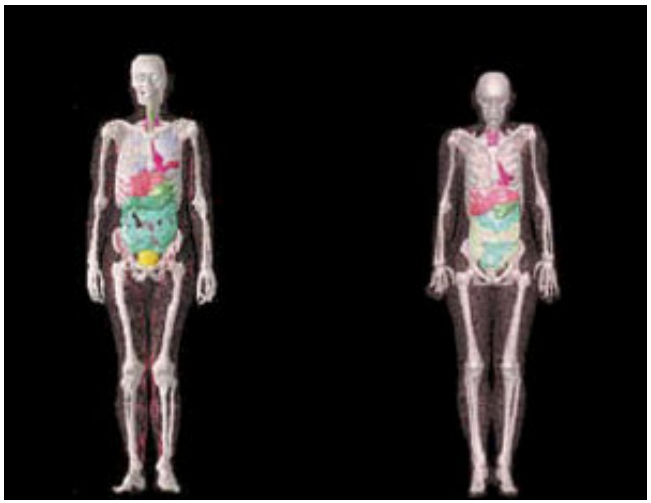
Voxelized reference phantom

Dose estimations using computational reference phantoms



Cristy & Eckerman (1987)
Male phantom



ICRP adult reference male and female computational phantoms (2009)

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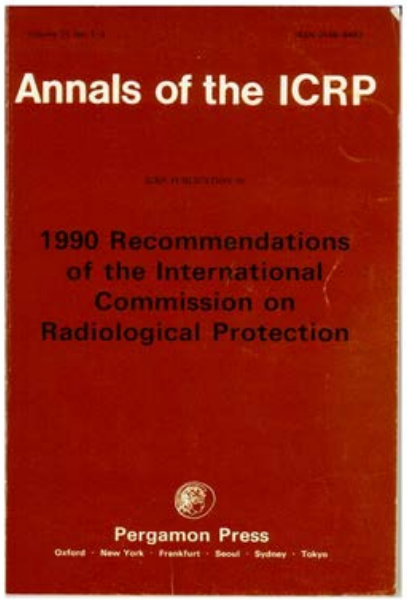
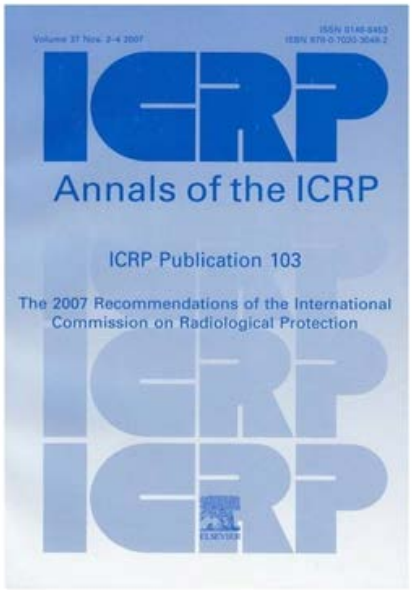
Updated w_T for stochastic effects





ICRP publication 60 (1991) ICRP publication 103 (2007)

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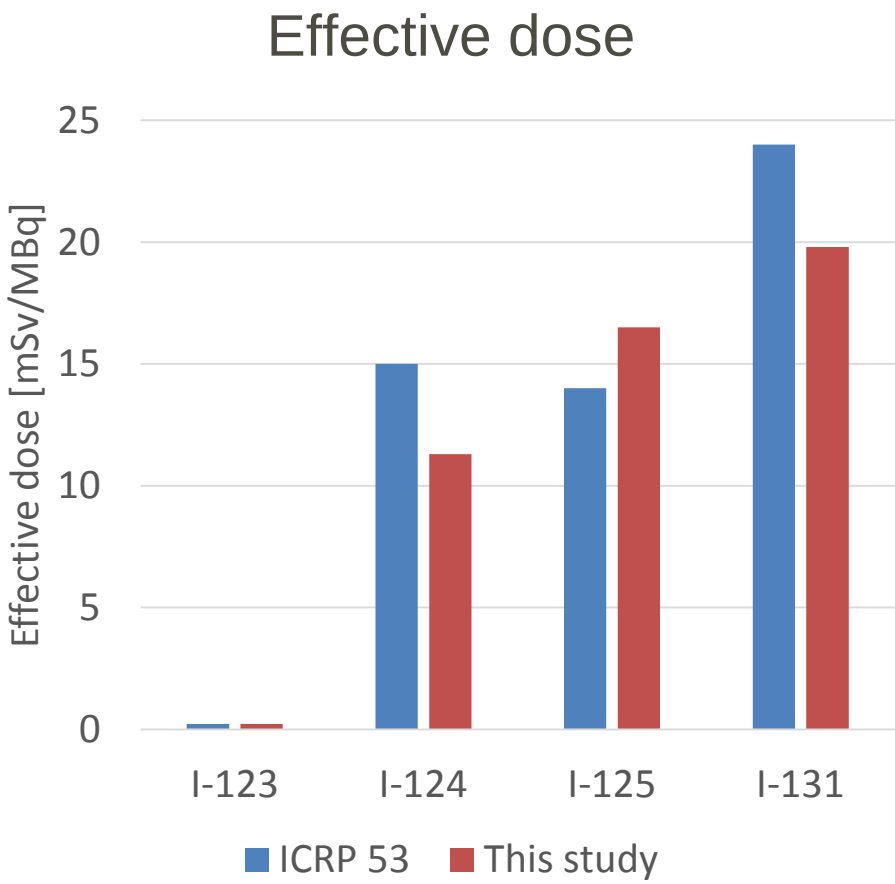
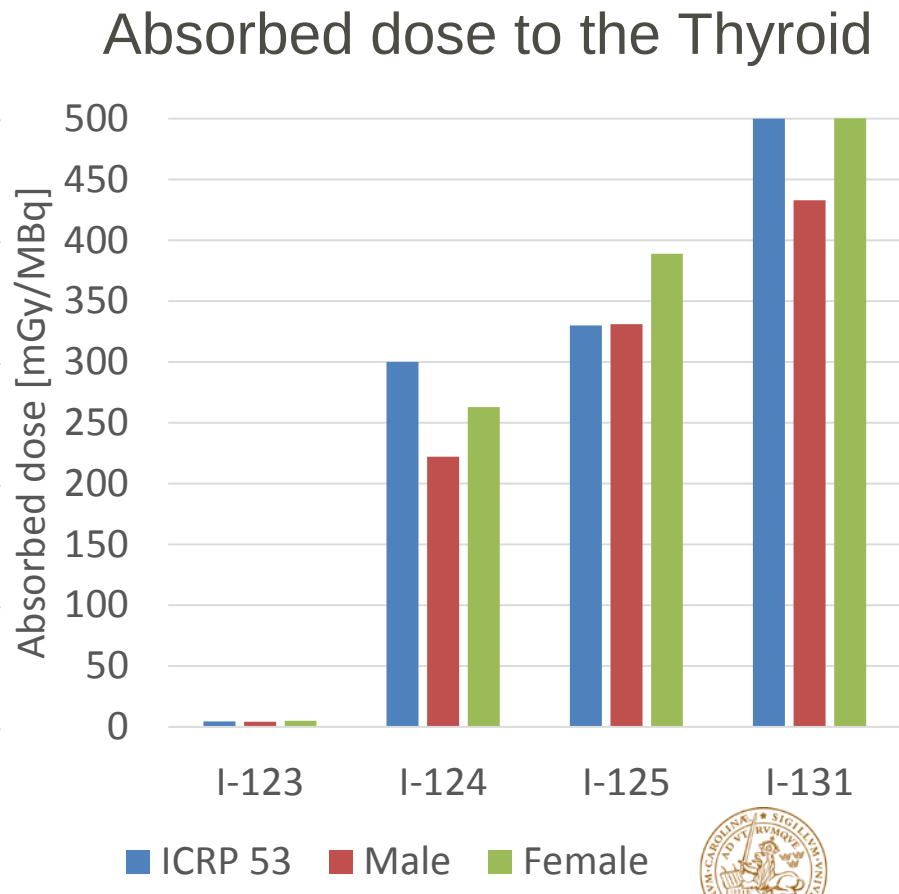
Results - normal uptake





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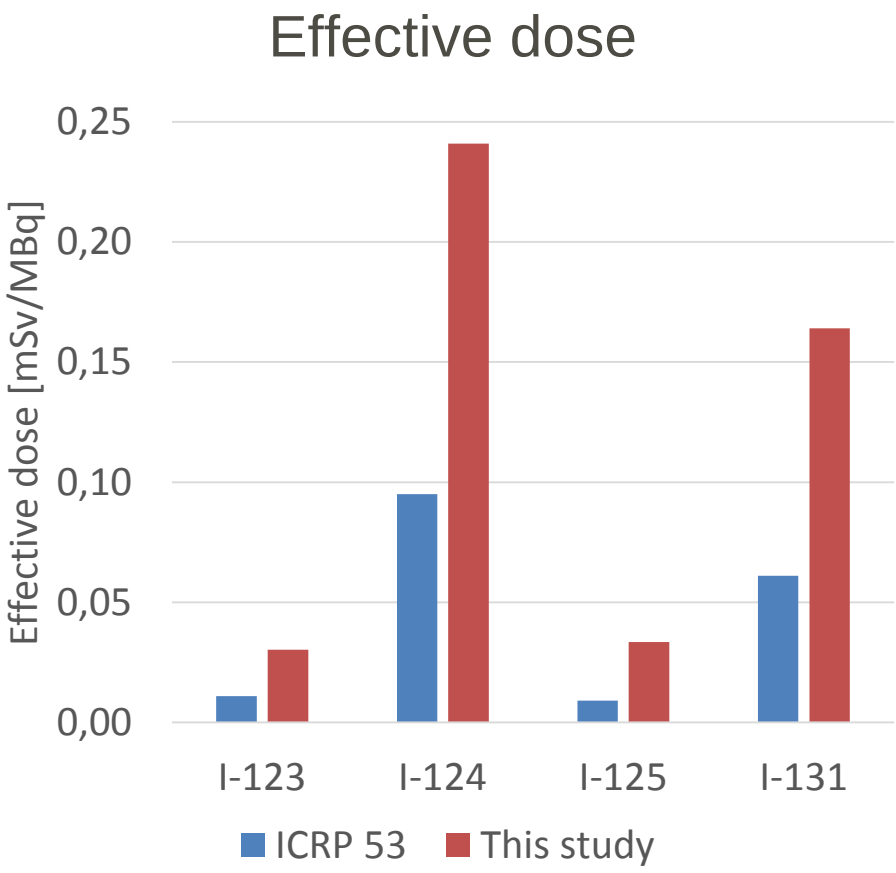
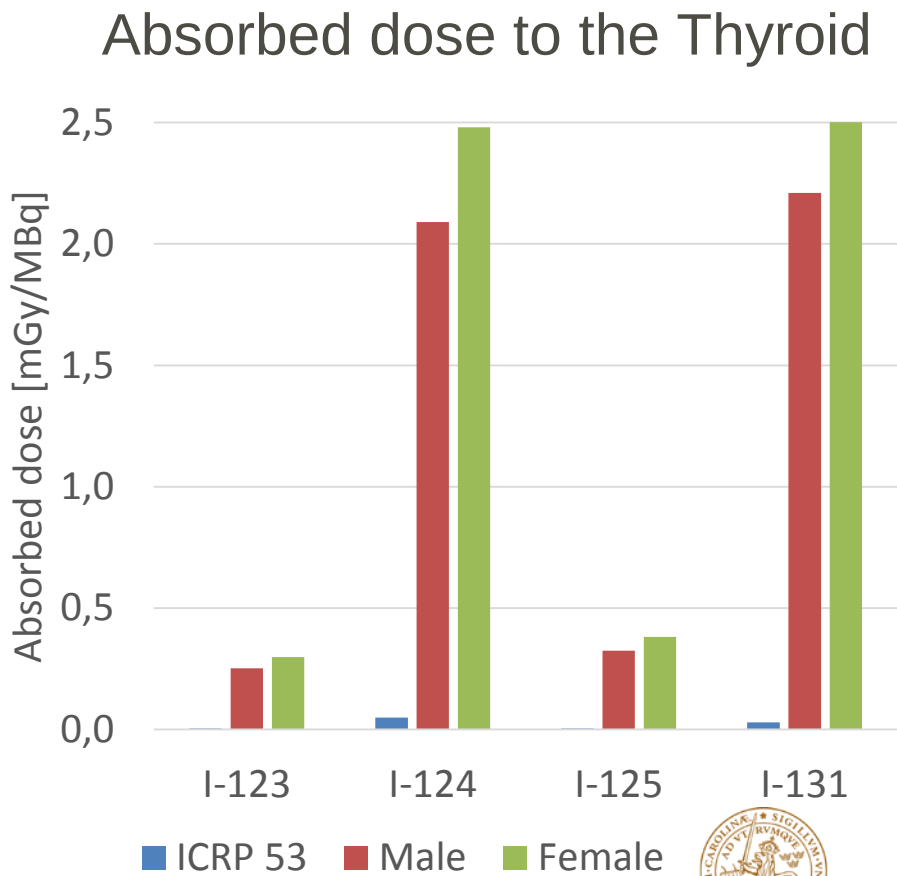
Results - blocked uptake





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Conclusion

- The new calculations mainly influences the dose estimates for blocked thyroid
  - mainly due to the changed assumption concerning the uptake of inorganic iodine

Questions?

- More realistic estimation of the radiation-induced risk, which is of most importance when justifying the use of iodide in nuclear medicine examinations.

NUMEMA NUCLEAR MEDICINE IN MALMÖ
Strål säkerhets nyndigheten
wedish Radiation Safety Authority
LUND UNIVERSITY