Evaluation of *In Utero* Doses from Maternal Ingestion of Strontium Radioisotopes at the Techa River

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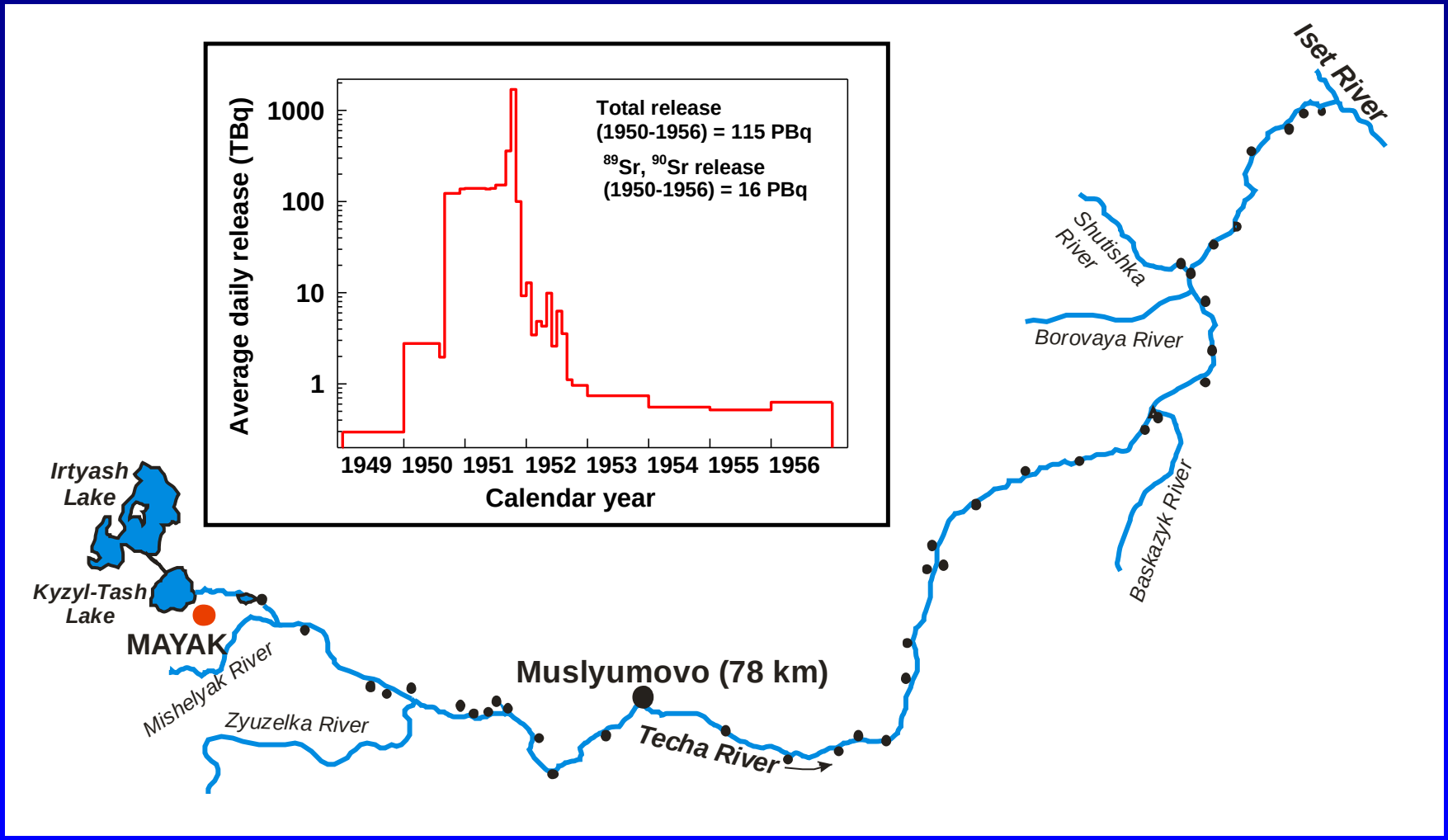
Contamination of the Techa River in 1950s (Southern Urals, Russia)



Pathways of internal exposure for the Techa River population

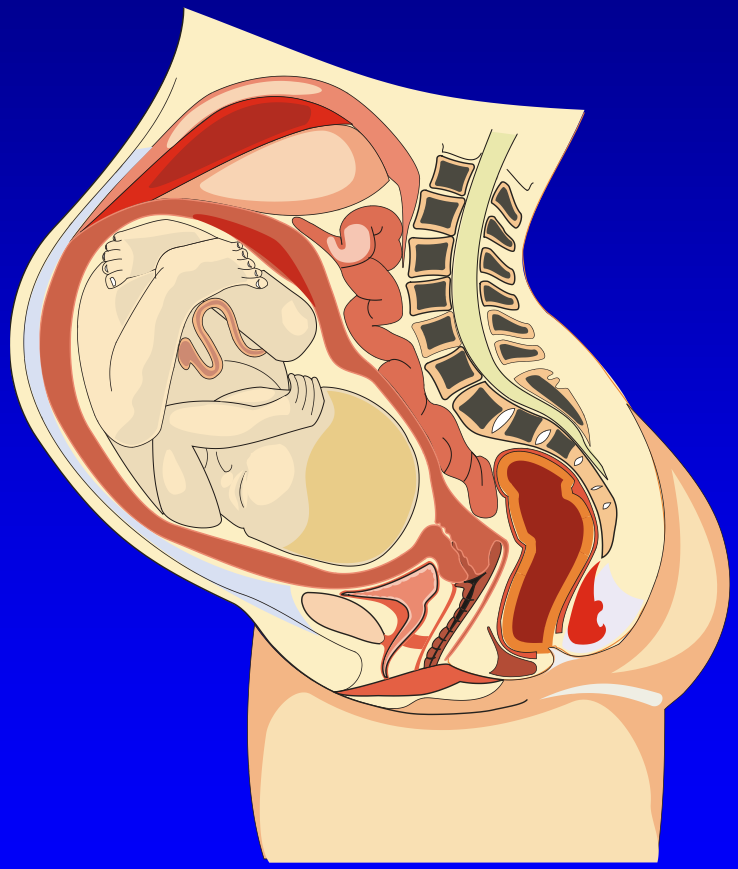
River water – an essential source of drinking water in most villages

Locally produced foodstuffs – milk, meat, vegetables, etc.

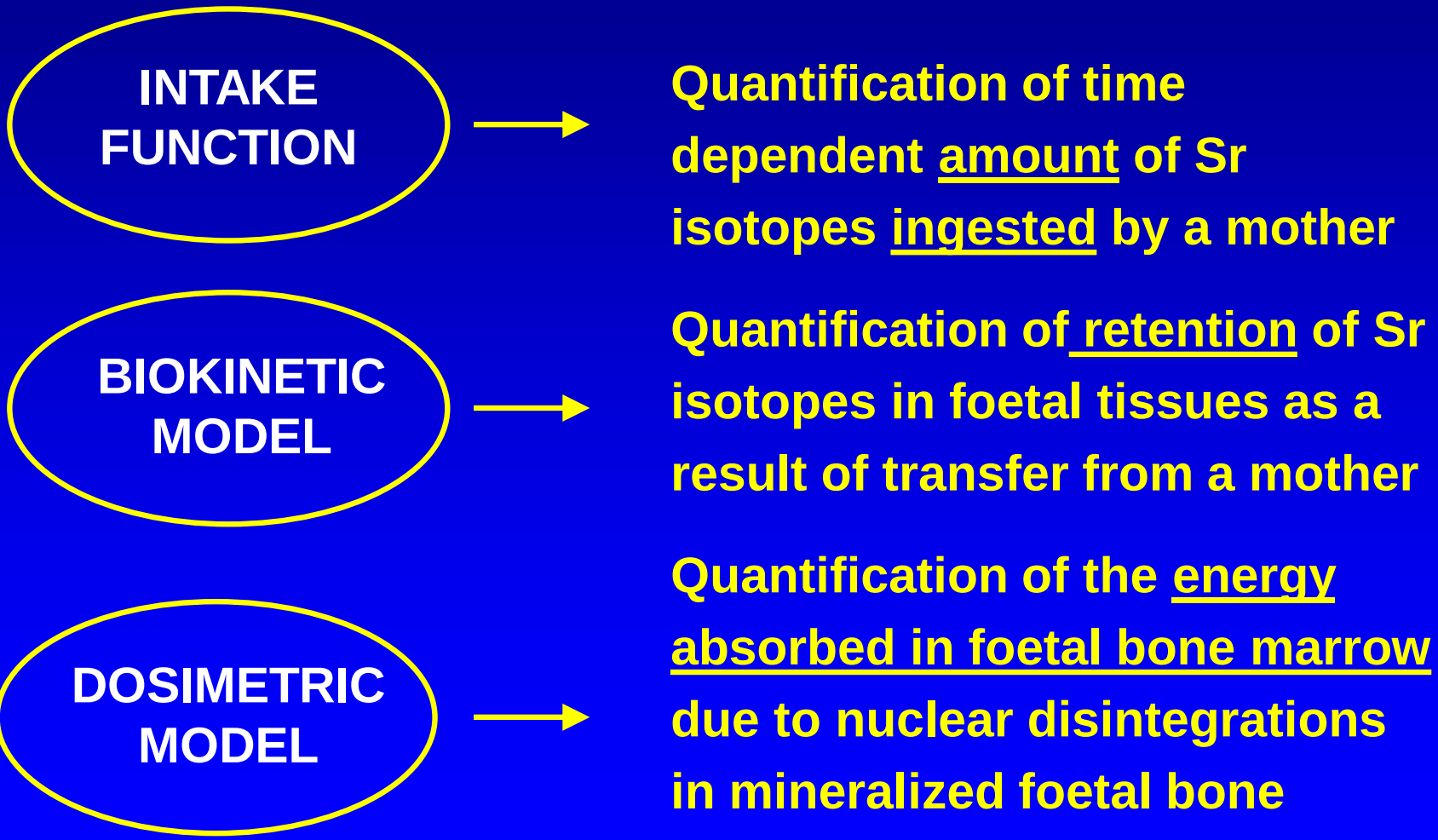
Muslyumovo
(78 km from release site)

Maternal ingestion of Sr isotopes lead to *in utero* exposure of offspring

Sr isotopes easily transfer through placenta during pregnancy and are retained in foetal tissues (predominantly skeleton)



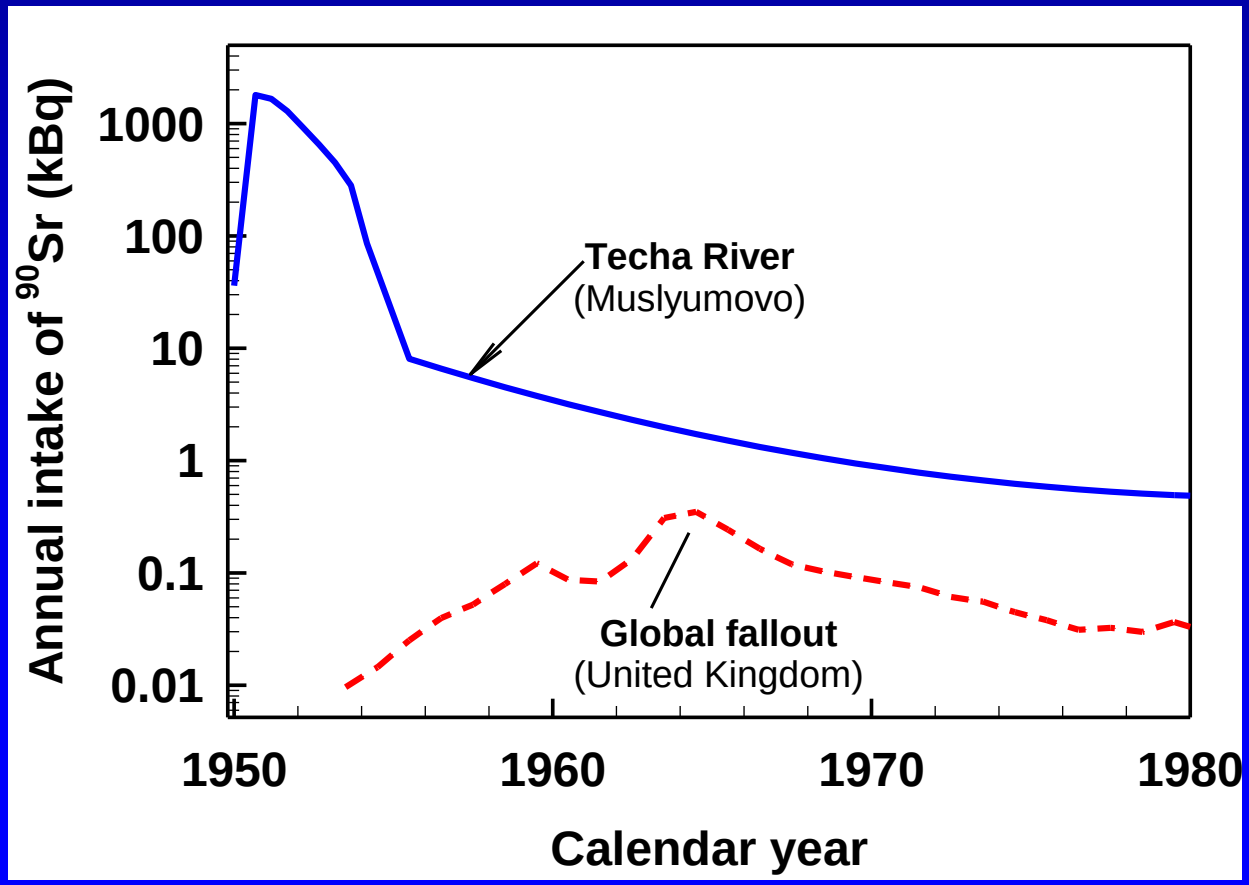
Methodology for *in utero* dose evaluation consists of the three major steps



Reconstruction of ^{89,90}Sr intakes for the Techa River residents

^{90}Sr - from numerous ^{90}Sr measurements in human teeth and whole body (Tolstykh *et al* 2011)

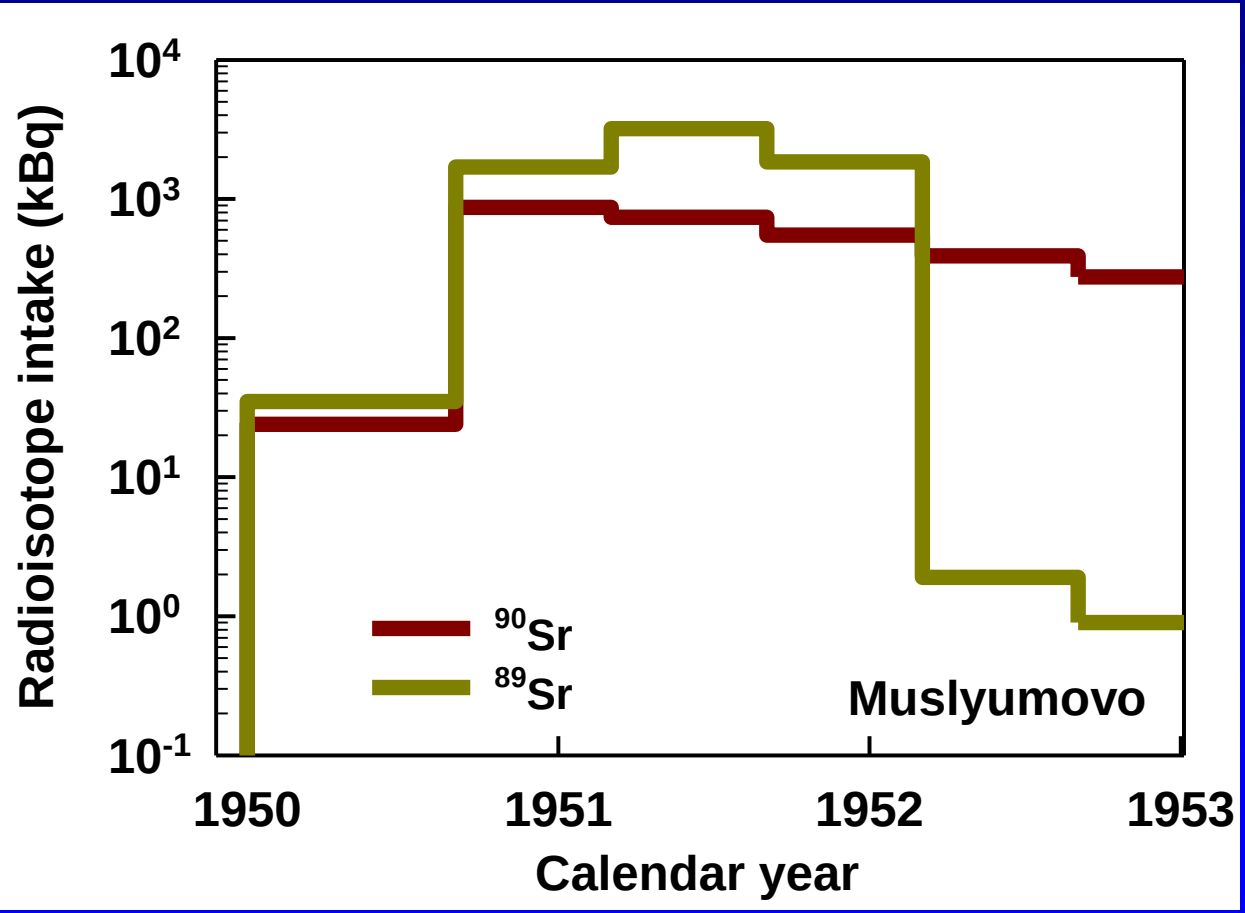
^{89}Sr - using ^{89}Sr-to-^{90}Sr ratio in river water (Shagina *et al* 2012)



Comparison of dietary ^{90}Sr intake at the Techa River and in the United Kingdom (Papworth and Vennart 1984)

Maternal intakes of Sr radioisotopes

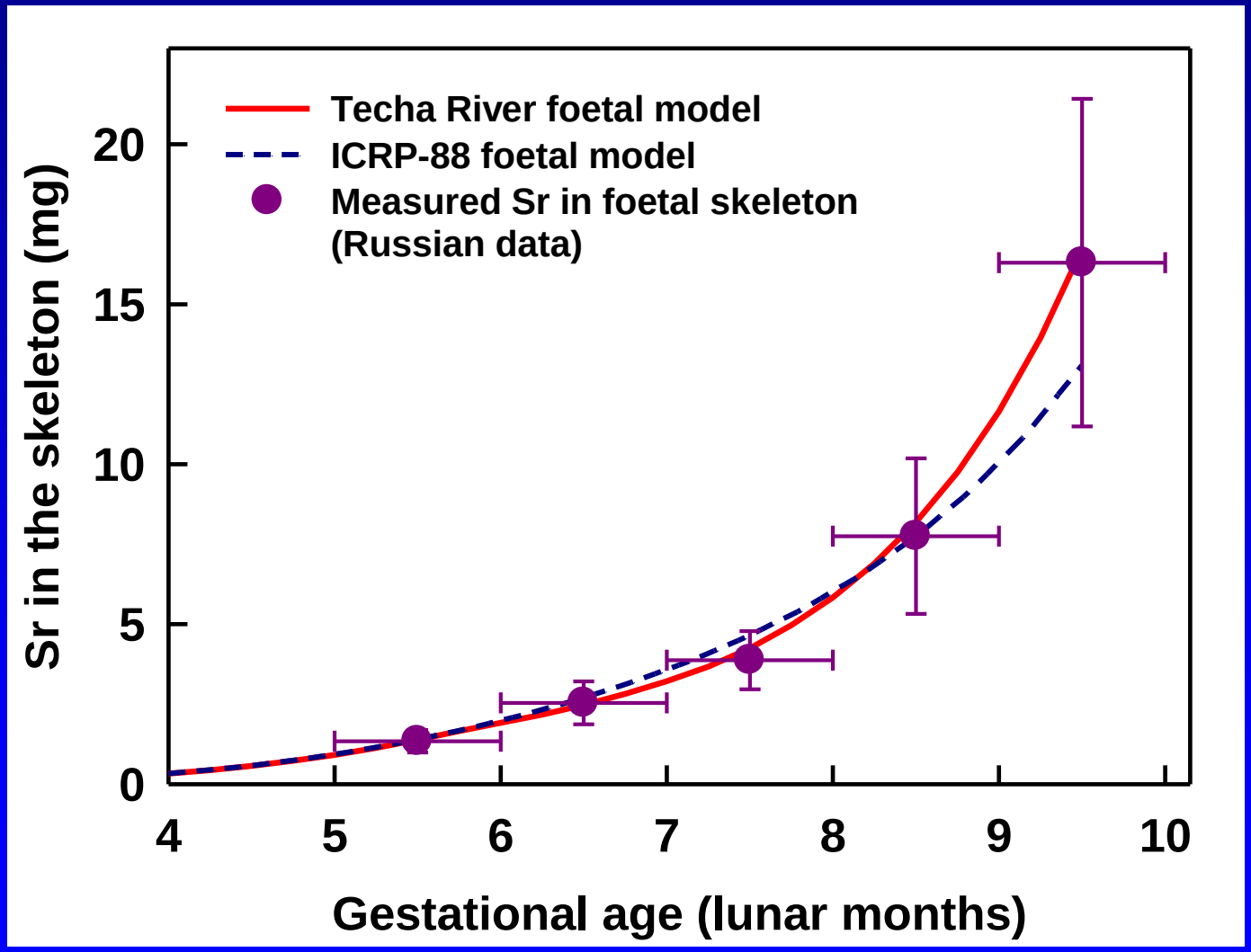
Intake of ^{89,90}Sr during pregnancy is increased due to increased nutritional and water requirements



Intake of ^{89,90}Sr by mothers in 1950-1952 (period of max intake)

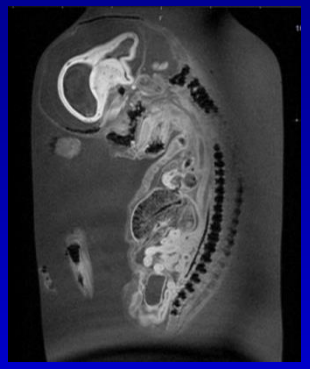
Biokinetic model for strontium

ICRP-88 biokinetic model was adapted to the Techa River population by fitting to Russian and Urals data

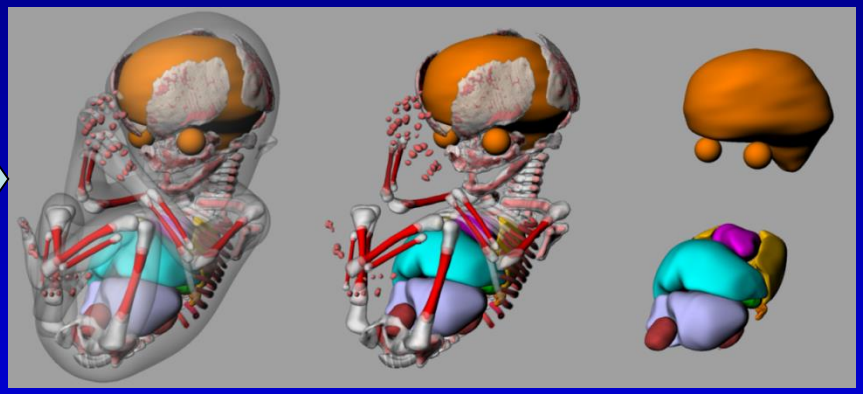


Details are in presentation P02.81 by Shagina et al.

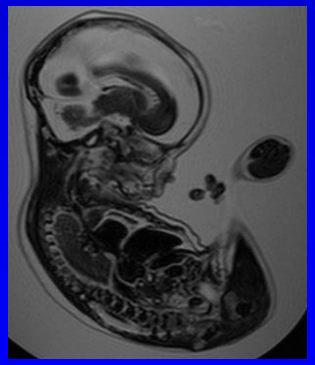
Dosimetry models for *in utero* exposure



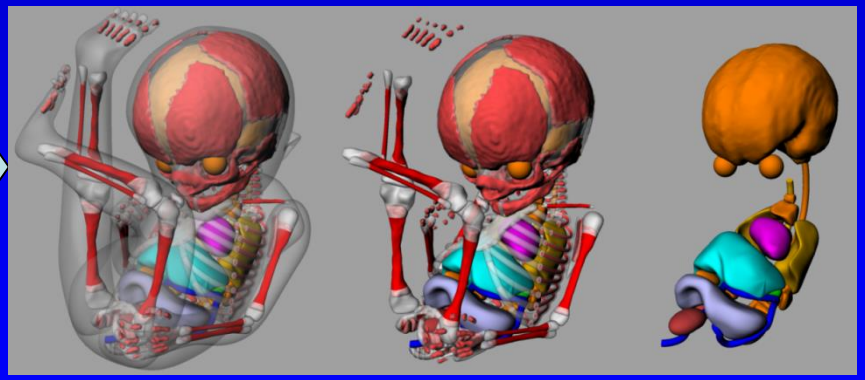
11.5 week foetus image



11.5 week foetus phantom



21 week foetus image

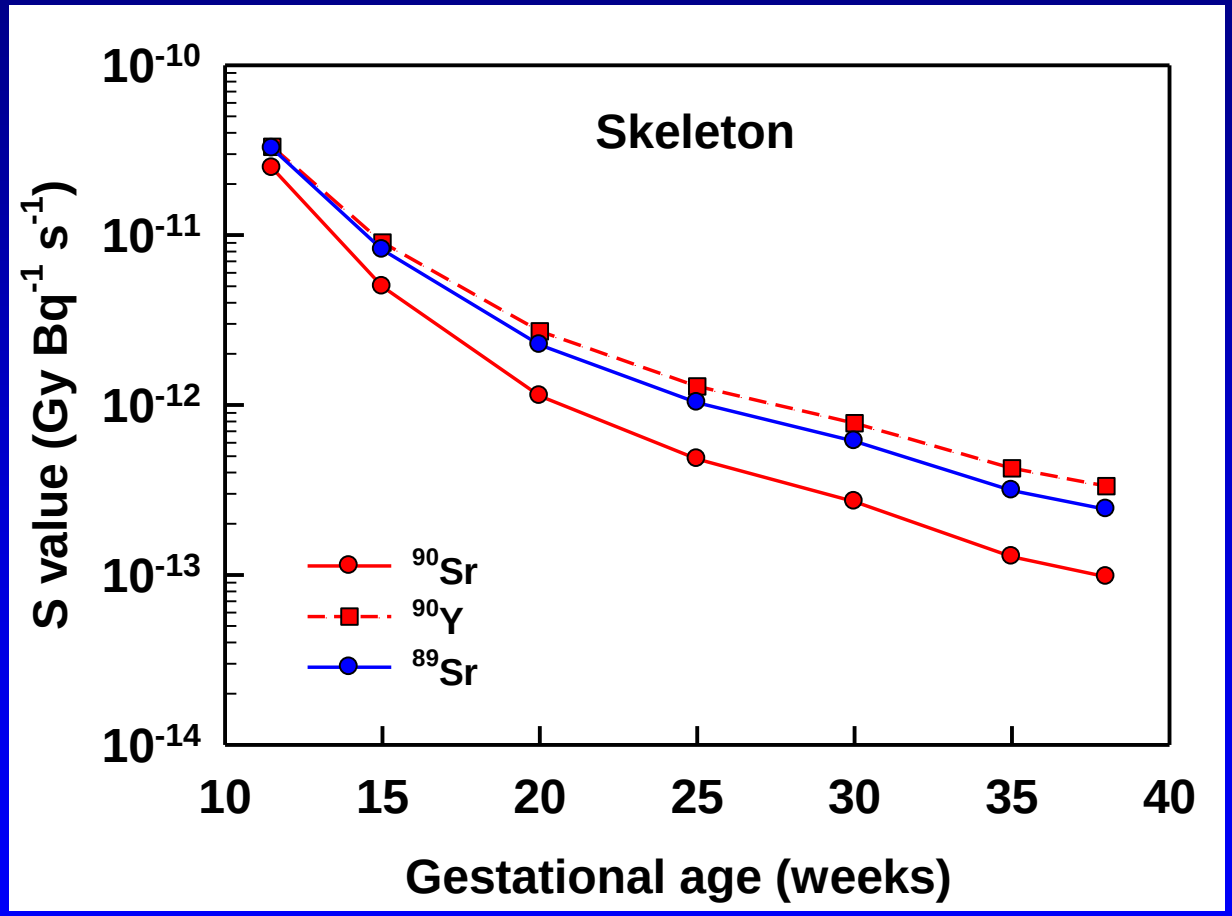


21 week foetus phantom

Phantoms for 11.5 and 21 week foetuses were developed at University of Florida from CT and MRI images of foetal specimens

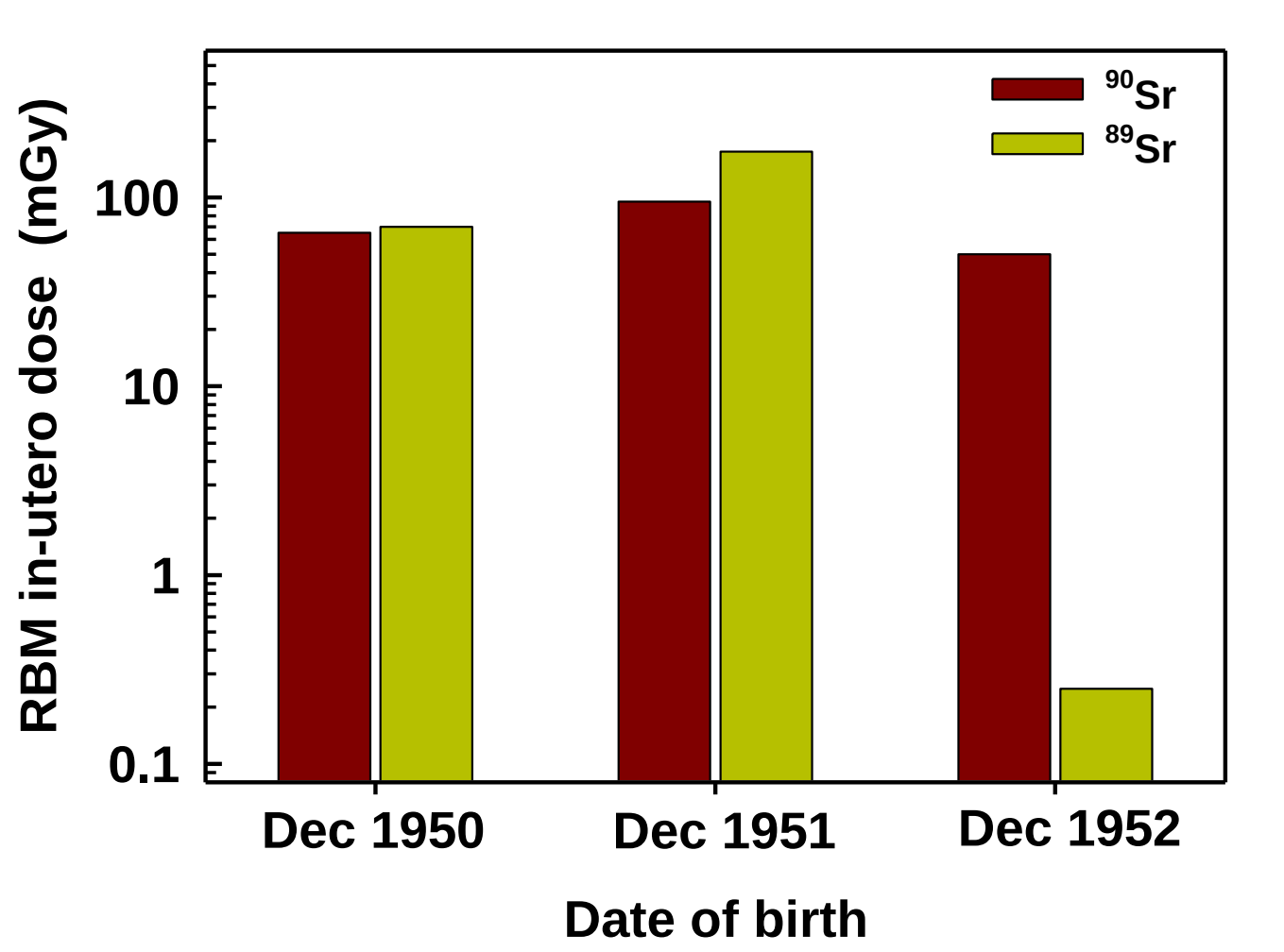
These phantoms were used to develop a series of all gestation ages (12-38 weeks)

Age-dependent dose per nuclear transformation for studied radionuclides

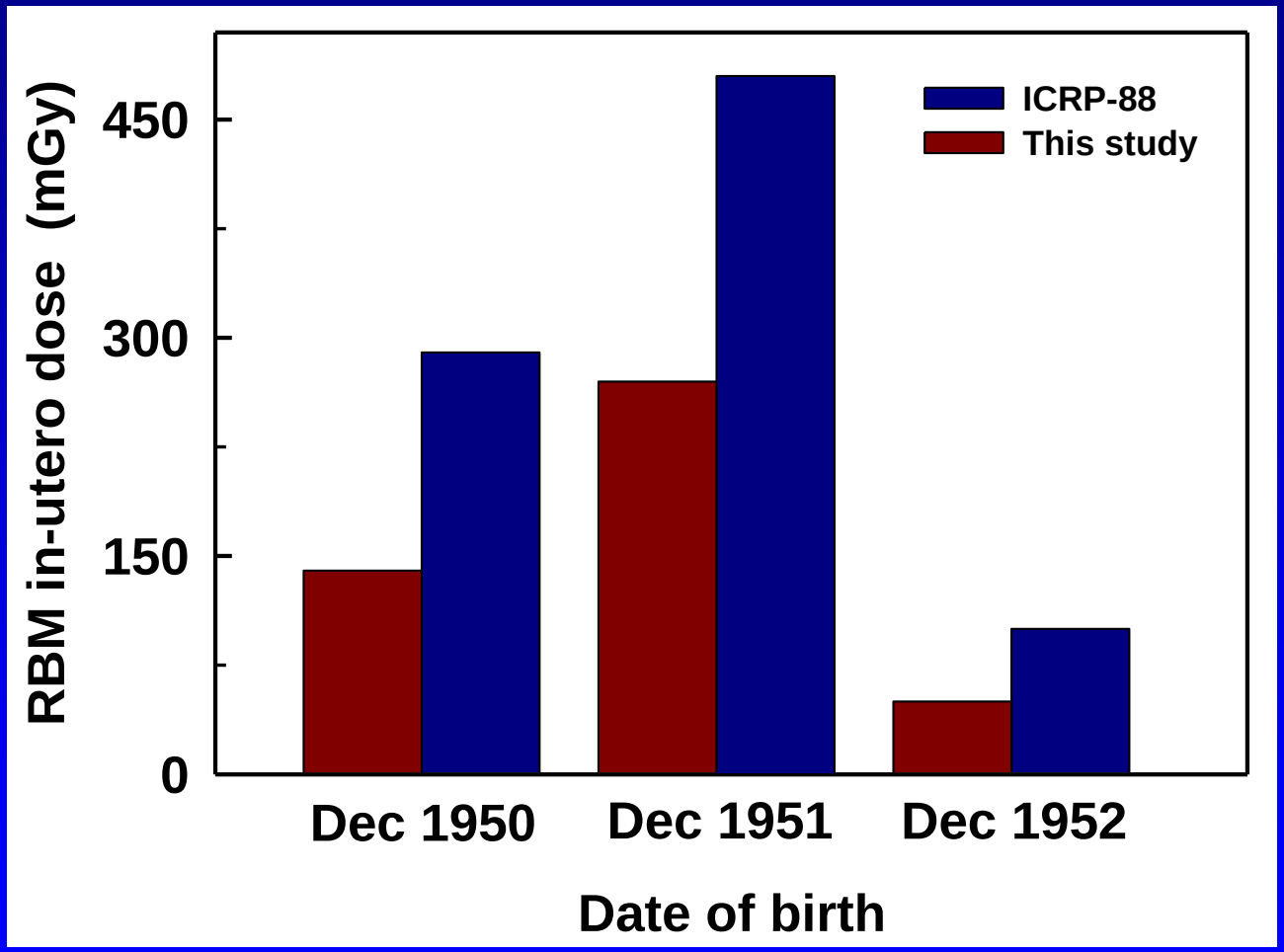


Dose in spongiosa is a surrogate for dose absorbed in foetal bone marrow

In-utero red bone marrow dose calculated for children born in Muslyumovo in 1950-1952



Comparison with estimates obtained with ICRP Publication 88 models



ICRP models were recommended for radiation protection of a foetus

Models developed in this study are more appropriate for epidemiological studies

Application of the developed methodology in risk assessment

Methodology and models developed in this study provide dosimetric support for evaluation of **solid cancer and leukaemia risk** from protracted exposure in the **Techa River *in utero* Exposed Cohort**

The Cohort comprises 12,000 offspring with most cohort members exposed to ingested radionuclides (mainly Sr isotopes). Study of this cohort may provide valuable information on risks from exposures to **internal emitters in early human life**

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I would like to thank the Russian IRPA Associate Society for nominating me for a Young Professional Prize

Thank you for your attention!