

# SOLO: Radiation Risk Research in the Southern Urals



Presentation to the 4<sup>th</sup> International MELODI  
Workshop 14 September 2012

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# SOLO – Epidemiological Studies of Exposed Southern Urals Populations



Four year EC 7<sup>th</sup> Framework project:

Started March 2010

End date August 2014 – including 6 month extension

Total value 9m € of which the EC contribution is 5m €

**Project Coordinator** : John Harrison (previously Colin Muirhead)

**Scientific Secretary** : Richard Haylock

**9 Contract Partners:** HPA, SUBI (RF), URCRM (RF), IARC (F), Helmholtz Zentrum München (D), UNIMAN (UK), ISS (I), LUMC (NL), Univ Florida (USA)

The work is divided into 4 scientific subprojects

# The aims of SOLO



To increase knowledge about radiation risks

- at low doses
- of specific cancers
- of non-cancer diseases
- from plutonium exposure
- from *in utero* exposure

Mainly using two radiation exposed populations in the Southern Urals of the Russian Federation:

- Mayak Worker Cohort  $\approx$  22,000
- Techa River (*in utero* exposed) offspring cohort  $\approx$  11,500

and for SP3 the Sellafield plutonium worker cohort  $\approx$  12,000

# SP 1 *External Dosimetry for Southern Urals Populations*



Aims to develop improved modelling of external dosimetry for the two cohorts using Electron Paramagnetic Resonance and Fluorescence In Situ Hybridisation techniques

Progress:

Strategies to validate the Techa river dosimetry system TRDS 2009 and the Mayak Worker Dosimetry System MWDS2008 have been developed.

Measurement of individual doses by EPR and FISH for exposed residents of the upper Techa region, Mayak workers and residents of Ozyorsk as control cohort for the workers in progress.

Analysis of data from the current project and previous SOUL project is ongoing.

Additional work on the FISH technique nearing completion.

# SP2: Epidemiological Studies of Mayak Workers



## Aims to

- Extend circulatory disease incidence and mortality analyses
- Perform analysis of chronic respiratory disease
- Perform first analysis of cancer incidence

## Progress:

- The Ozyorsk Cause of Death Register is updated to end of 2008
- Analyses of circulatory diseases in an enlarged cohort and with extended follow-up have been carried out and published.
- A first analysis of CRD incidence has been completed.
- A first analysis of lung, liver and bone cancer incidence completed

# Latest Mayak results: Cerebrovascular disease (Azizova et al 2011)



18,763 workers: 1948-72 followed to 2005

Cerebrovascular diseases: 7,326 cases and 1,495 deaths

Analyses adjusted for non-radiation factors: hypertension, BMI, duration of employment, smoking, plant.

Dose to liver used for internal risk calculations

## Incidence analysis:

External dose ERR/Gy: 0.413 (95% CI 0.324, 0.502)

Internal dose ERR/Gy: 0.095 (95% CI 0.035, 0.154)

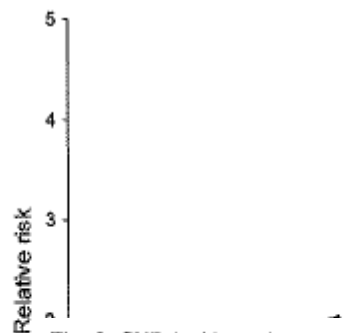
## Mortality analysis:

External dose ERR/Gy: 0.032 (-0.060, 0.124)

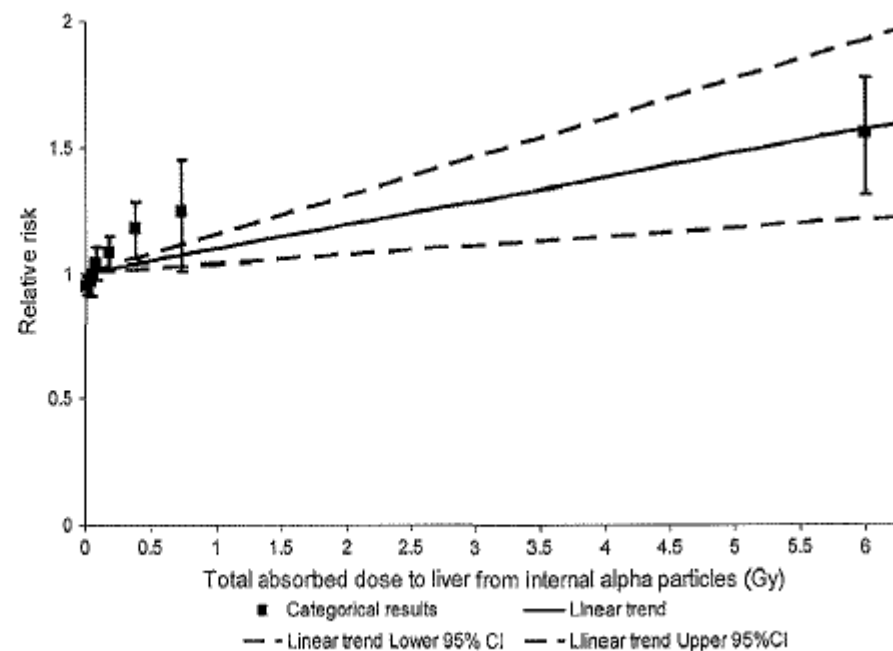
Internal dose ERR/Gy: 0.143 (-0.080, 0.367)

# Latest Mayak results: Cerebrovascular disease (Azizova et al 2011)

**Fig. 1** CVD incidence in relation to total absorbed dose from external gamma-rays. ERR/Gy = 0.413 (95% CI 0.324, 0.502) based on 0 year lag. CI confidence interval



**Fig. 2** CVD incidence in relation to total absorbed dose to liver from internal alpha-particle radiation. ERR/Gy = 0.095 (95% CI 0.035, 0.154) based on 0 year lag. CI confidence interval



# Latest Mayak results: Ischemic heart disease (Azizova et al 2011)



18,763 workers: 1948-72 followed to 2005

IHD: 6,134 cases and 2,629 deaths

Analyses adjusted for non-radiation factors: hypertension, BMI, duration of employment, smoking, plant.

Dose to liver used for internal risk calculations

## Incidence analysis:

External dose ERR/Gy: 0.099 (95% CI: 0.045-0.153)

Internal dose ERR/Gy: 0.008 (95% CI: -0.014, 0.029)

## Mortality analysis:

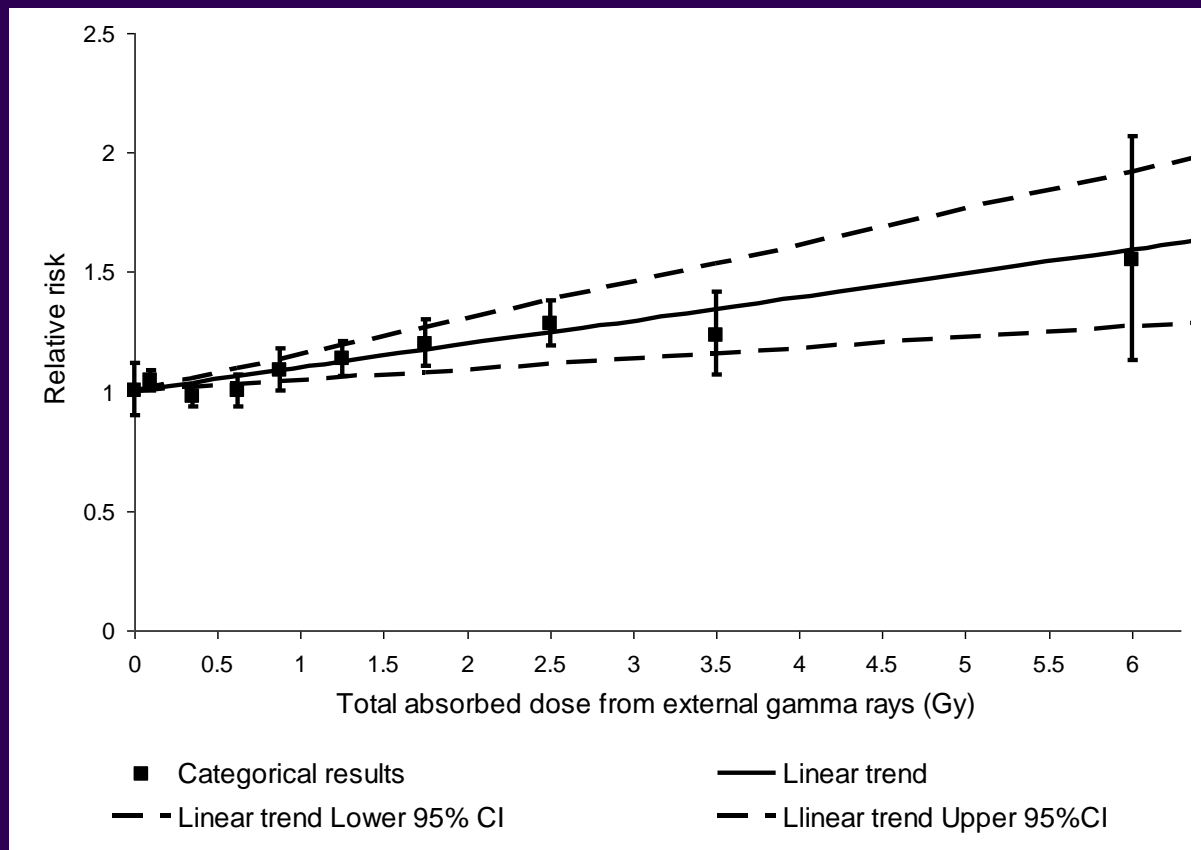
External dose ERR/Gy: 0.057 (95% CI: -0.014, 0.127)

Internal dose ERR/Gy: 0.263 (95% CI: 0.065, 0.461)\*

\* with additional stratification by external dose ERR/Gy: 0.097 (95% CI: -0.092, 0.287)\*



# Latest Mayak results: Ischemic Heart Disease (Azizova et al 2012)



# SP3: Joint analysis of Mayak and Sellafield plutonium workers



Aims perform a joint epidemiological study of cancer and non-cancer diseases in these two groups.

A two year delay occurred because of the closure of Westlakes Scientific Consulting preventing access to the Sellafield data.

Progress:

External dosimetry review started

Internal dosimetry methodology has been developed

Draft research study protocol completed

Study to be presented to Sellafield Research Governance group to gain formal consent next week.

## SP4: Epidemiological study of cancer following *in utero* irradiation



Aims to perform an epidemiological study of cancer in children born to women from either of the Mayak and Techa river groups who were exposed to radiation while pregnant.

Progress:

The Techa river *in utero* exposed cohort has been defined and collection of follow-up is progressing well.

The internal dosimetry methodology for estimating foetal doses for the Techa cohort is being updated.

A feasibility study to ascertain if cohort pooling appropriate has been completed – it concludes pooling will provide increased statistical power for solid cancers and leukaemia analyses.

Subprojects 1,2 and 4 on course to finish by March 2014

Subproject 3 has a 6 month extension and will finish by  
September 2014

Next project meeting will be held in Brussels in March 2013.

Further information available from the solo website:

[www.solo-fp7.eu](http://www.solo-fp7.eu)