

## **THEME 1: Radioactive Release Assessment**

### **Working Group 3**

**The Chernobyl I-131 release: model validation and assessment of the countermeasure effectiveness working group**

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(EMRAS Iodine Working Group Leader)



**Centralne Laboratorium Ochrony Radiologicznej**  
**Warszawa**  
**Central Laboratory for Radiological Protection**

## EMRAS Iodine Working Group

### **main targets of IWG**

- **models applicability to evaluation of countermeasures effectiveness**

### **countermeasures**

- **administration of stable iodine**
- **limitation of fresh milk consumption**
- **restriction of cows pasturing**

**uncertainty ?, limitation ?, requested input data ?**

## EMRAS Iodine Working Group

### **activity of the IWG environmental modelling exercises on radioiodine**

- **to test and compare models' predictions with  
real environmental data**
- **to intercompare modelling approaches and model  
predictions among several assessors**

## PREDICTIONS FOR MAZOVIA SCENARIO

Model	Participant Name	Country	Organization
1 LIETDOS	Ms T.Nedveckaite, Mr. Vitold Filistovic (BIOMASS) PLAVSK, MAZOVIA 1, 2, PRAQUE	Lithuania	Institute of Physics
2 OSCAAR	Mr T HOMMA (BIOMASS) PLAVSK, MAZOVIA2, PRAQUE	Japan	Japan Atomic Energy Research Institute
3 UniVes	Mr B.Kanyár (BIOMASS) PLAVSK, MAZOVIA1, 2, PRAQUE	Hungary	University of Veszprém Department of Radiochemistry
4 CLRP	Mr P. Krajewski (BIOMASS) PLAVSK, MAZOVIA 2, PRAQUE	Poland	Central Laboratory for Radiological Protection
5 ASTRAL	Ms C. Duffa (New) PLAVSK, PRAQUE ??	France	Institut de Radioprotection et de Sûreté Nucléaire (IRSN)
6 Ecosys-87	Mr M. Ammann (New) PLAVSK, MAZOVIA1, 2, PRAQUE	Finland	Radiation & Nuclear Safety Authority (STUK)
7 Plavsk Dose Calculator	Mr S. Simon (New) PLAVSK, PRAQUE ??	USA	National Cancer Institute
8 SPADE V.4.6	Mr D. Webbe-Wood (New) PLAVSK, PRAQUE ??	UK	Food Standard Agency
9 CLIMRAD	O. Vlasov (New) PLAVSK, MAZOVIA1, 2, PRAQUE	Russian Federation	Medical Radiological Research Center
10 MODEL	Irina Zvonova (New) PLAVSK, MAZOVIA1, 2, PRAQUE	Russian Federation	Institute of Radiation Hygiene

## EMRAS Iodine Working Group Summary

### 2003/2004 COMPLETED SCENARIO

#### **PLAVSK Scenario (Chernobyl) – draft report on the EMRAS website**

*Primery prepared by SENES, (description, electronically available input data) customised for IWG by Irina Zwonowa, Pawel Krajewski*

#### model validation problem!

reconstruction of  $^{131}\text{I}$  impact using  $^{137}\text{Cs}$  as a tracer

#### considered end points

- *reconstruction of  $^{131}\text{I}$  air concentration,  $^{131}\text{I}$  deposition*
- inhalation dose contribution to the total dose
- doses to thyroid from ingestion

#### different approaches:

- uniform  $^{131}\text{I}$  air concentration over PLAVSK REGION (40 x60 km area),  
different rains pattern,
- changeable  $^{131}\text{I}$  concentration in air, uniform rain

## EMRAS Iodine Working Group Summary

### General Conclusions from Plavsk Scenario

predictions with in a factor of three of the observations, discrepancies between the estimates of average doses to thyroid not exceeded a factor of ten.

the most important factor of uncertainty of predictions of  $^{131}\text{I}$  concentration in milk and consequently ingestion doses: time when cows have been put on a pasture

approach giving the best fit to the observed data :

- reconstruction of  $^{137}\text{Cs}$  air concentration from places with lowest  $^{137}\text{Cs}$  deposition (*assuming deposition as dry*)
- reconstruction of rain pattern for localities with higher  $^{137}\text{Cs}$  deposition (*assuming additional  $^{137}\text{Cs}$  deposition as wet*)
- isotopic ratio  $^{131}\text{I}/^{137}\text{Cs}$
- reconstruction of  $^{131}\text{I}$  deposition

## **EMRAS Iodine Working Group Summary**

### **ISSUES TO TRS-364 GROUP**

#### **model of grass interception**

**in a case of mixed (dry&wet) radioiodine fallout with three forms of  
radioiodine: aerosol bound, elemental I<sub>2</sub>, organic CH<sub>3</sub>I**

#### **iodine milk transfer factor**

**cow iodine metabolic model, uncertainty range,  
dependence of milk transfer factor on cows diet and cow's milk productivity**

## 2005 CURRENTLY PUBLISHED AND EVALUATED SCENARIO

### **<sup>131</sup>I WARSAW SCENARIO (Chernobyl)**

(description, electronically available input data, and templates for predictions)

#### **crucial points for model validation!**

##### **effectiveness of countermeasures**

- administration of stable iodine solution,
- limitation of fresh milk consumption (uncertain data),
- restriction of cows pasturing (uncertain data)

##### **end points considered for model testing:**

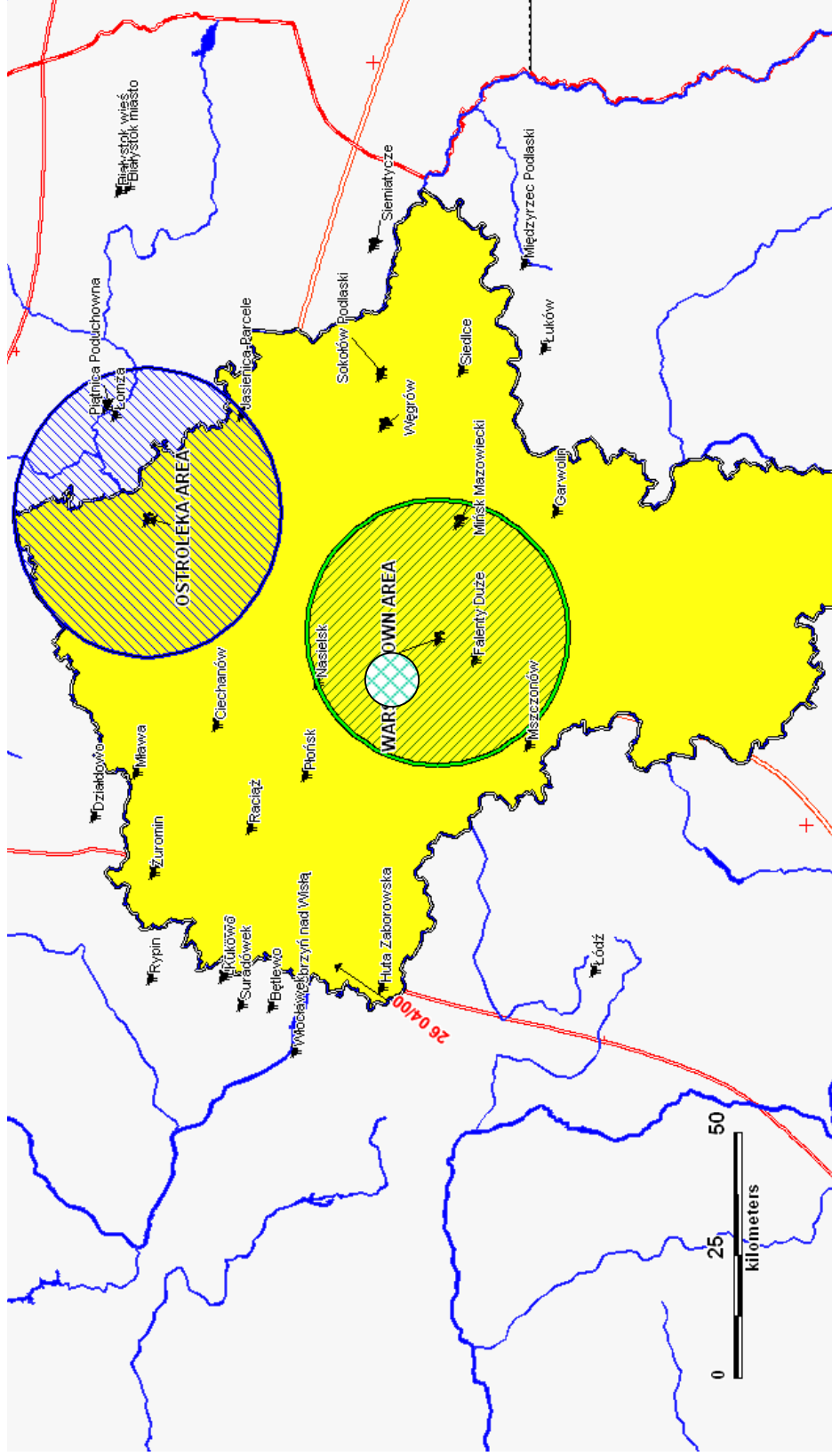
- <sup>131</sup>I concentration in milk
- <sup>131</sup>I thyroid burden for different age groups for two specified location



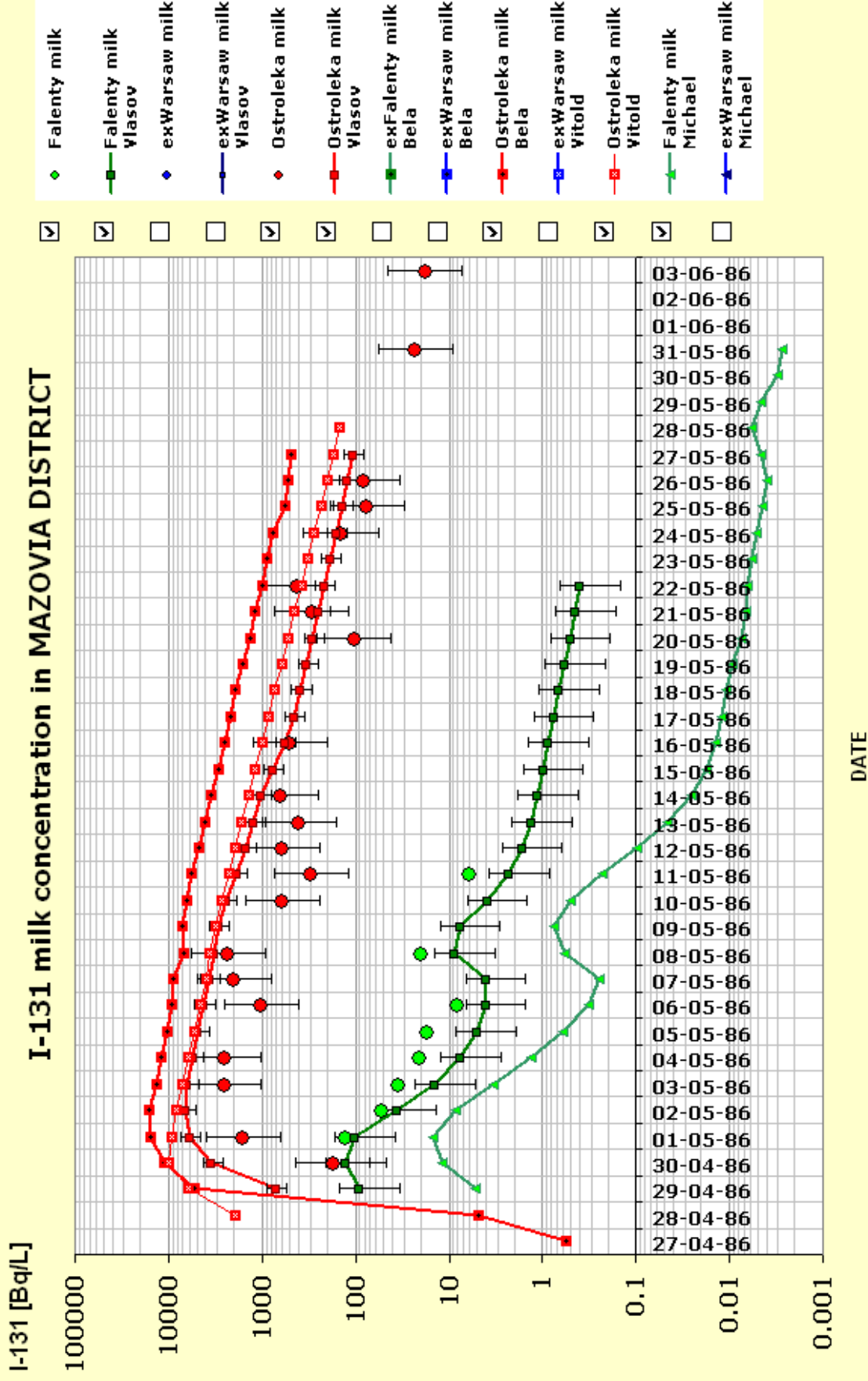
21–25 November 2005

## SCENARIO MAZOWIA

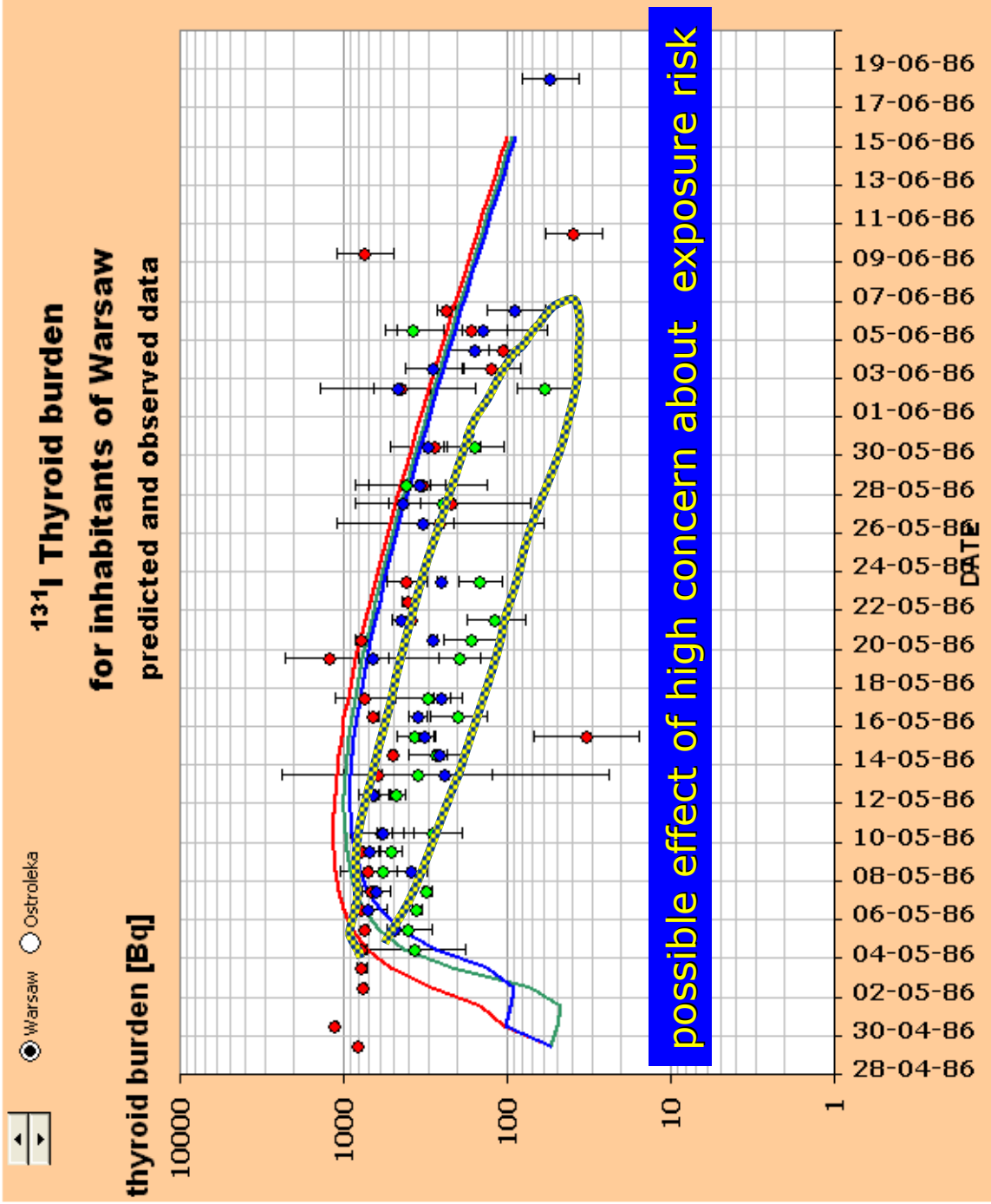
### DATA FROM CHERNOBYL AIR POLLUTION IN THE MAZOVIA AREA



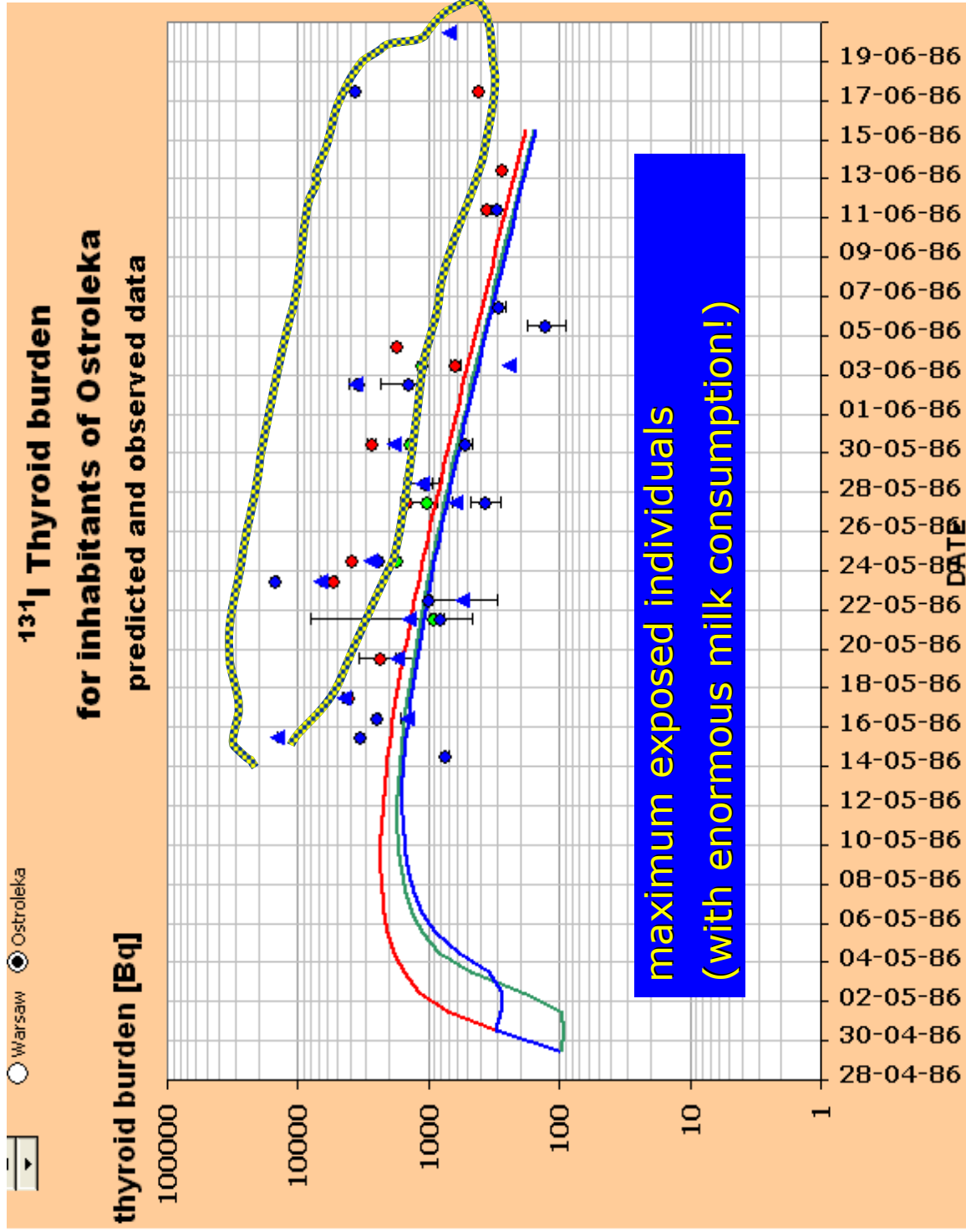
3<sup>rd</sup> Combined Meetings of the IAEA Programme on  
**Environmental Modelling for Radiation Safety (EMRAS)**  
 21–25 November 2005



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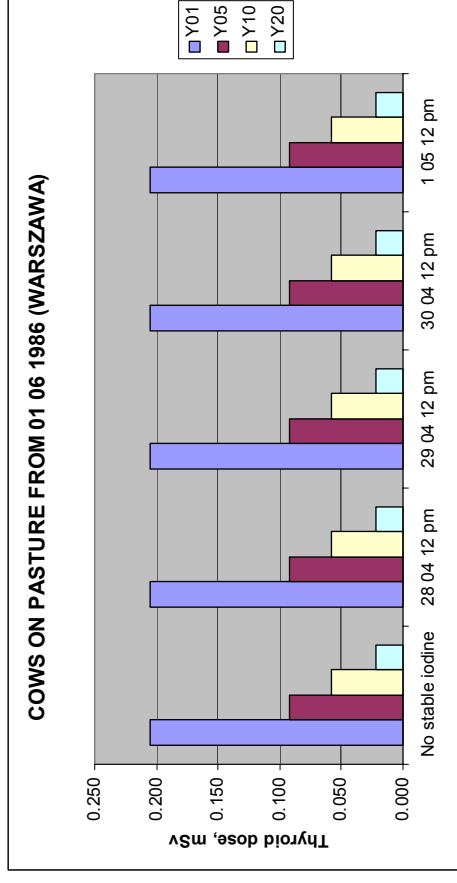
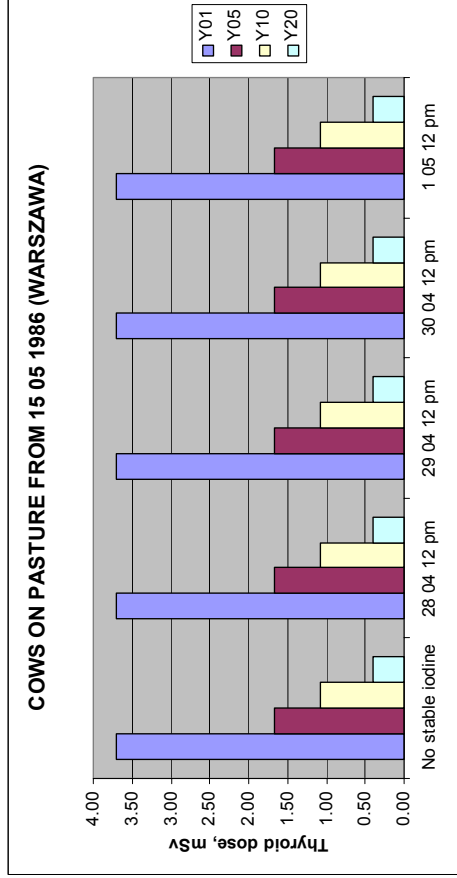
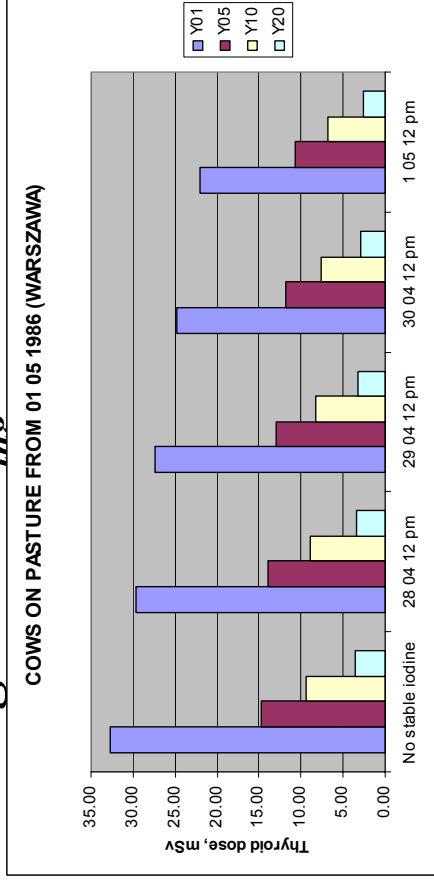
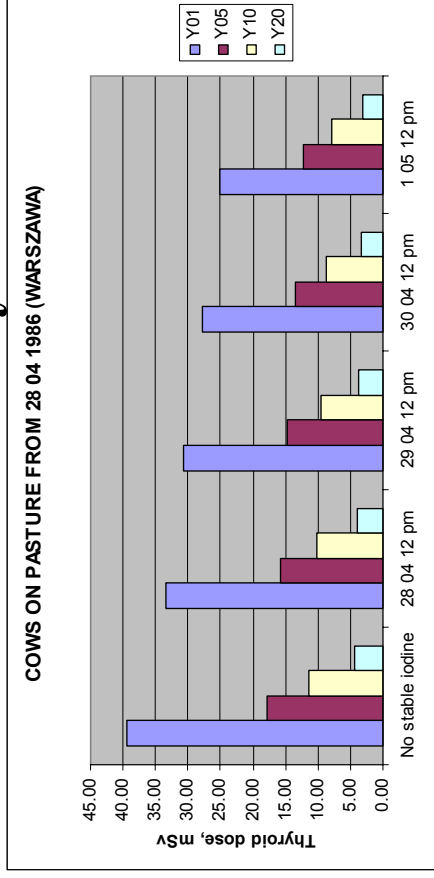
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21–25 November 2005

# Thyroid dose due to ingestion $D_{ing}$



Reference: Model description and assumptions for Scenario W

Tatjana Nedveckaite, Vitold Filistovic

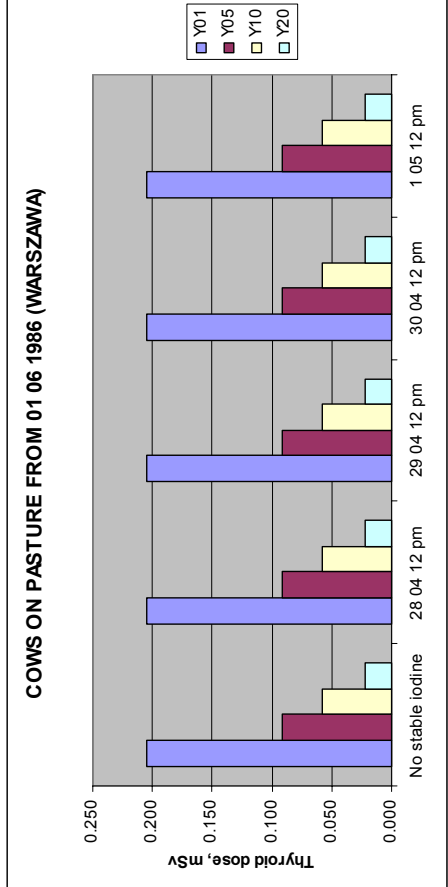
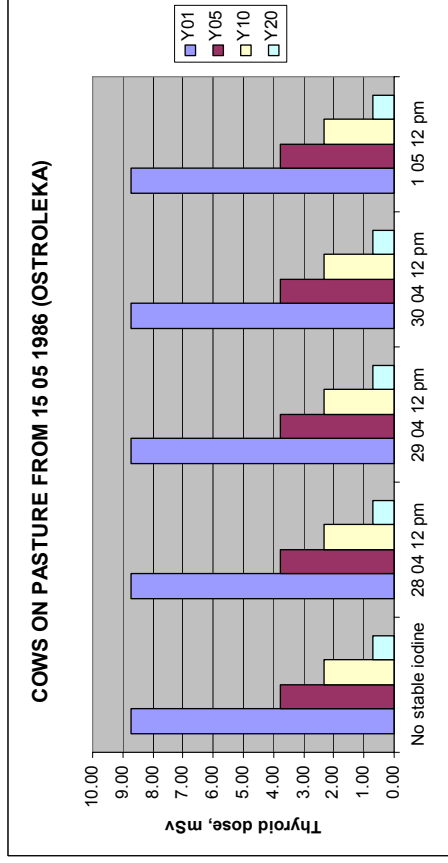
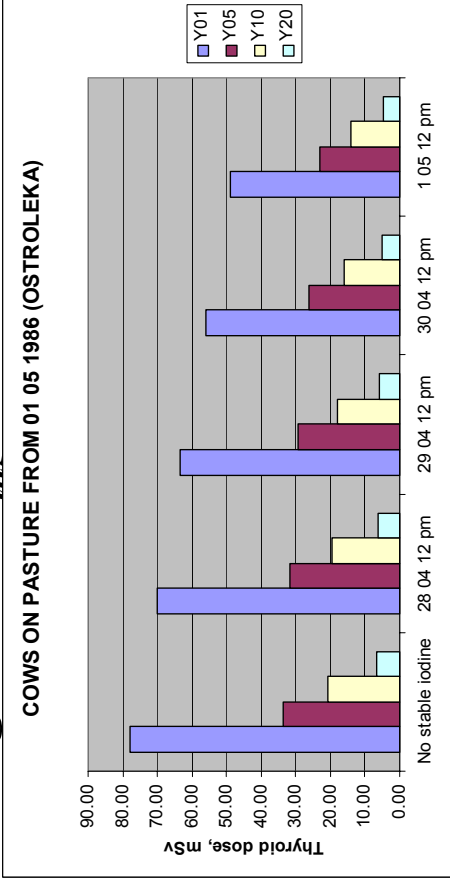
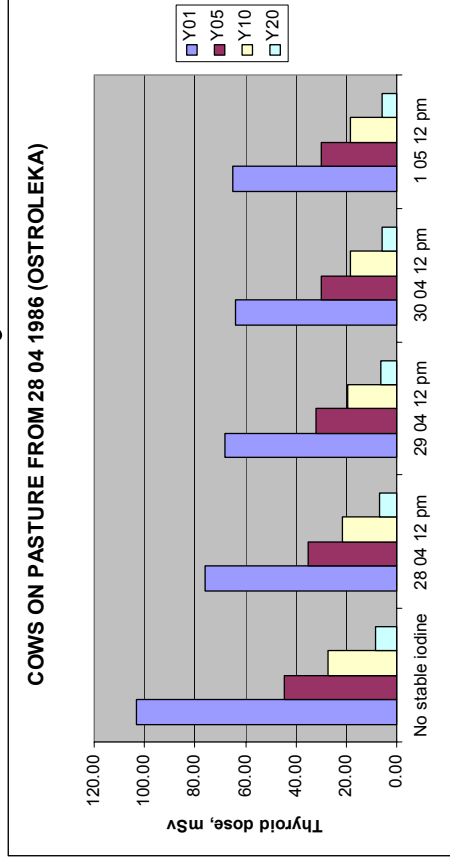
Institute of Physics, Savanoriu 231, Lt-2058,  
Lithuania,

E-mail: [tatjana@cablenet.lt](mailto:tatjana@cablenet.lt); [vifil@ktl.mii.lt](mailto:vifil@ktl.mii.lt)

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E-mail: [tatjana@cablenet.lt](mailto:tatjana@cablenet.lt); [viifil@ktl.mii.lt](mailto:viifil@ktl.mii.lt)

## **SCENARIO UNDER PREPARATION**

### **PraGue scenario**

**Malátová, M. Bartusková, J. Oceánský**

**(version 1, 18.11.2005)**

National Radiation Protection Institute, Czech Republic  
*(<sup>137</sup>Cs in VAMP's Central Bohemia Scenario)*

#### **Main Target:**

**Influence of different agricultural practices  
for I-131 dose reduction**

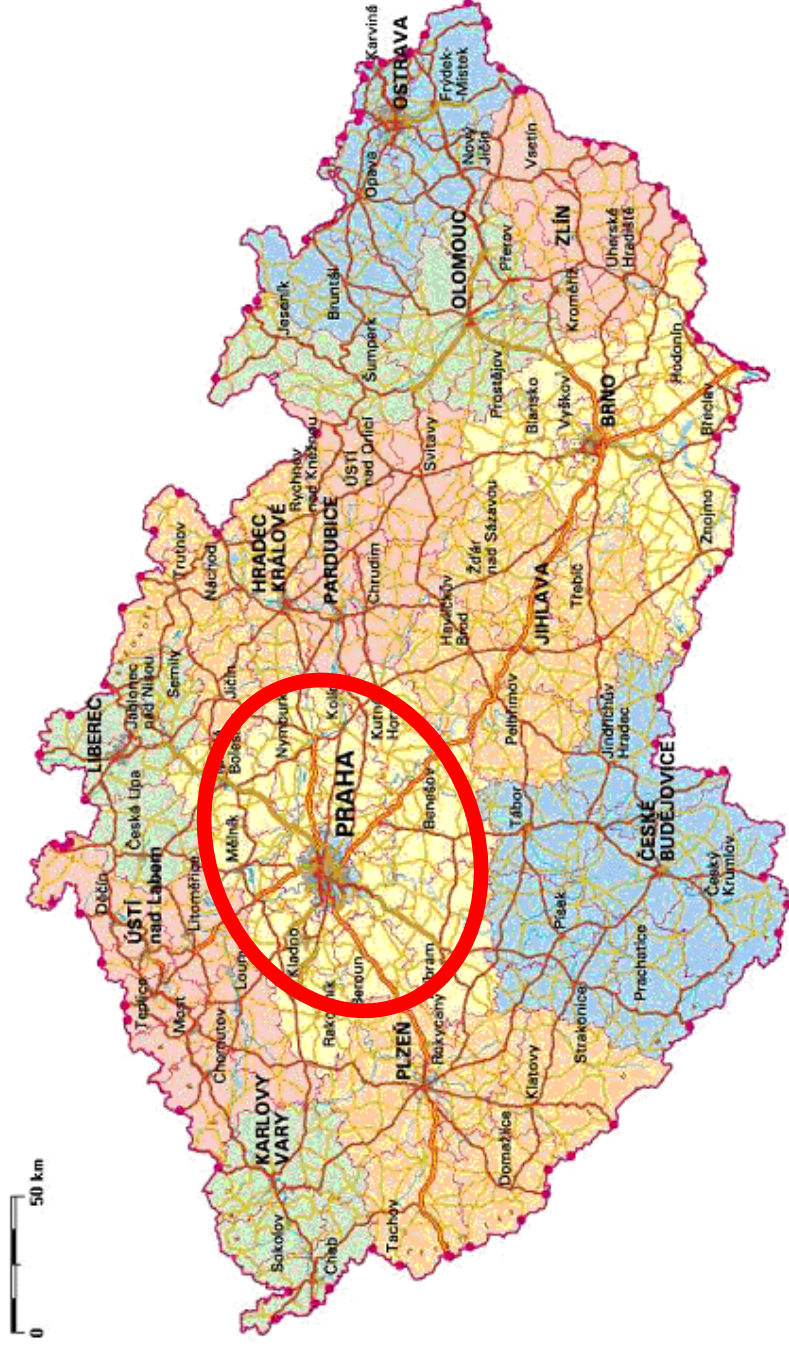
#### **Data:**

**Air, Precipitation, Vegetation, Animal feed, Water,  
Milk, Human Thyroid**

3<sup>rd</sup> Combined Meetings of the IAEA Programme on  
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21–25 November 2005

## SCENARIO UNDER PREPARATION



Map of the Czech Republic (red line – approximately Central Bohemia region)

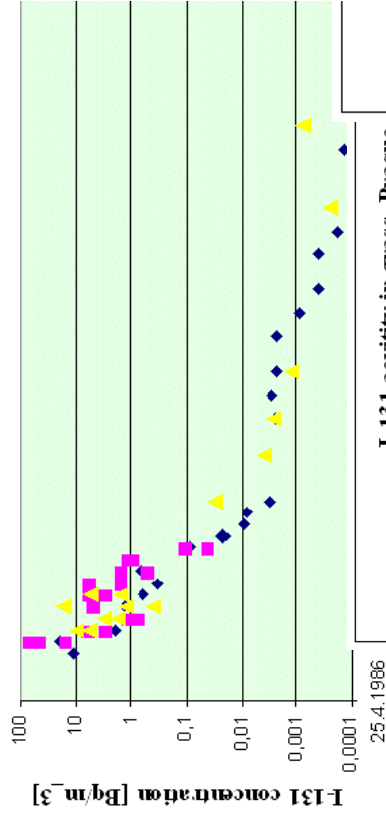


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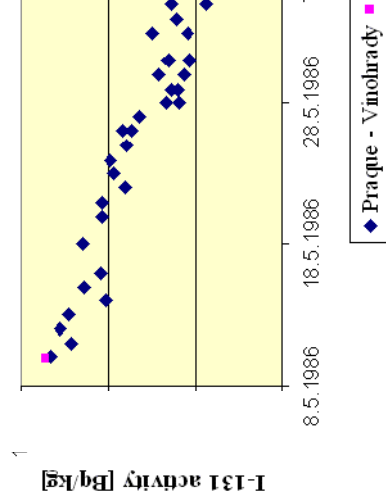
21–25 November 2005

# SCENARIO UNDER PREPARATION

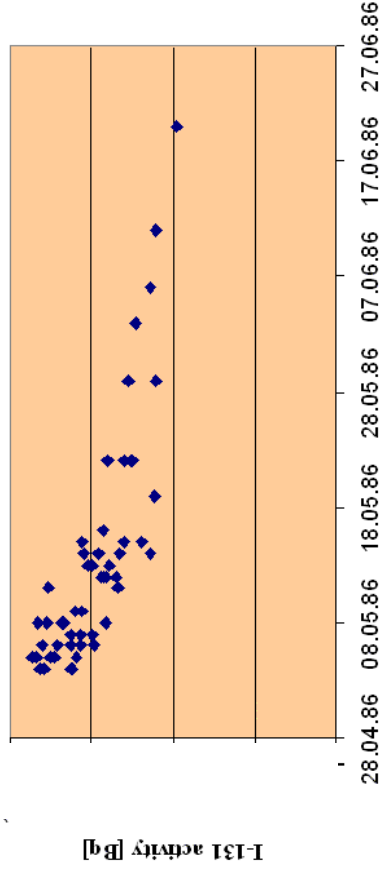
I-131 concentration in aerosol, 3 places in Prague - city,  
 29. 4. - 13. 6. 1986



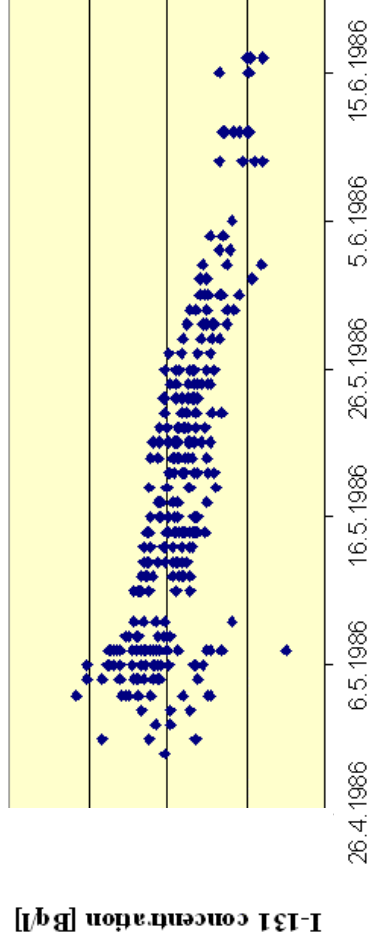
I-131 activity in grass, Prague  
 10.5. - 18.6.1986



I-131, internal contamination, female, Prague,  
 4. 5. 1986 - 20. 6. 1986



Central Bohemia, 30. 4. - 16. 6. 1986



## EMRAS Iodine Working Group Summary

### MILESTONES PLANNED

- **end of January 2006**
    - 1 summary report on Warsaw Scenario (first run)  
*will be published on EMRAS website*
  - **end of April 2006**
    - 1 second run of predictions for Warsaw Scenario
- modified end points
- effectiveness of thyroid blocking for inhalation pathway!  
(children, adults)
  - thyroid burden and doses for maximum exposed individuals  
(with enormous milk consumption!)
- 1 distribution of PRAGUE Scenario draft

## EMRAS Iodine Working Group Summary

### MILESTONES PLANNED

#### ● 7 – 10 June 2006

#### ● IWG meeting in Prague

- ❑ summary of the second run of predictions for Warsaw Scenario
- ❑ discussion on Prague Scenario, clarification, additional required data

#### ● November 2006

#### ● 4th Combined EMRAS meeting IAEA

- disclosing observed data for Prague Scenario,
- evaluation of predictions,
- IWG Report on EMRAS website

#### ● 2007

#### ● Preparation of the IWG Final Report

conclusions, recommendations

Thanks for your attention

*Pawel Krajewski*

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