



*Use of Proficiency tests organised by
PROCORAD to improve quality of
tritium in urine measurement*

NPL meeting, 24 th January 2006



- *French association created in 1995 by ABNF, COGEMA and CEA*
- *structured around Administrative Council, Head Office, Scientific Council and Intercomparison Managers*
- *120 members from 24 countries , 70 laboratories (incl. 54 outside France).*
- *www.procorad.org or info@procorad.org*

Main Goals:

- ☞ To promote quality management in the laboratories by preparing intercomparison exercises on biological samples loaded with artificial radionuclides (certified values) or taken from contaminated workers (uncertified values)*
- ☞ To supply information about the best technical protocols and to provide for scientific discussion during the annual meeting and workshop sessions (for instance, accreditation, method validation at last year's meeting)*



Exercises :

- *CEA Cadarache : ^{90}Sr and X gamma emitters in urine*
- *CEA Grenoble : ^{14}C in urine; « surprise » urine*
- *CEA Marcoule : U in urine ; actinides in urine*
- *CEA Valduc : ^3H in urine*
- *COGEMA La Hague : actinides in faecal ash*

- ***☞ 3 samples at least***



Tritium in urine

2 different set of samples:

- *one for tritiated water measurement with 5 samples -
 - A: blank urine sample
 - B urine with activity between 1,000 and 2,000 Bq/ l
 - C: urine with activity between 5,000 and 10,000 Bq/ l
 - D urine sample from a contaminated worker <70kBq/ l
 - E : Tritiated water by dilution of the primary solution*

- *one sample for OBT measurement (sample of 200 ml of urine with activity between 10 and 60 kBq/ l of tritiated thymidine)*



Organization of the intercomparison

- *In accordance with the Quality Assurance Programme of the Valduc Biological Laboratory*
- *The document emphasizes the different steps in sample preparation, from collection of blank urine to dispatching of samples in safe conditions; also, processing results using PROCOSTAT software and publication of the final report.*
- *Each step requires care and checking procedures followed by Quality Management staff of the lab.*
- *The Quality document is available on request to all participants in the exercise.*



Technical data

- *Participants submit their results directly to the website and have to answer a technical questionnaire.*
- *The questions asked to the participants are: information about LS cocktail used, counting time, method of calibration or quenching, but also management of the blank sample for the final results, etc.*
- *For next year, we plan to investigate more technical details of the sampling method, for example, or the volume of LS added, proportion of urine vs LS cocktail or LSC equipment used.*



Participation

• Always very high (Not for OBT...), because Tritium in urine seems to be the easiest PROCORAD bioassay for our participants! :

- 2001: 47 labs**
- 2002: 50 labs**
- 2003: 48 labs**
- 2004: 44 labs**
- 2005: 49 labs**
- 2006: 52 labs**



Preparation of the samples

- Urine pool from the Aube Center (no H3 marking in the environment)*
- Sample D: urine from employee at Valduc plant, contaminated by tritiated water*
- Preservation of urine sample using thiomersal (5 g per liter)*
- Set to pH 2 by HCl*
- Samples manufactured at different dates to avoid any errors at the labelling or packaging stage*



Loading solutions used

- Source of tritiated water recorded on 14th November 2003 supplied by CERCA Primary Laboratory*
- Source of tritiated thymidine recorded on 22nd July 2003 supplied by AMERSHAM (target value not certified by the manufacturer)*



Processing of results

-the data laboratories submit by e-mail in the intranet session is automatically entered in the PROCOSTAT software, which applies 4 tests to exclude aberrant values (outlier labs), the GRUBBS, DIXON, Z-SCORE and STUDENT tests

-afterwards, raw anonymous data, arithmetic and geometrical mean, median value and min and max values are plotted in a final table and 3 graphs are generated

-these graphs are presented and discussed during the meeting. They are also included in the final report after checking steps and corrections if necessary.



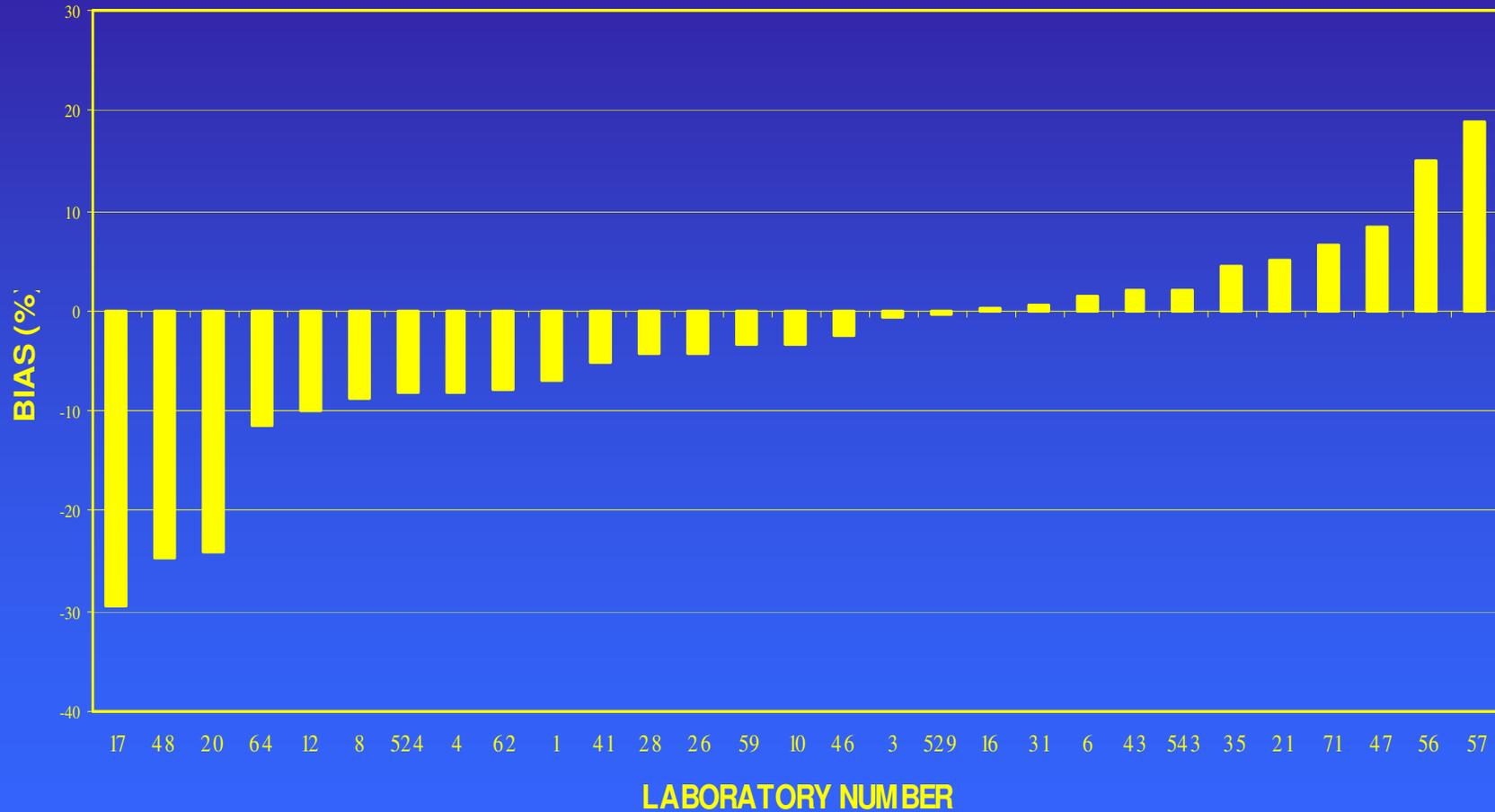
Technical protocols:

-Tritiated water: LS measurement with quenching correction curve

-OBT: vacuum distillation of urine sample at low temperature (weakness of the link ^3H -Thymidine) to separate tritiated water, or direct measurement of OBT by dilution of the urine distillation residue and LS of the solution.

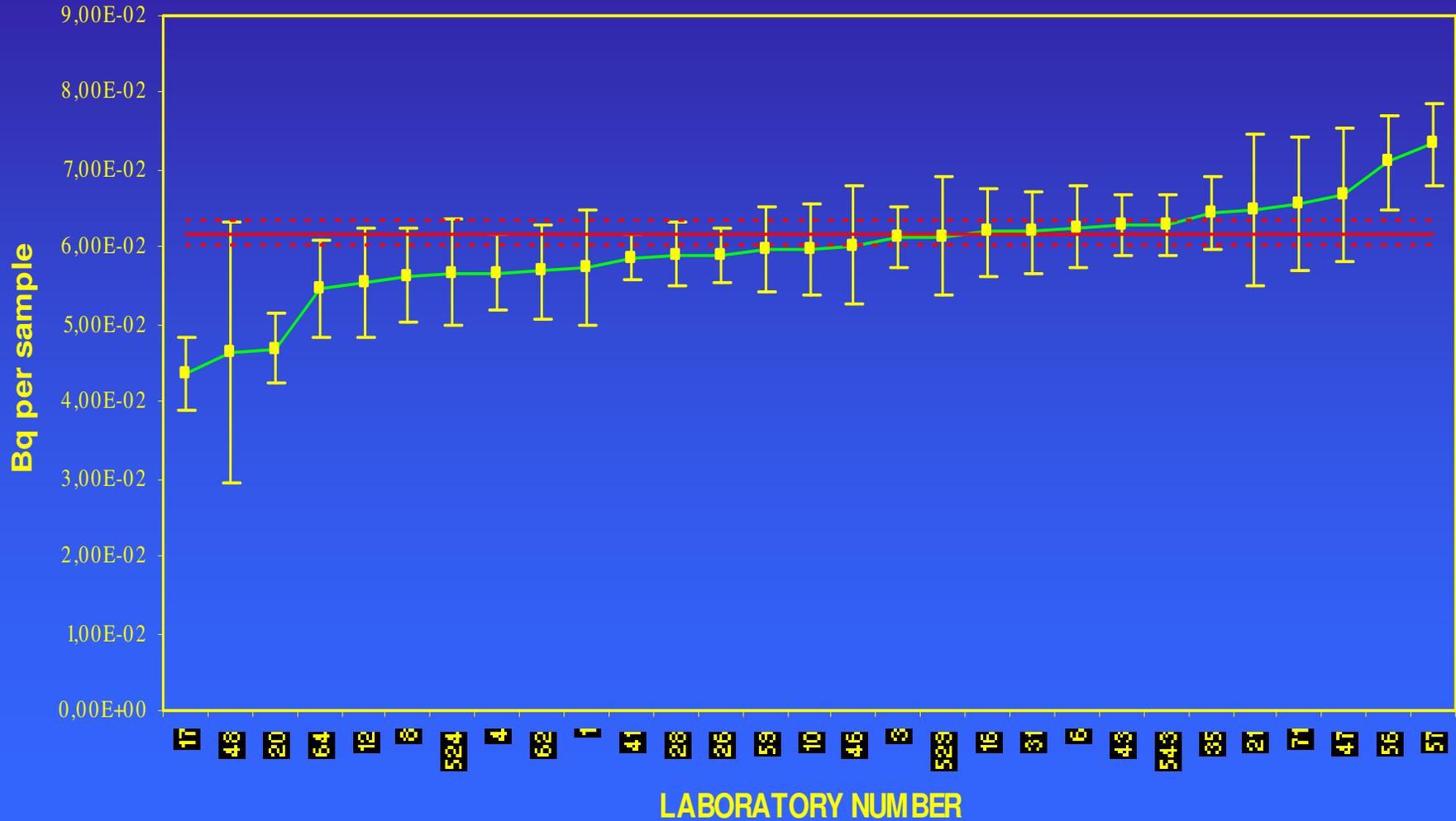


Graph of the results (1)

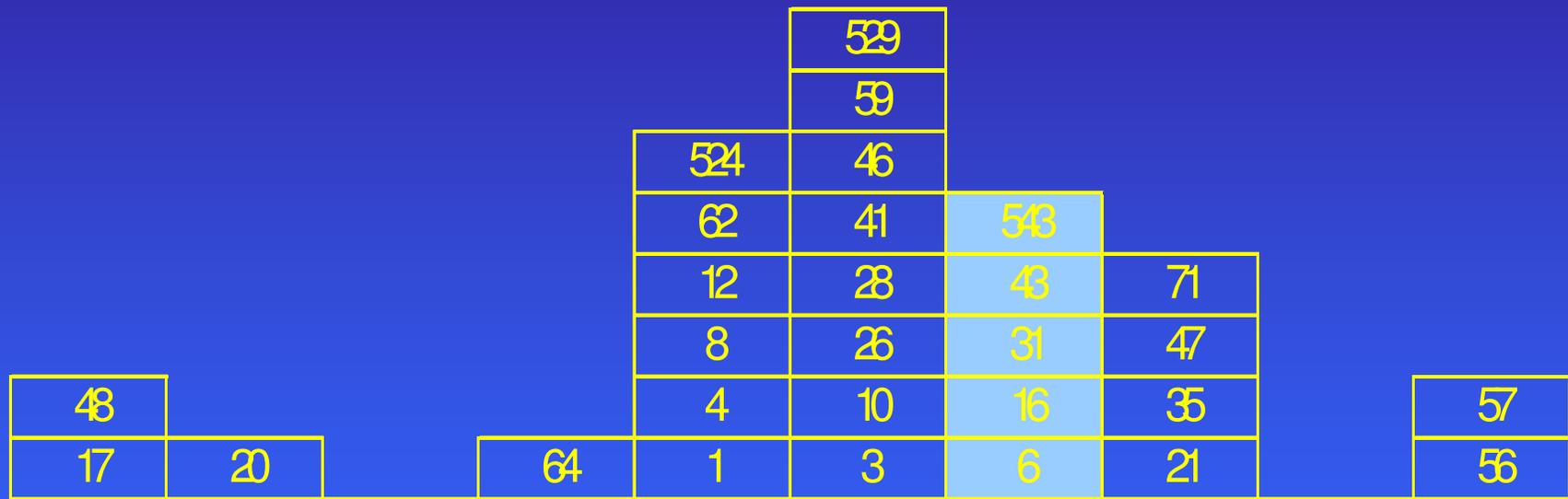




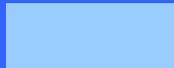
Graph of the results (2)



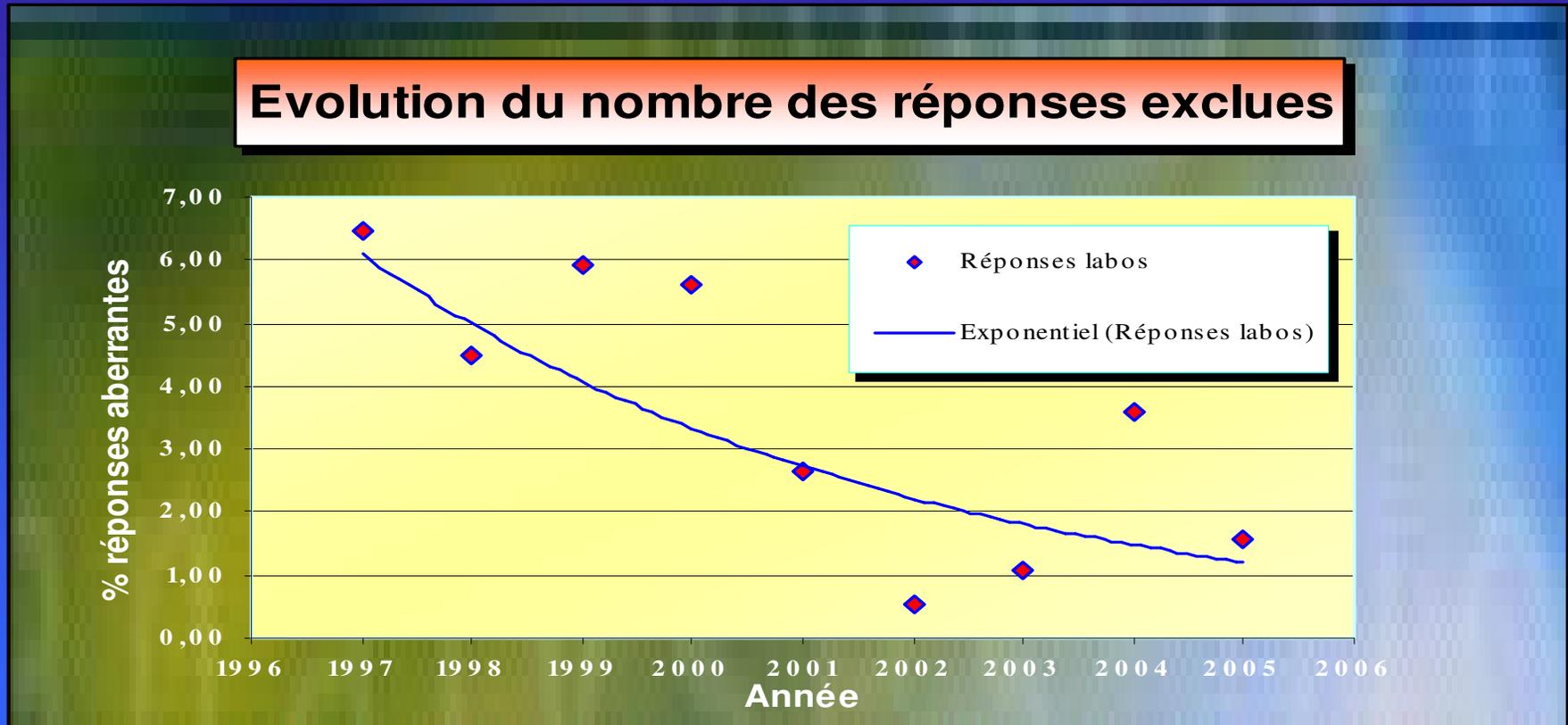
Graph of the results (3)



4,36E02	>4,66E02	>4,95E02	>5,25E02	>5,55E02	>5,85E02	>6,14E02	>6,44E02	>6,74E02	>7,03E02
←4,66E02	←4,95E02	←5,25E02	←5,55E02	←5,85E02	←6,14E02	←6,44E02	←6,74E02	←7,03E02	7,33E02

 Column target value

Results obtained for tritiated water in urine



The quality of the results has been quite remarkable for many years now, with a constant decrease in outliers

Results obtained for OBТ in urine (2005)

-Results give an overestimation of 6% between the mean value and the (uncertified) target value. The ageing of the source since 2003 might explain the 5.4% increase in tritiated water. So we had only 2 outlier labs.

-9 labs measured the distillation residue and also supplied the calculated value (T activity – Tritiated water activity).

-3 labs provided results for tritiated thymidine without indicating the techniques they used, other than distillation?!

PROCORAD

Advantages of PROCORAD

- 👍 ***Fast processing of the data and notification of your results***
- 👍 ***Guaranteed homogeneity and security of data handling (website \Rightarrow Procostat)***
- 👍 ***Anonymity ensured***
- 👍 ***Certified values provided by accredited manufacturers***

PROCORAD

Advantages of PROCORAD

- 👍 Selection and publication of the best and most accurate methods for the benefit of PROCORAD members***
- 👍 High level of scientific discussion at the annual meeting and on line via the forum session on the website***



Thank you for your attention !