



Comparison of Internal Dosimetry Estimation of ^{177}Lu -DOTA-Trastuzumab in Metastatic States (OLINDA vs IDAC)

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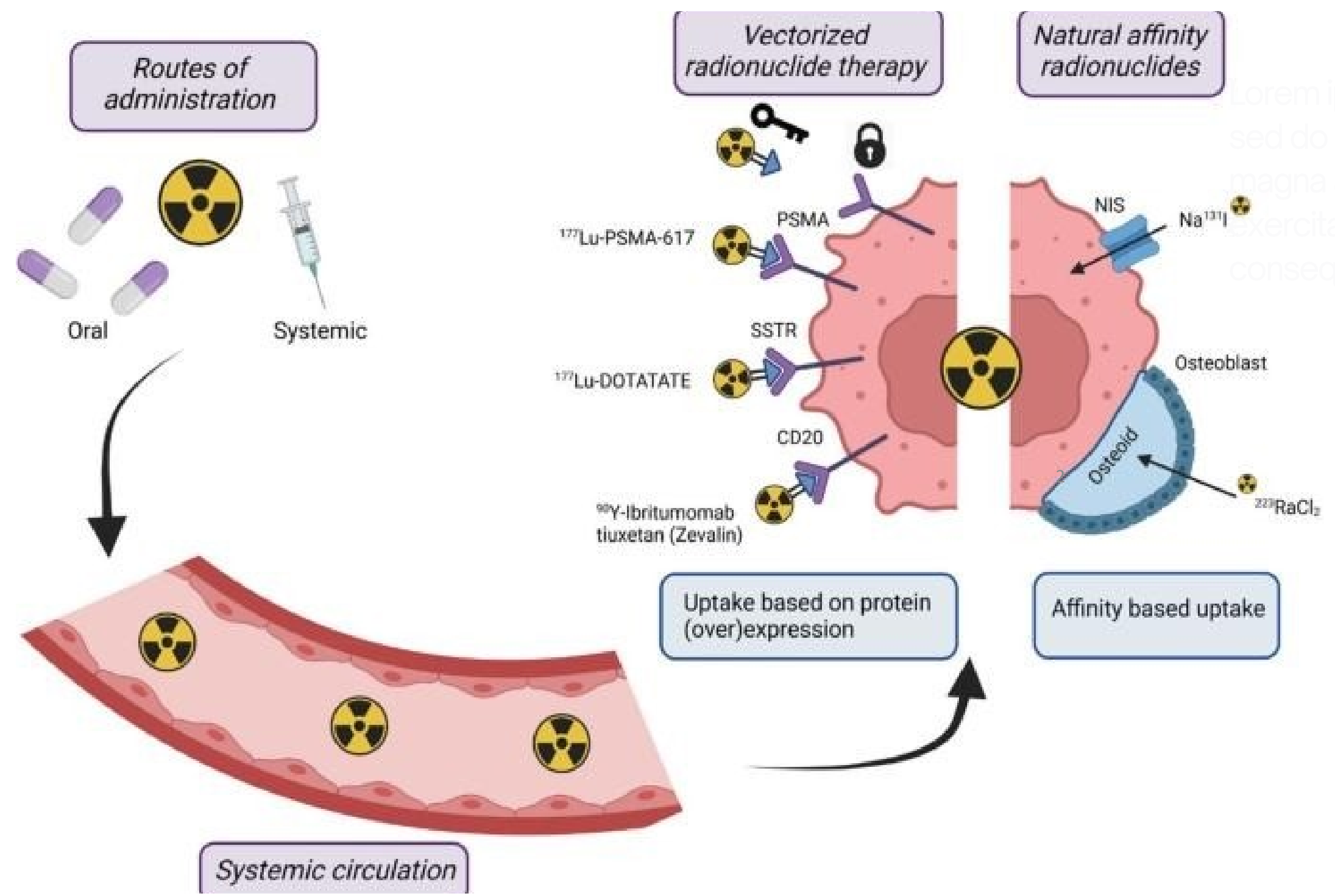
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Targeted Radionuclide Therapy

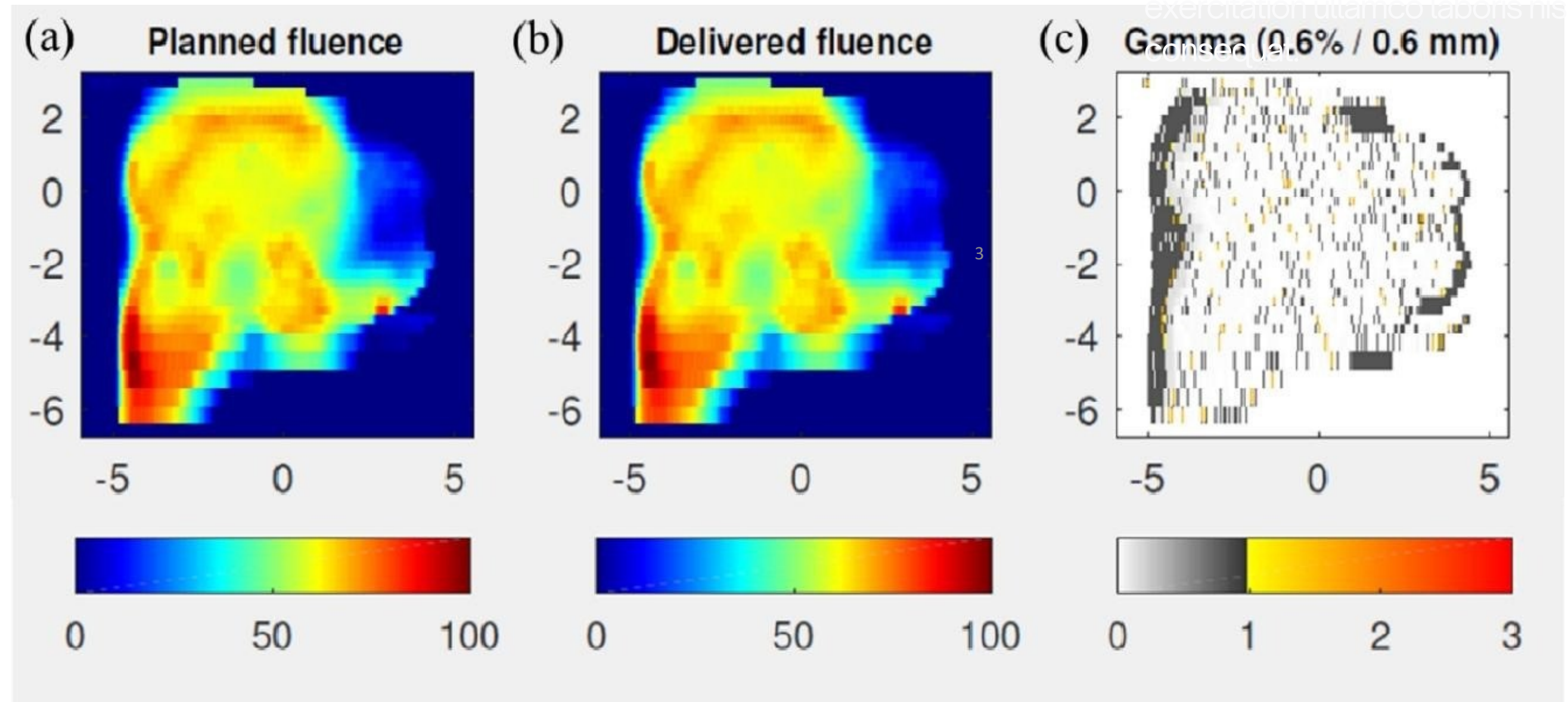


Targeted radionuclide therapy combines molecular targeting with radiation delivery. ^{177}Lu provides beta emission suitable for therapy and gamma emission for imaging. Trastuzumab selectively binds HER2-positive cancer cells.

Research Problem

Variability in Dosimetry Software

Different dosimetry software produce inconsistent absorbed dose values. This variability may affect treatment planning accuracy and patient safety.



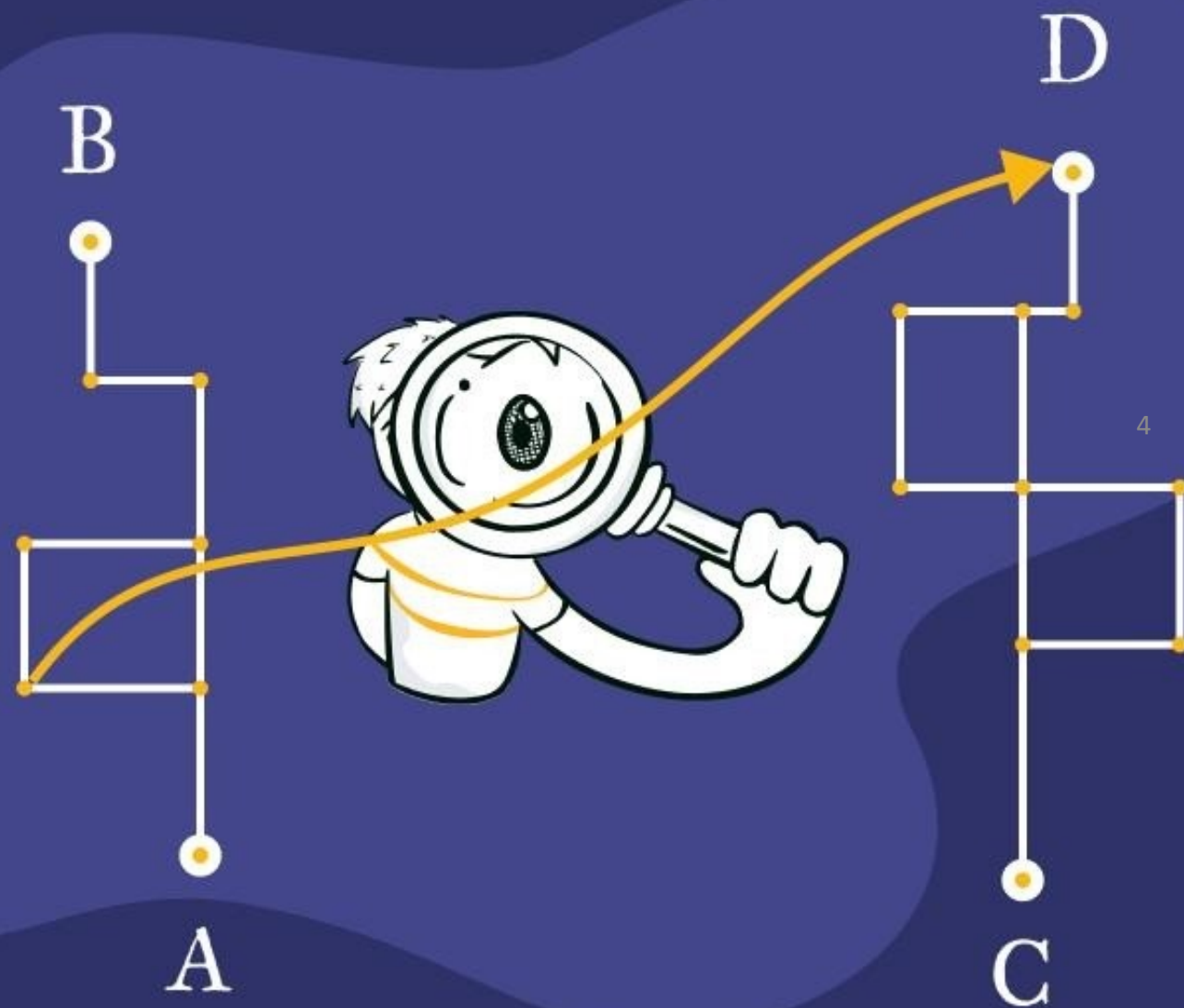
Aim of the Study

To compare internal dose calculations of ^{177}Lu -DOTA-Trastuzumab using:

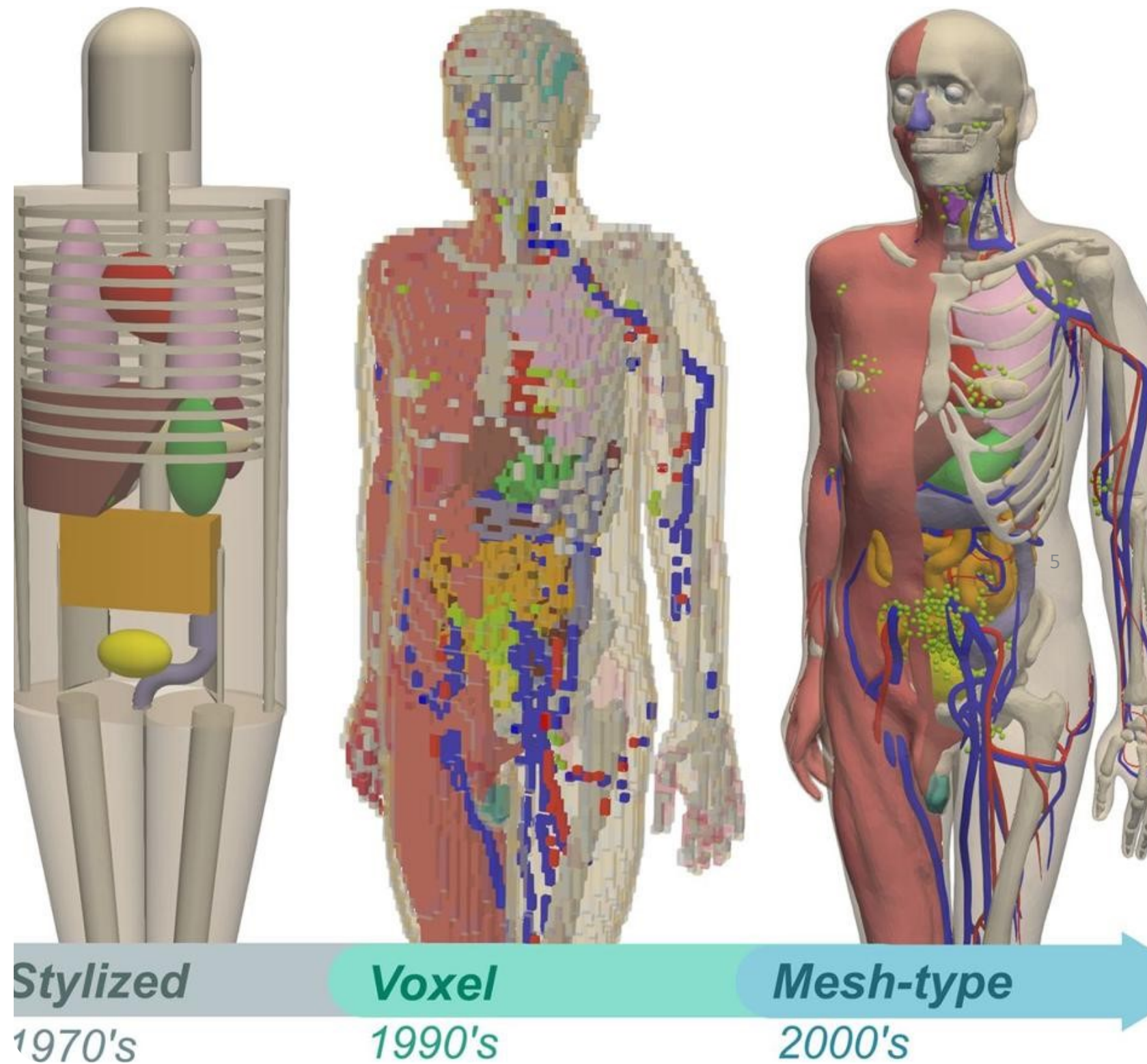
Trastuzumab using:

IDAC 2.1

OLINDA/EXM v2.1.1

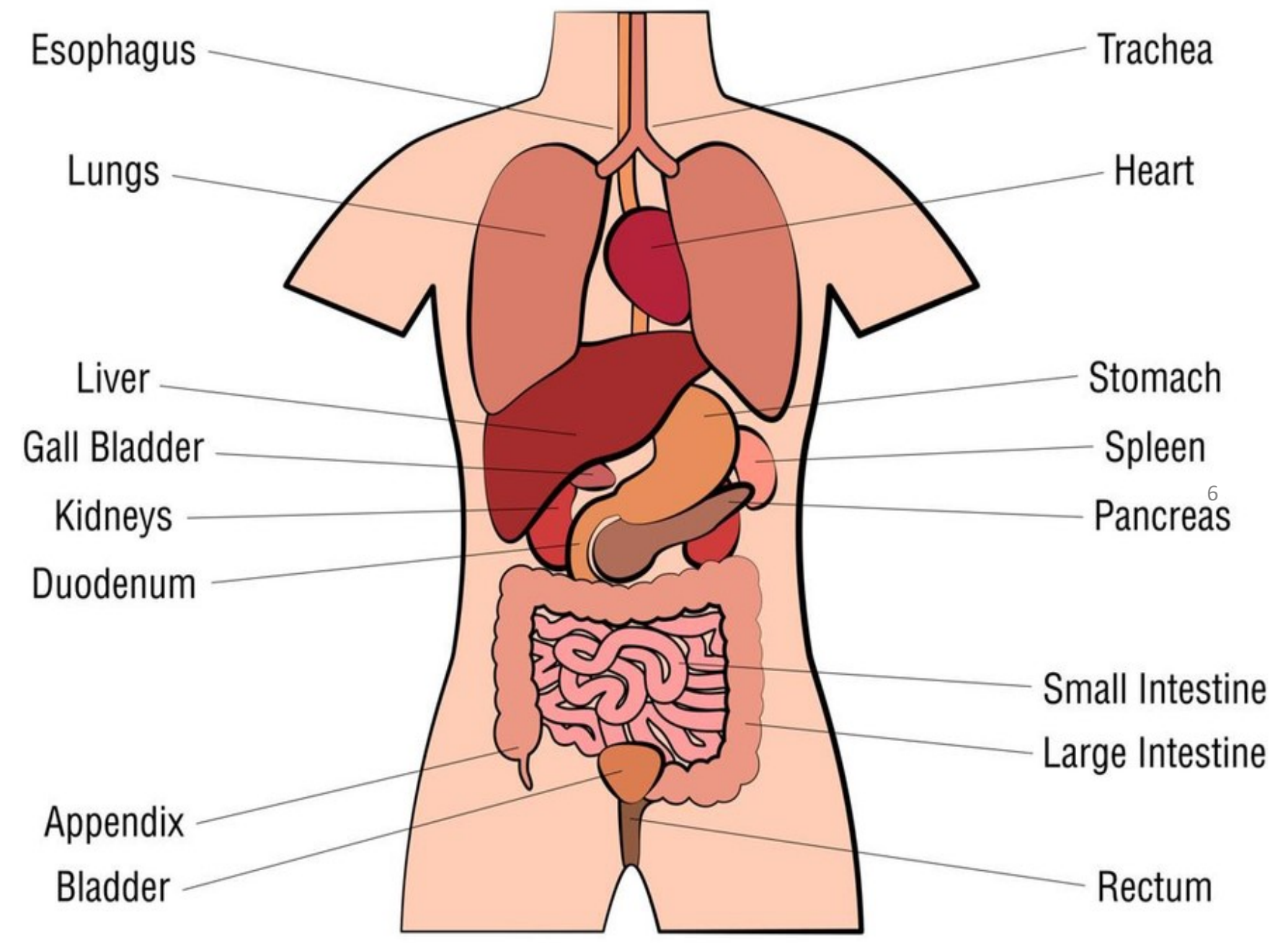


Study Design



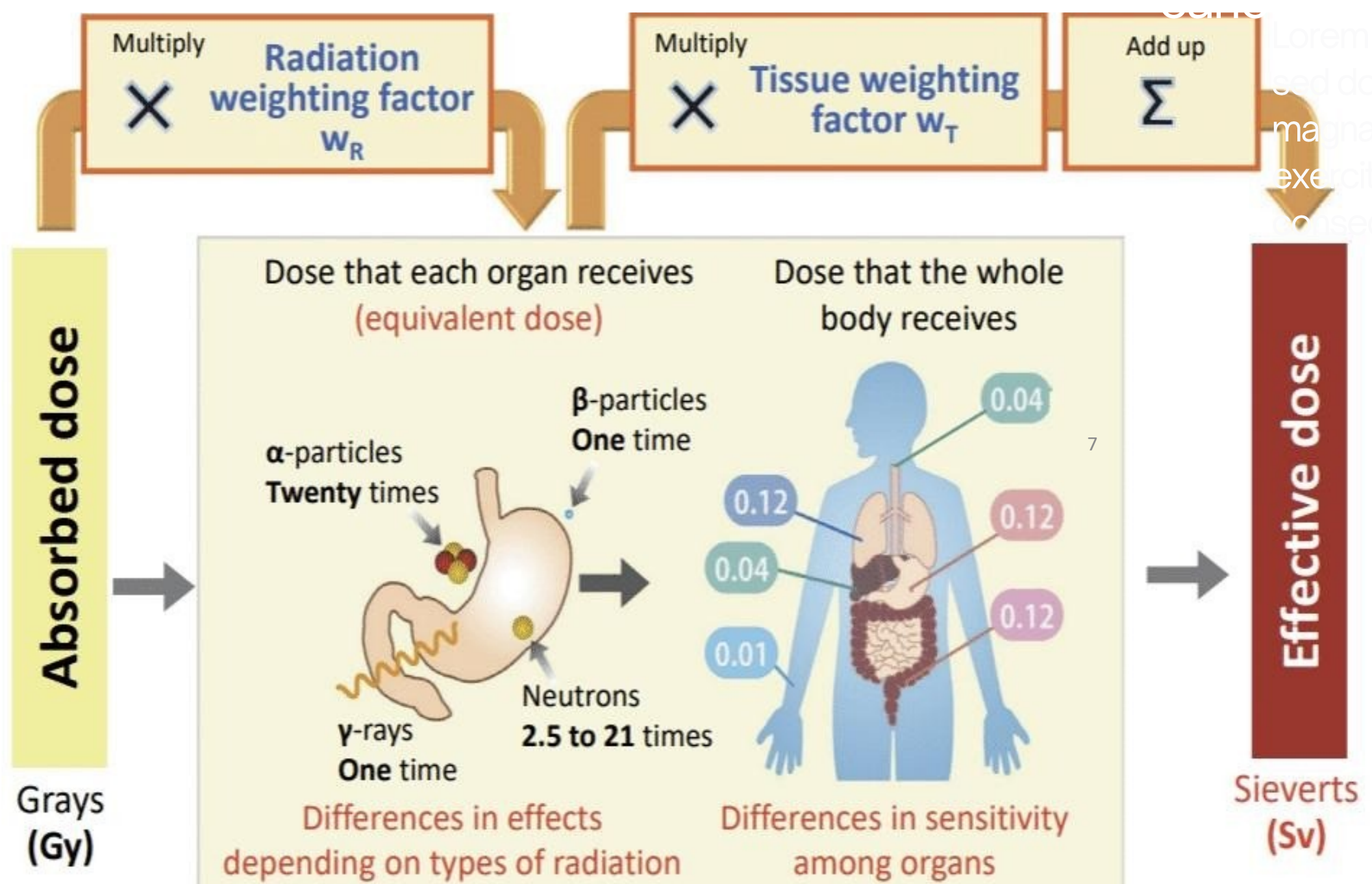
Previously published biokinetic data were utilized. Time-integrated activity coefficients were calculated. Dose estimation performed using both software systems.

Target Organs



Liver, kidneys, spleen, heart wall, red marrow, and tumor were analyzed. These organs represent critical and dose-limiting tissues.

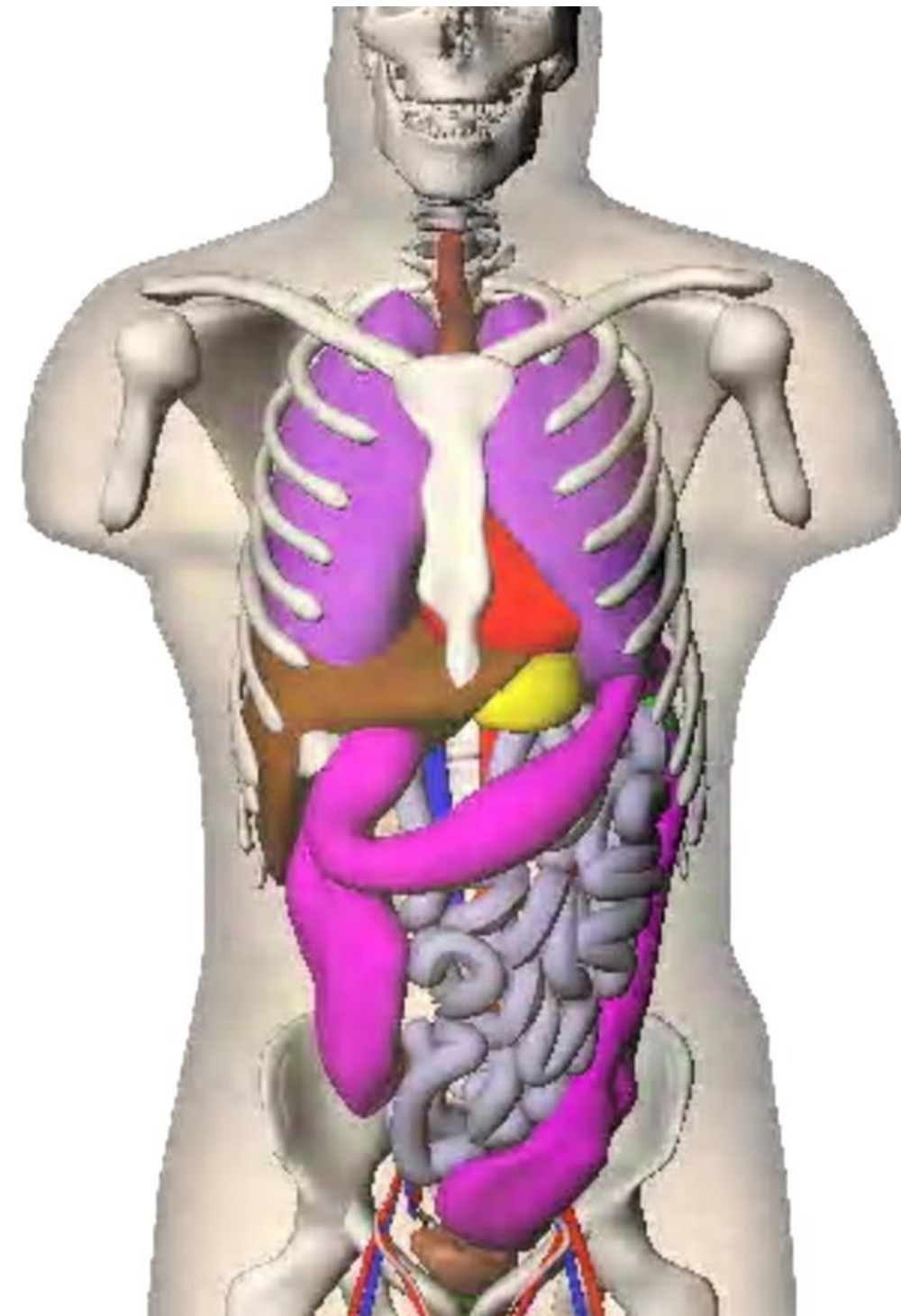
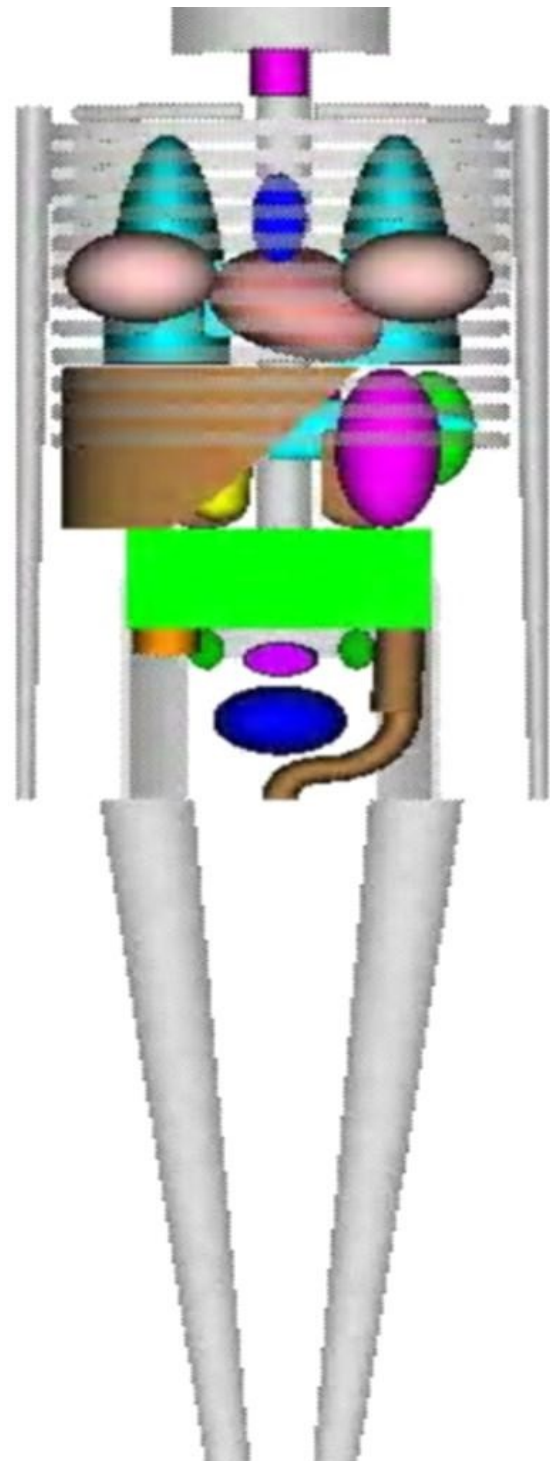
Absorbed Dose Calculation



Absorbed dose depends on:

- 1- Cumulated activity
- 2- S-values
- 3 -Anatomical phantoms

IDAC vs OLINDA



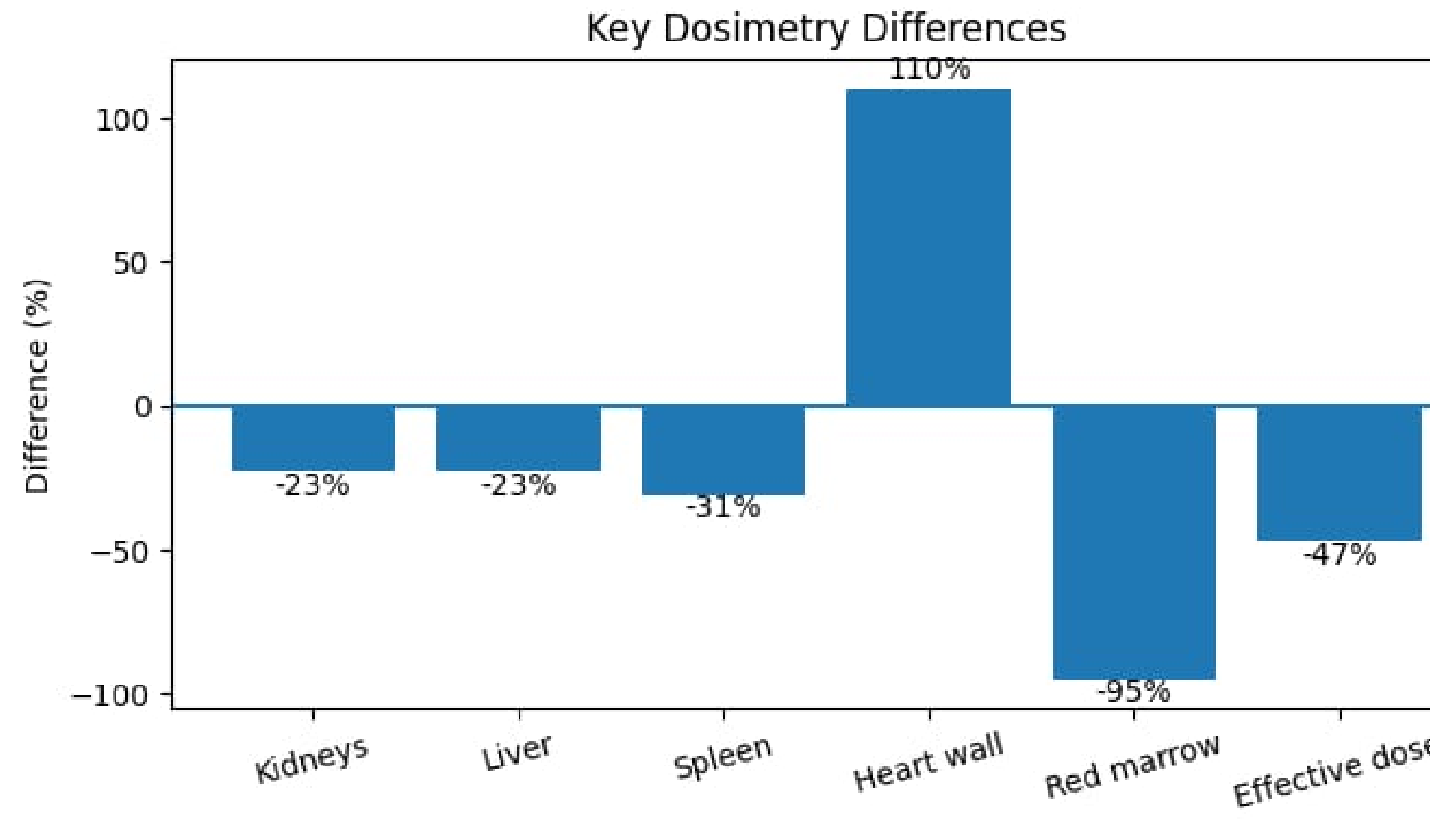
IDAC uses updated ICRP reference computational phantoms.

OLINDA depends on voxel-based. Differences in modeling lead to variations in dose estimation.

Comparative Dosimetry Results

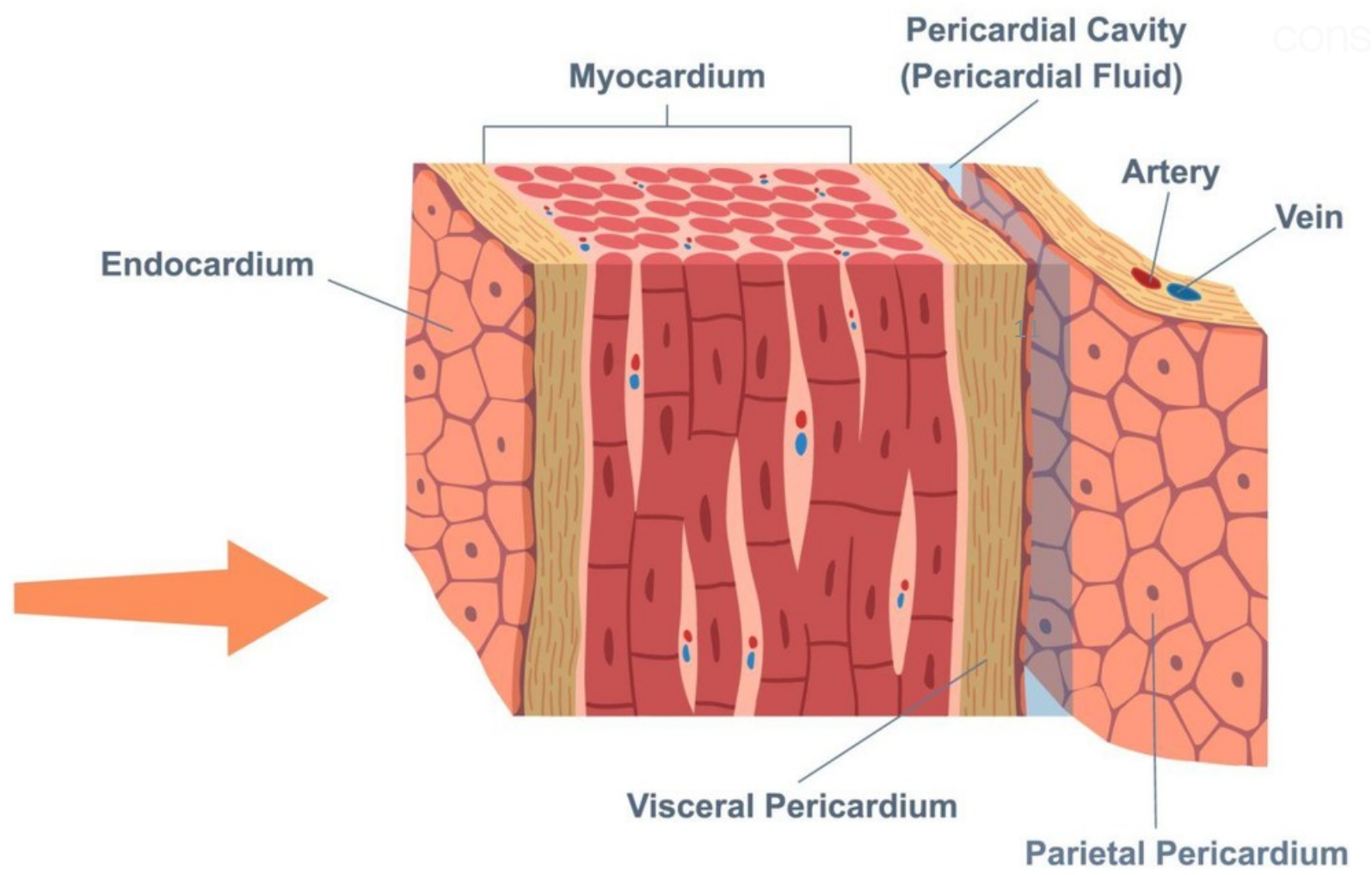
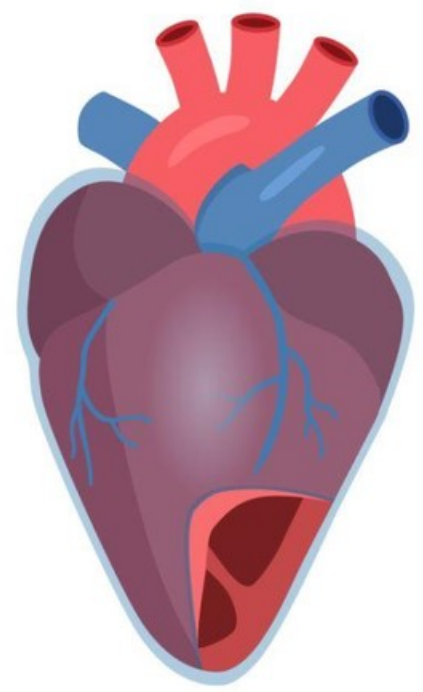
| Difference (%) | IDAC 2.1 | OLINDA EXM | Organ |
|----------------|-------------|-------------|----------------|
| -23% | 1.09 ± 0.28 | 1.42 ± 0.36 | Kidneys |
| -23% | 0.82 ± 0.57 | 1.07 ± 0.73 | Liver |
| -31% | 0.97 ± 0.32 | 1.41 ± 0.46 | Spleen |
| 110% | 3.09 ± 1.46 | 1.47 ± 0.60 | Heart wall |
| -95% | 0.008 | 0.15 ± 0.02 | Red marrow |
| -47% | 0.13 | 0.24 ± 0.04 | Effective dose |

- IDAC showed **20–30%** lower ↓ doses in kidneys, liver, and spleen.
- Heart wall dose was ~**110%** higher ↑ in IDAC.
- Red marrow showed the largest discrepancy (~**95%**).
- Effective dose in IDAC was ~**47%** lower ↓ than OLINDA.



Significant Variation

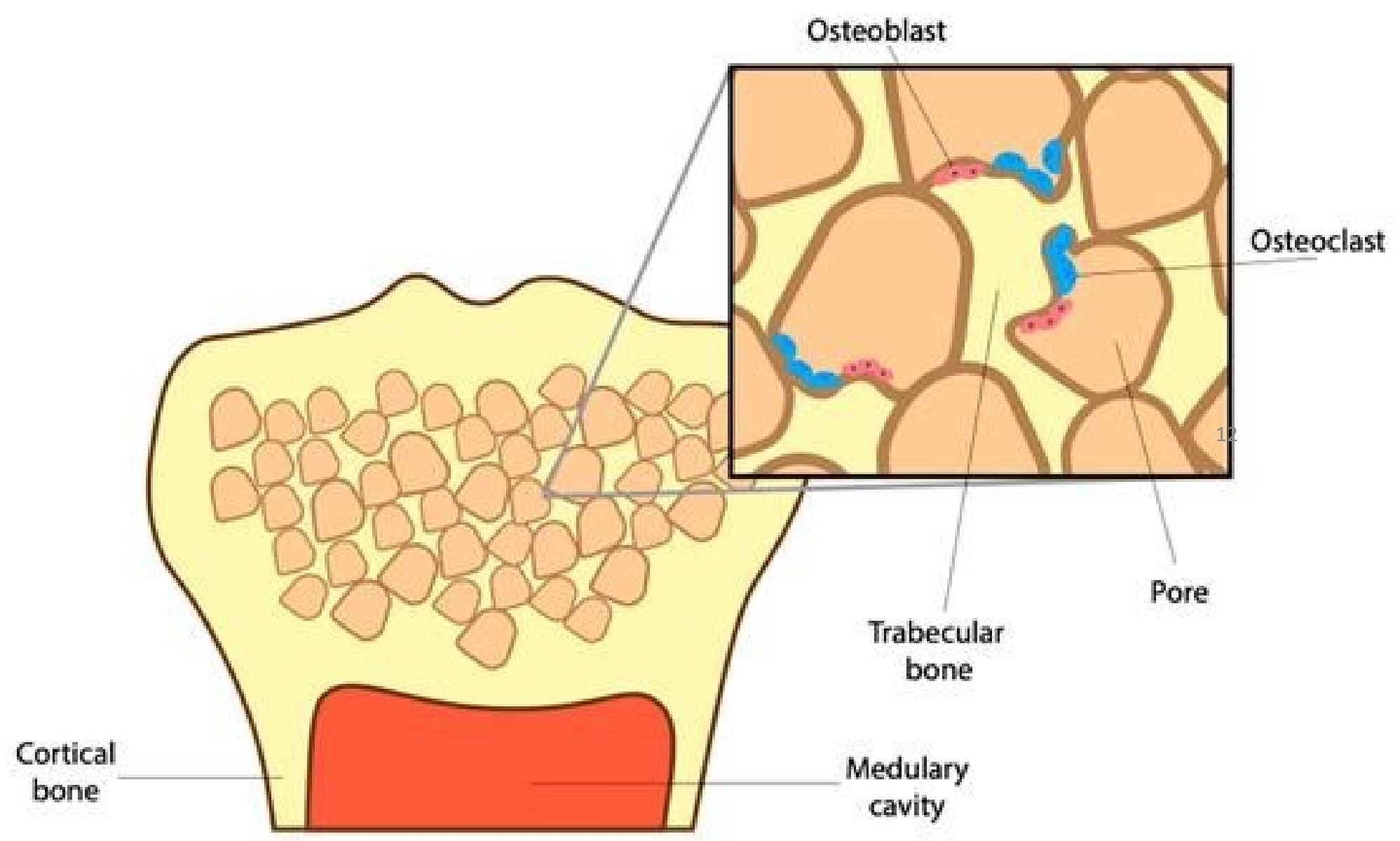
THE HEART WALL



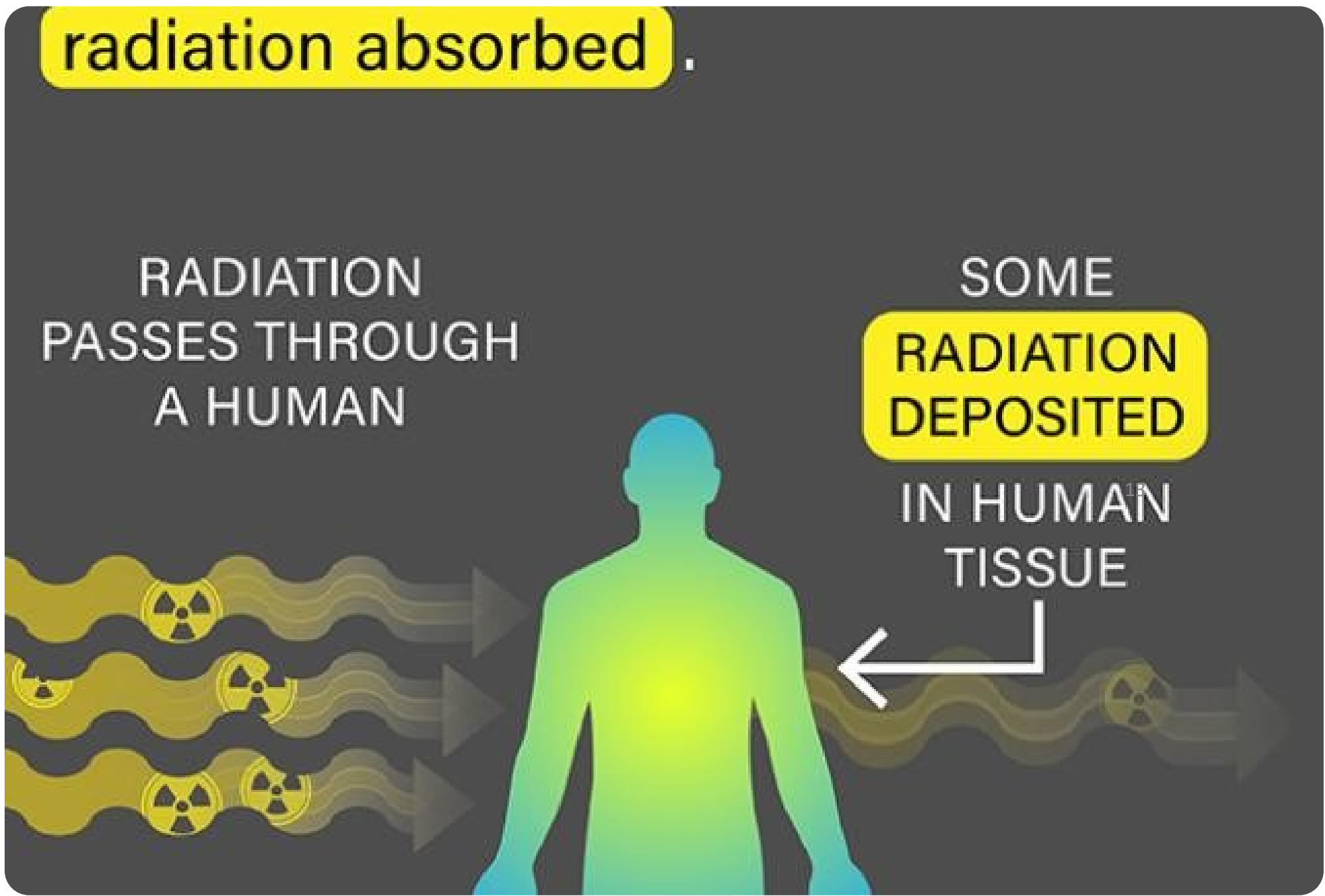
IDAC showed higher values (~110%). This is likely due to differences in activity distribution assumptions.

Major Discrepancy

A large difference (~95%) was observed for red marrow, mainly due to differences in skeletal and marrow modeling, including variations in anatomical structure and dose contribution assumptions between IDAC 2.1 and OLINDA EXM v2.1.1.



Overall Dose Assessment



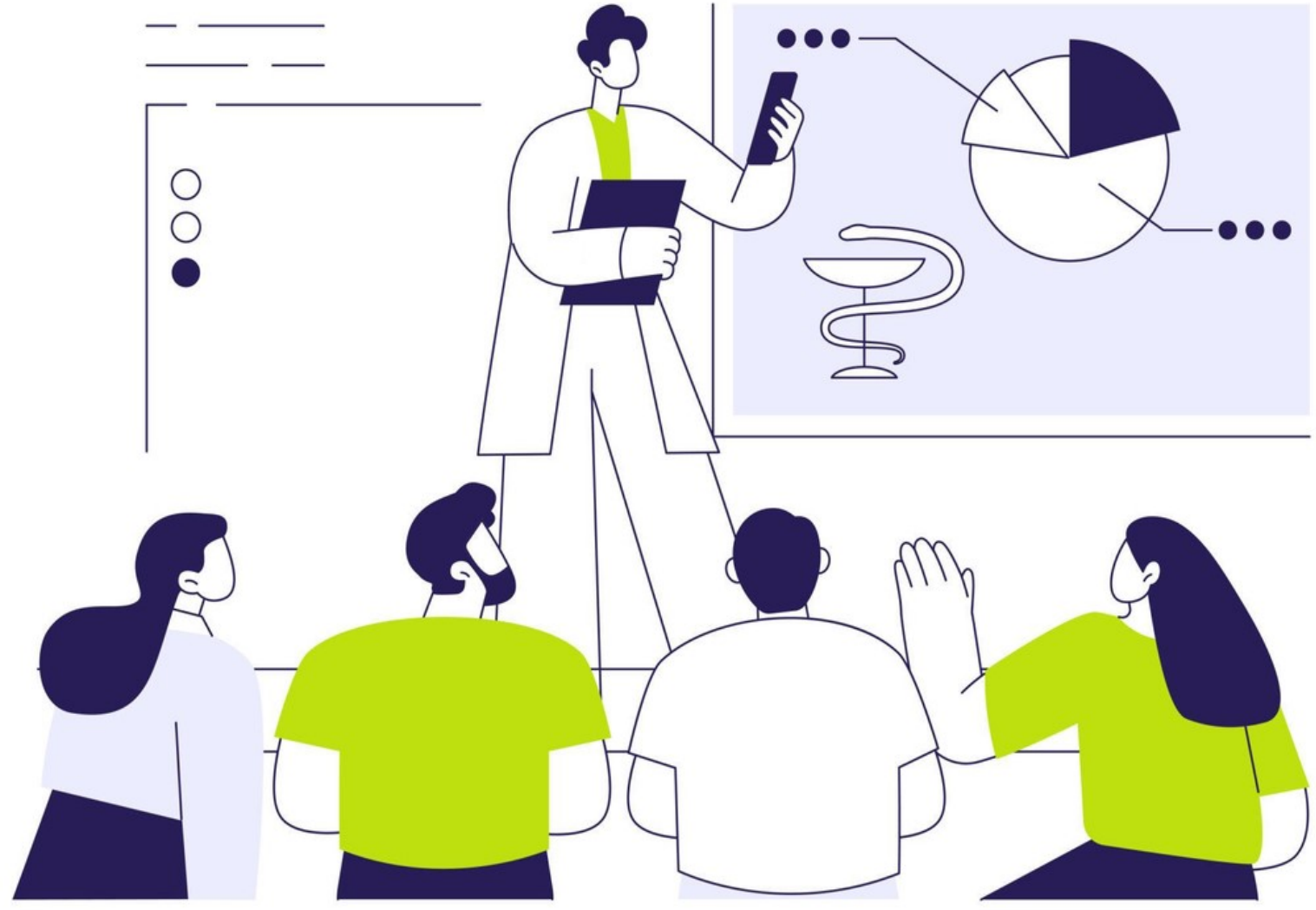
IDAC estimated a lower effective dose (~47%). This aligns with updated ICRP tissue weighting factors.

Interpretation of Results



Both software agree on critical organs. However, numerical differences arise from modeling assumptions. This impacts personalized dosimetry decisions.

Key Findings



Software choice

significantly affects dose estimation.

Standardization is needed for clinical consistency. Further validation studies are recommended.

Thanks to supervisors and collaborators.

Thank you for your attention.

Any Questions?

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