

NORIP subproject

National Haematological Reference
Value Study in Finland

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Turku - Finland

Measurands included in the study:

B-Eryt	E-MCH
B-Hb	E-MCHC
B-Hkr	E-MCV
B-Leuk	B-Trom

Kierros	Sairaala
Lokakuu 1999 (n = 6)	HYKS, Helsinki Kainuun KS, Kajaani Kymenlaakson KS, Kotka Laakson sairaala, Helsinki OYS, Oulu Peijaksen sairaala, Vantaa
Tammikuu 2000 (n = 9)	Keskussotilassairaala, Helsinki Loimaan AS, Loimaa Pohjois-Karjalan KS, Joensuu Sairaala Lapponia, Kemijärvi Sairaala Mehiläinen, Helsinki Seinäjoen sairaala, Seinäjoki TAYS, Tampere Västra Nylands Kretssjukhus, Ekenäs Yhtyneet Laboratoriot Oy, Helsinki
Huhtikuu 2000 (n = 17)	Etelä-Karjalan KS, Lappeenranta Kanta-Hämeen KS, Hämeenlinna Keski-Pohjanmaan KS, Kokkola Kuusankosken AS, Kuusankoski Lapin KS, Rovaniemi Lohjan AS, Lohja Länsi-Pohjan KS, Kemi Medix Diacor, Espoo Mikkelin KS, Mikkeli Päijät-Hämeen KS, Lahti Rauman AS, Rauma Salon AS, Salo Satakunnan KS, Pori Savonlinnan KS, Savonlinna TYKS, Turku Vaasan KS, Vaasa Valkeakosken AS, Valkeakoski

Design of the study

- number of reference individuals: **821** (406 men, 439 women)
- Ages: evenly distributed between 18 and 85 years of age
- number of participating laboratories across Finland: **25**

- each laboratory collected three (3) EDTA-tubes of blood from reference individuals attending the NORIP study
- all laboratories used similar blood collection tubes centrally distributed by Labquality (liquid EDTA, with 3 mL draw capacity)
- **tube no. 1:** Analysed like a routine sample on the same day
- **tube no. 2:** Stored in room temperature until analysis on the following day
- **tube no. 3:** Sent as an ordinary overnight mail to Helsinki, where analysed on the following day

Presentation of results in Graphs:

Graph 1 : CUSUM-graph

x: reference individual

y: cumulative difference of

HELSINKI RESULT – LOCAL RESULT ON DAY 2. (M-L2)

Graph 2: x: date of analysis of reference samples

y: Laboratory average of M-L2

Graph 3: x: Laboratory average of M-L2

y: Laboratory average of LOCAL RESULTS ON DAY 2

minus LOCAL RESULT ON DAY 1 (L2-L1)

Graph 4: REFERENCE VALUES ON AGE

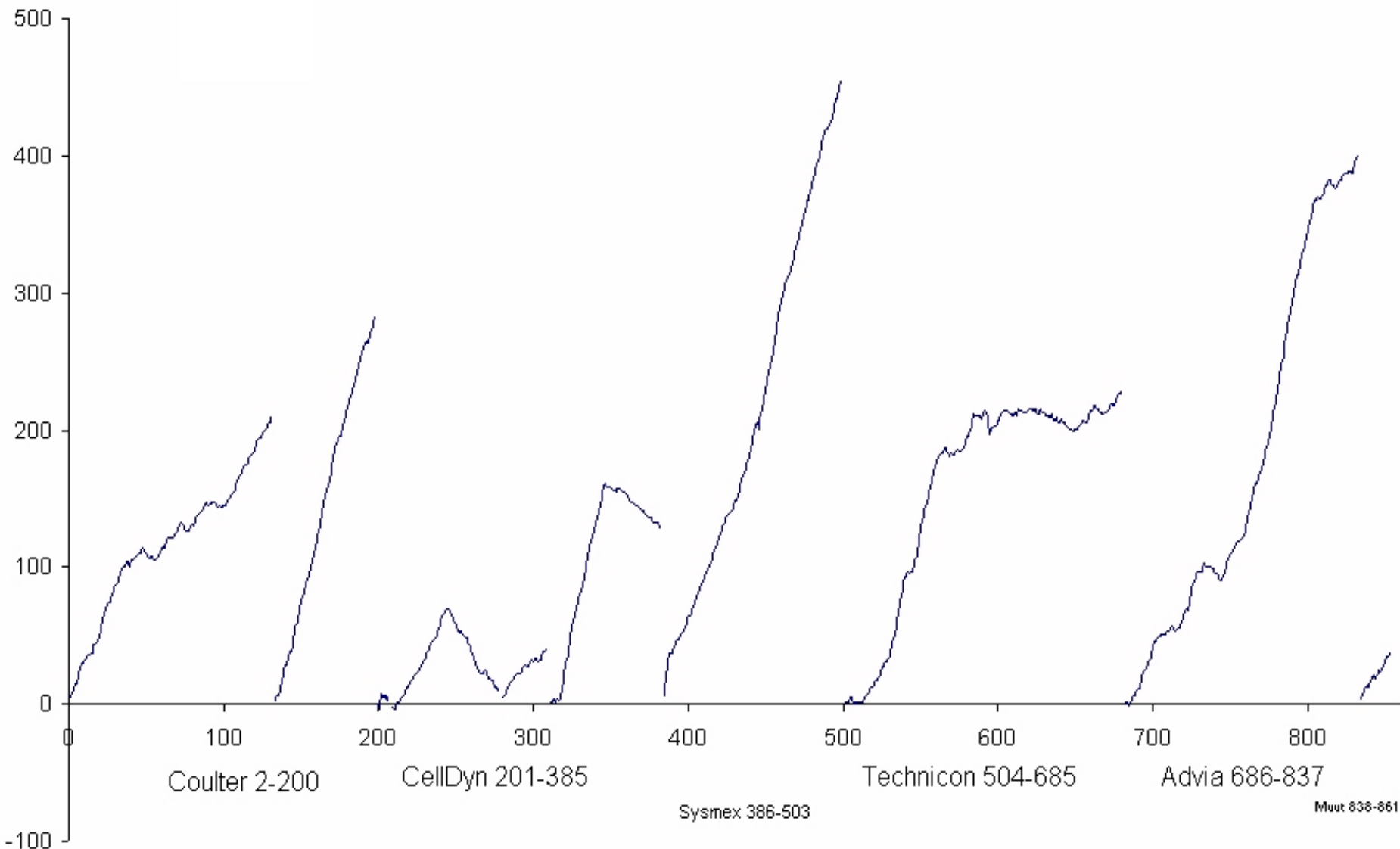
x: age in years

y: Local result on day 1. (L1)

Some laboratories may have used two different methods to analyze part of the samples, in such cases two laboratory averages, one for each method, have been calculated.

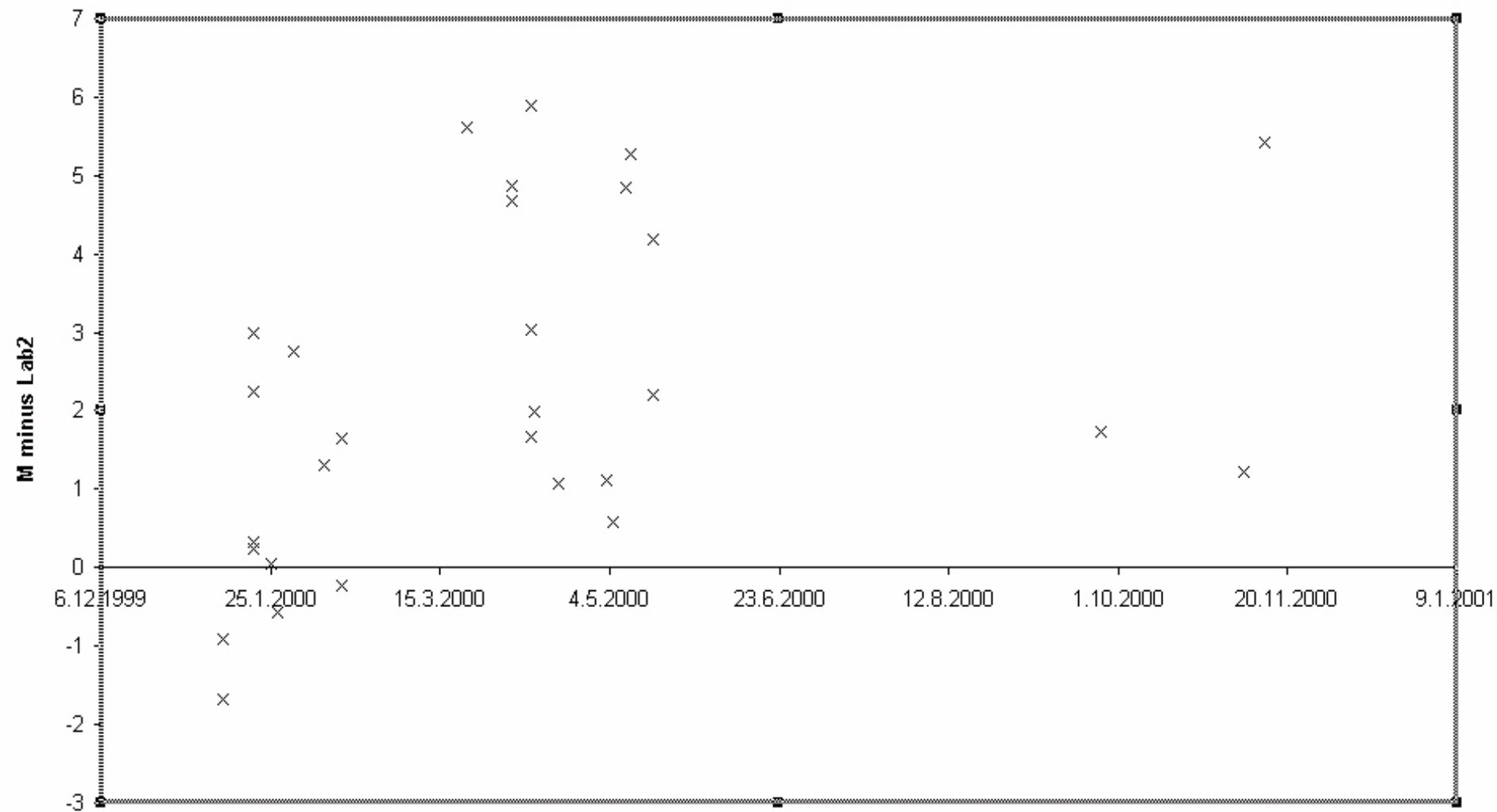
CUSUM-graph

Hemoglobin



x: number of reference individual (results from one laboratory and laboratories with similar method are consecutive)
y: Cumulative sum of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2 (the value is reset to zero after change of the method group).

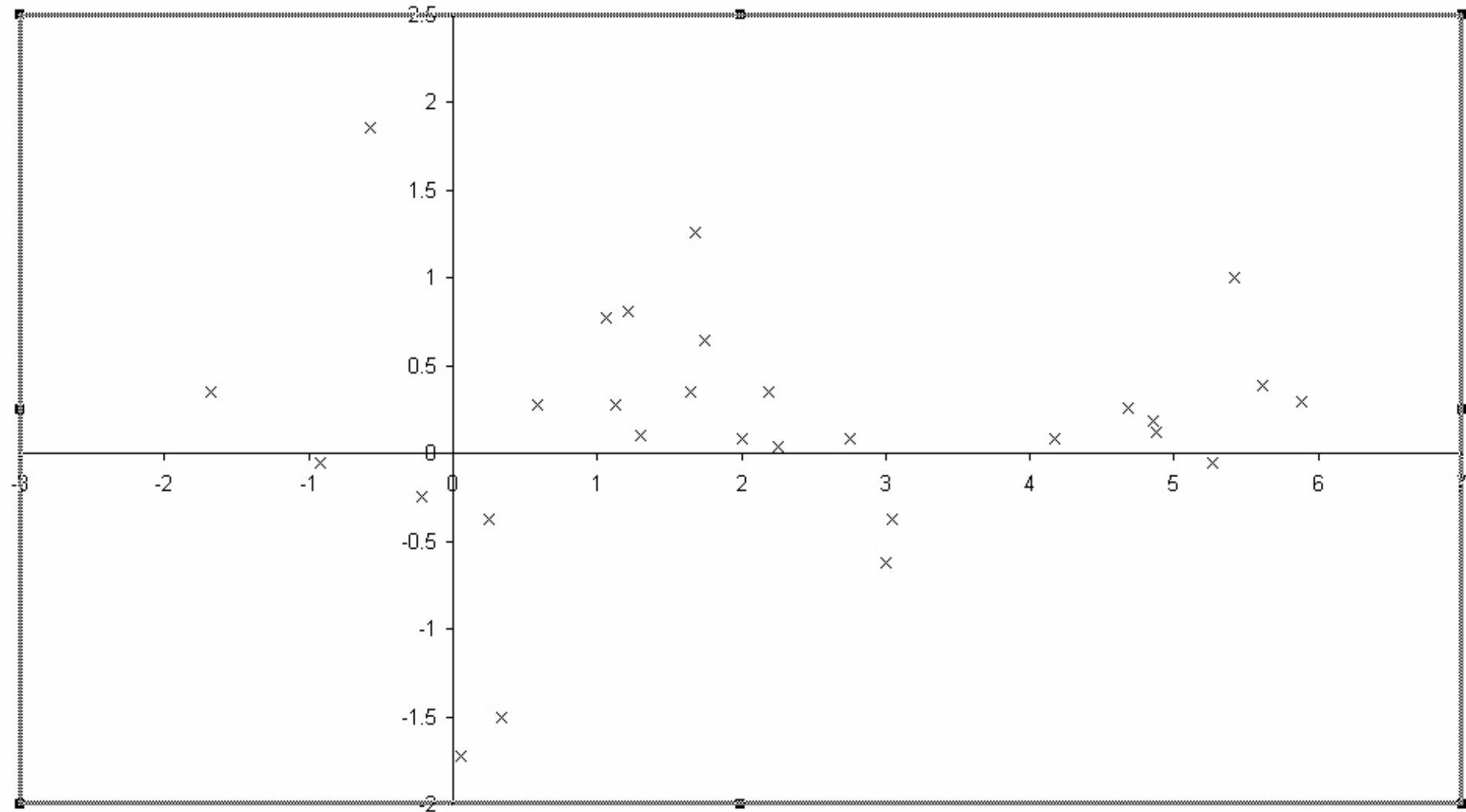
Hemoglobin



x: Date (day 1) of analysis of reference samples

y: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

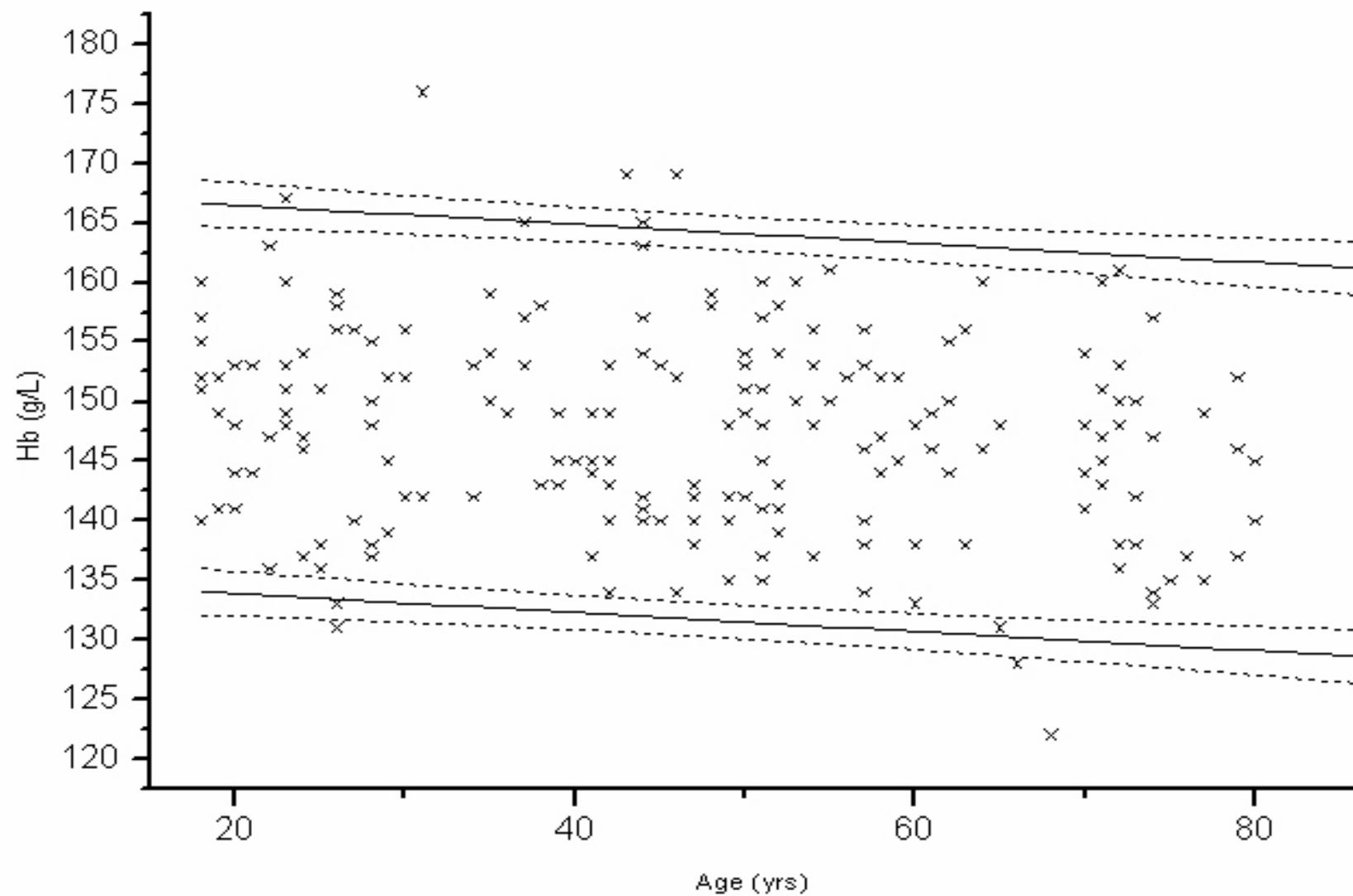
Hemoglobin



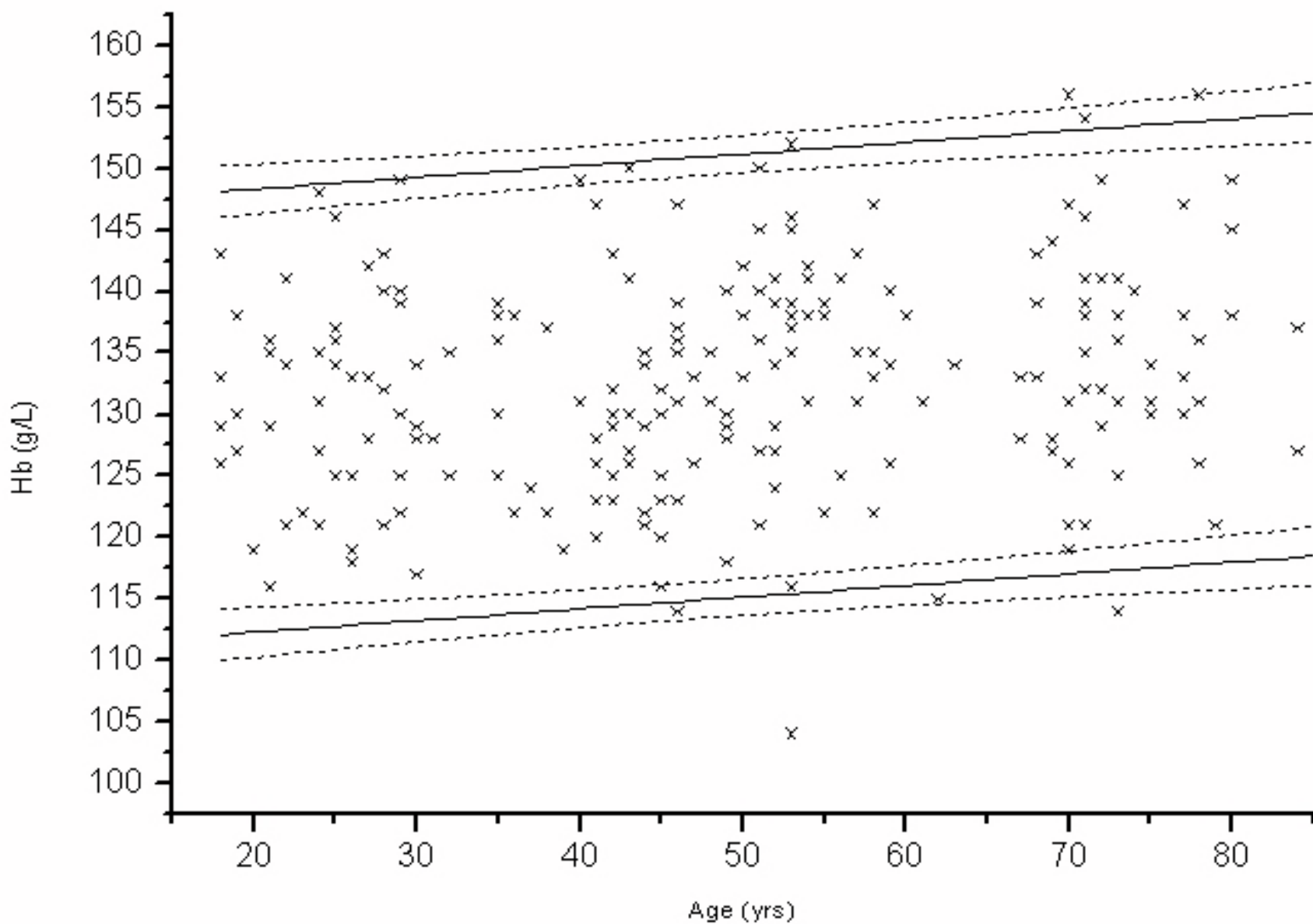
x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

Hemoglobin (men)



Hemoglobin (women)



Hemoglobin: men:

131 - 164 g/L

or

men at 20 yrs

134 - 166 g/L

(R² of age appr. 3%)

men at 40 yrs

132 - 165 g/L

men at 60 yrs

131 - 163 g/L

men at 80 yrs

129 - 162 g/L

women:

115 - 152 g/L

or

women at 20 yrs

112 - 148 g/L

(R² of age appr. 3%)

women at 40 yrs

114 - 150 g/L

women at 60 yrs

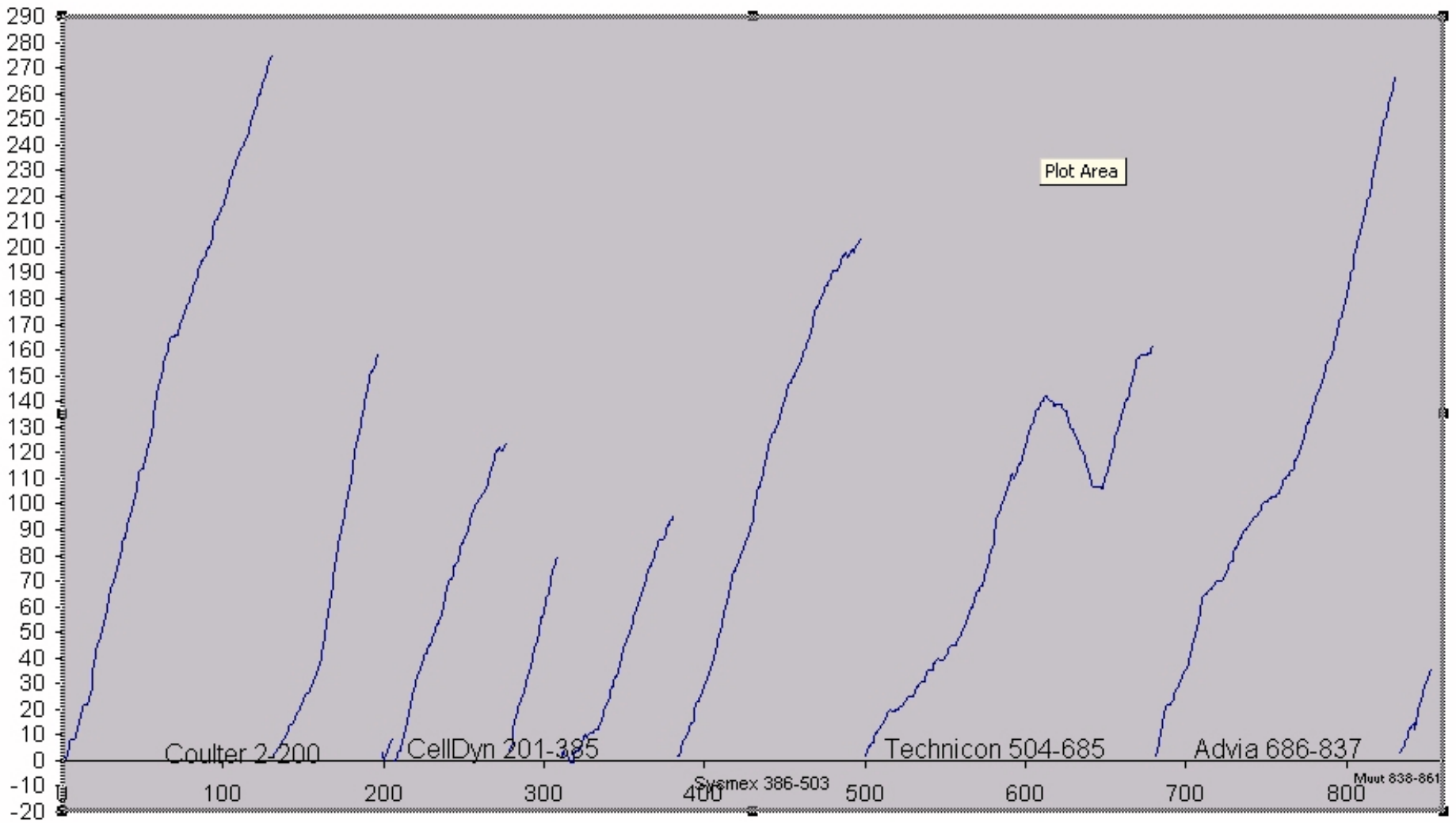
116 - 152 g/L

women at 80 yrs

118 - 154 g/L

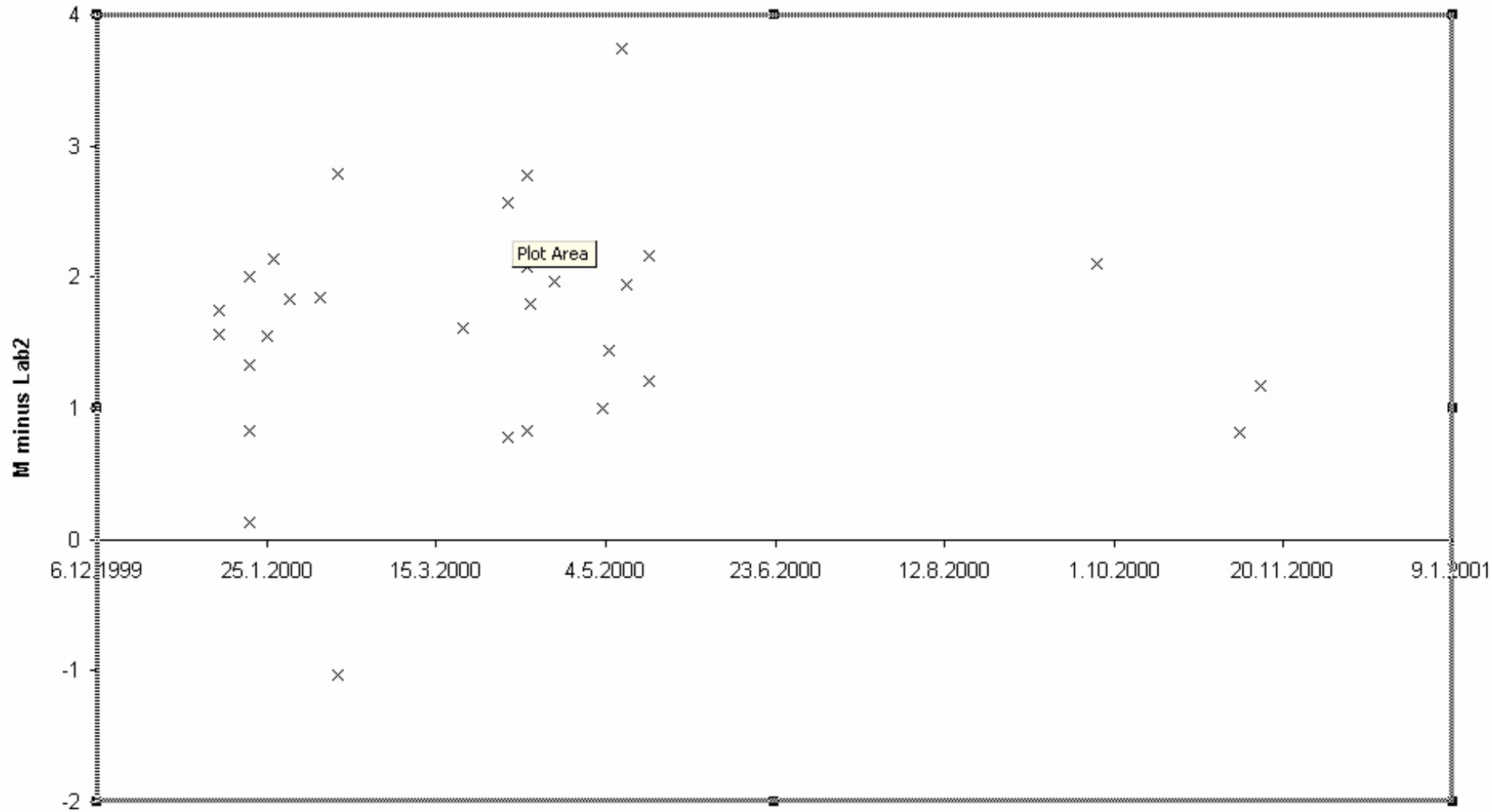
CUSUM-graph

Hematocrit



- x: number of reference individual (values from one laboratory and laboratories with similar method are consecutive)
- y: Cumulative sum of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2 (the value is reset to zero after change of the method group).

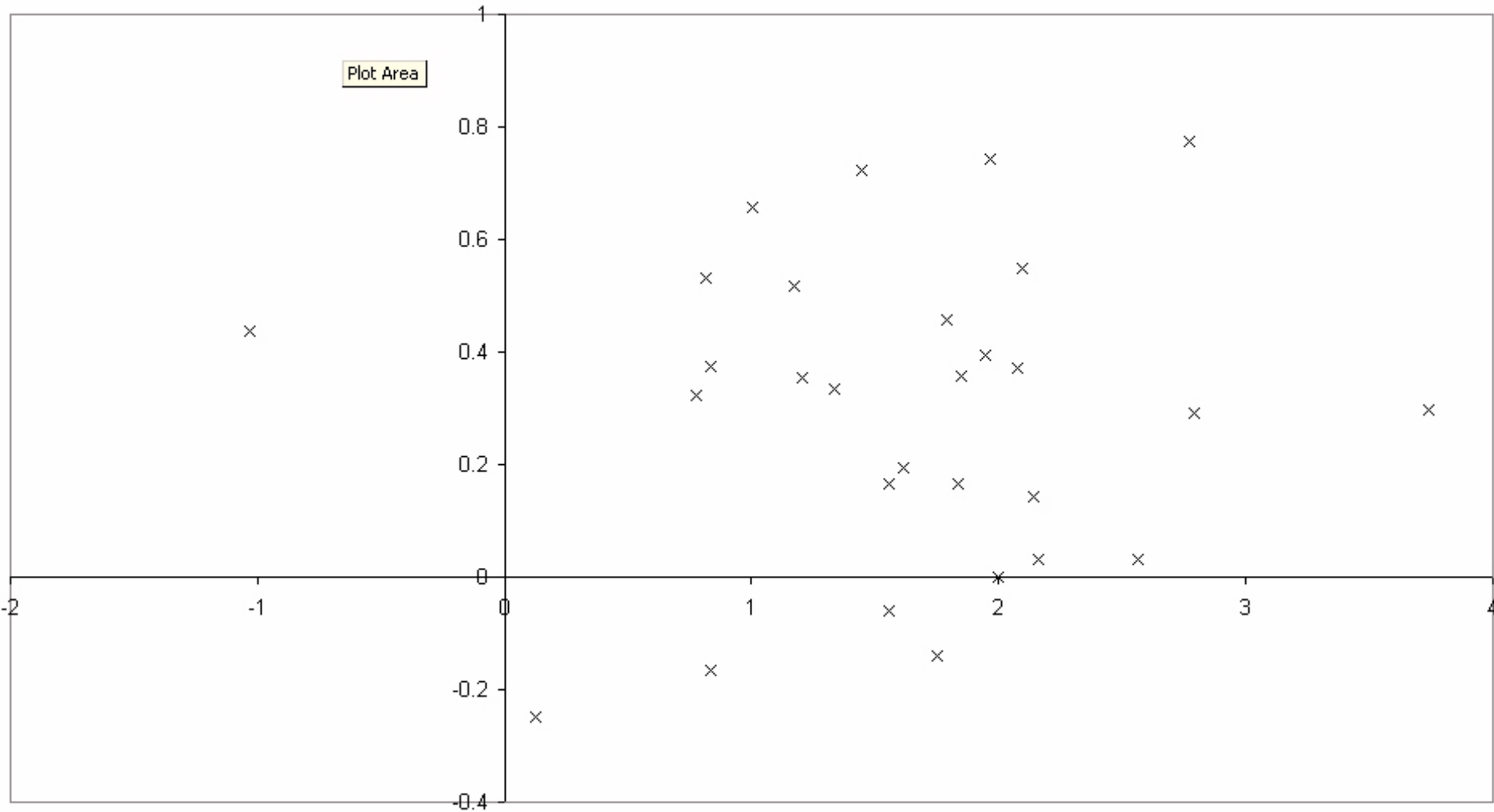
Hematocrit



x: Date (day 1) of analysis of reference samples

y: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

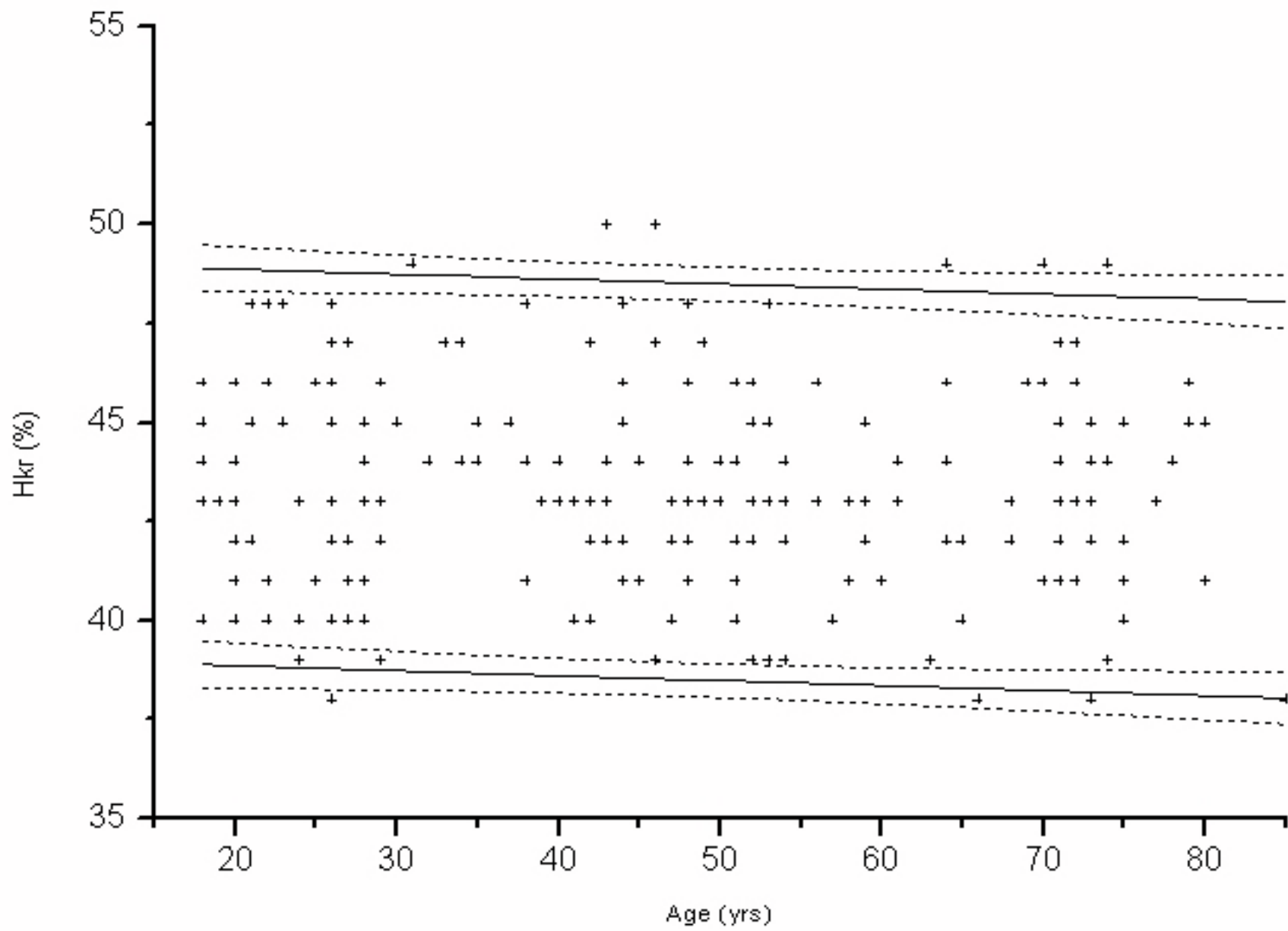
Hematokriitti



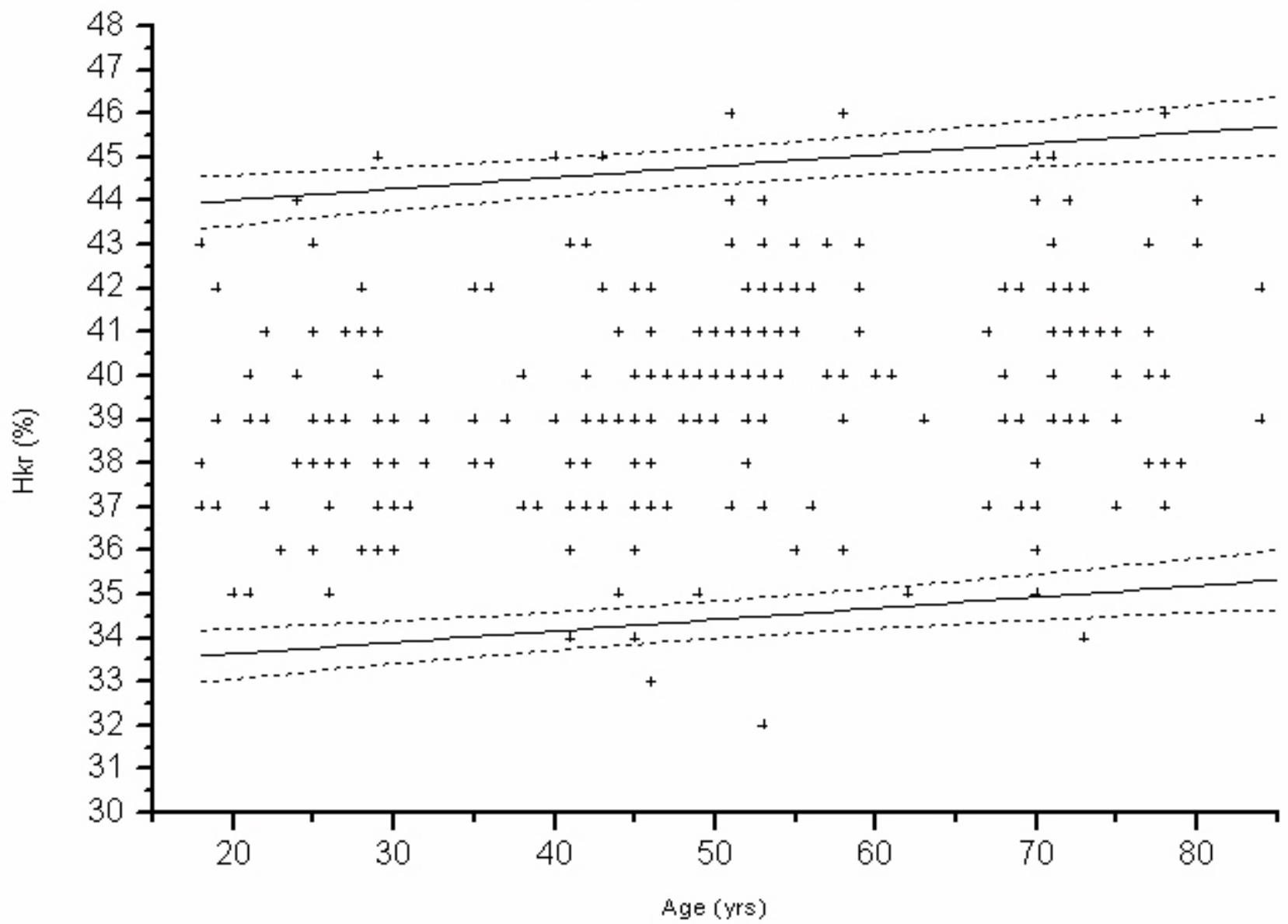
x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

Hkr (men)



Hkr (women)



Hematocrit: men: 38 - 49 %

women: 34 - 45 %

or

women at 20 yrs 34 - 44 % (R² of age appr. 3%)

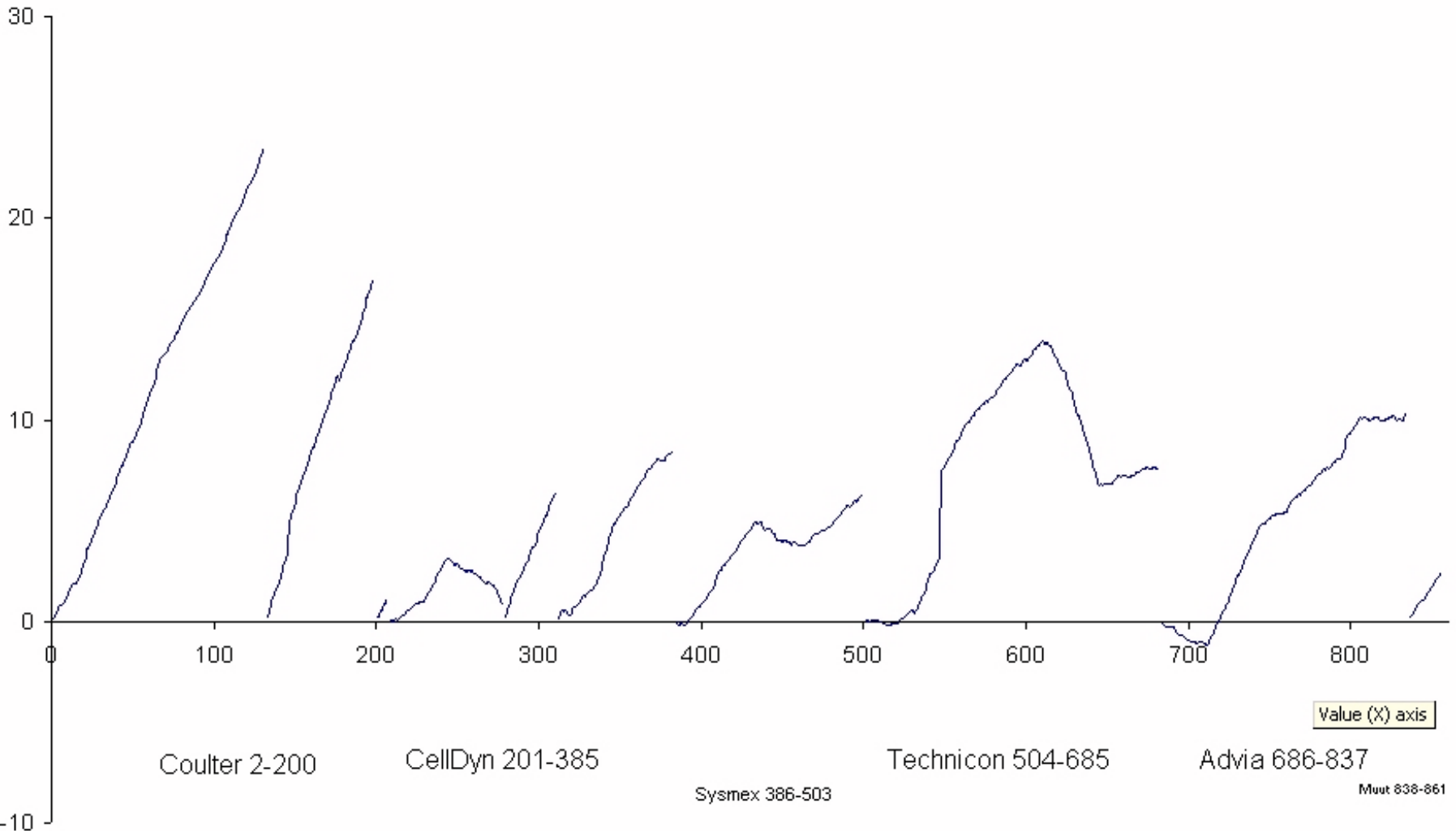
women at 40 yrs 34 - 45 %

women at 60 yrs 35 - 45 %

women at 80 yrs 35 - 46 %

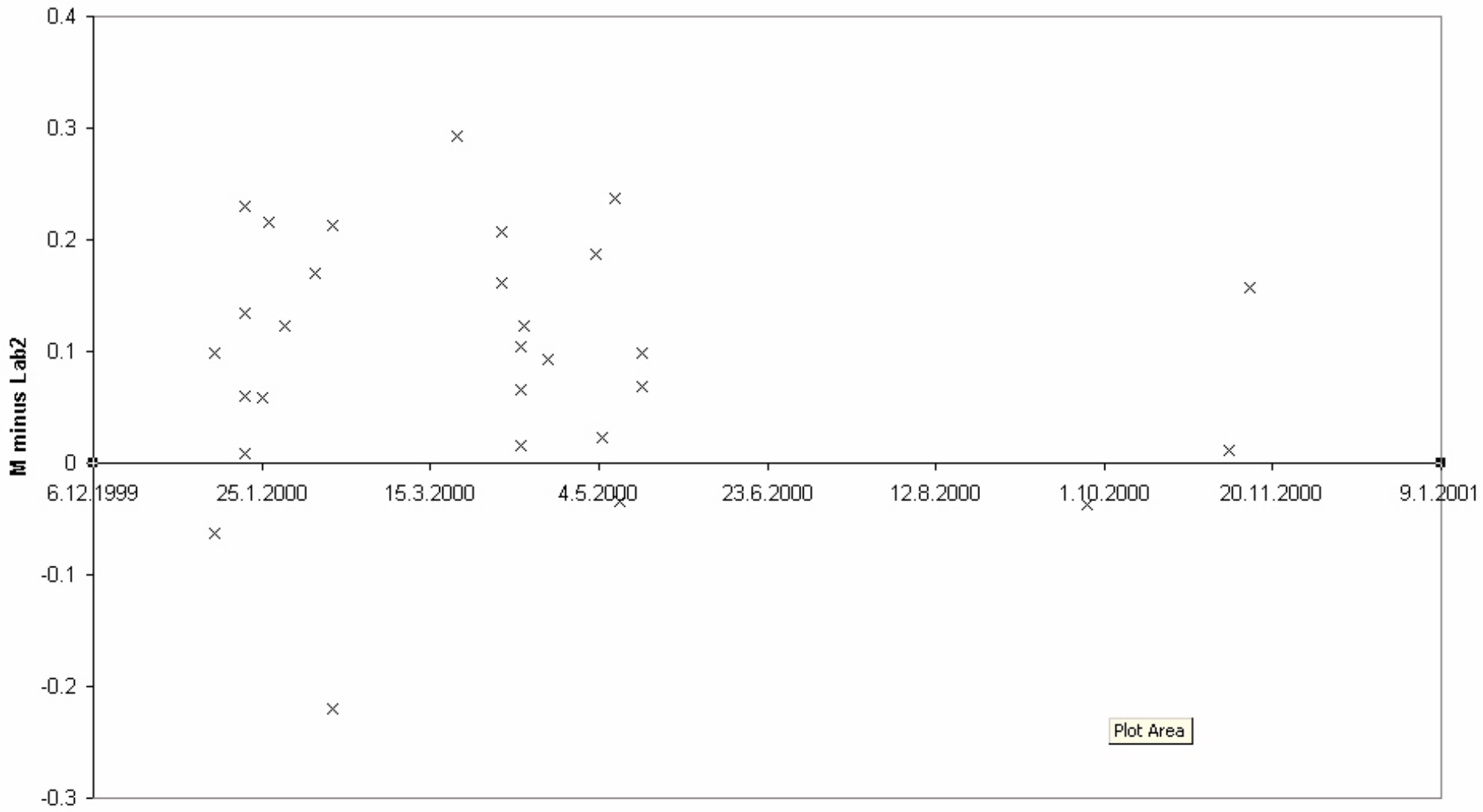
CUSUM-graph

Erytrosyytit



x: number of reference individual (values from one laboratory and laboratories with similar method are consecutive)
y: Cumulative sum of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2 (the value is reset to zero after change of the method group).

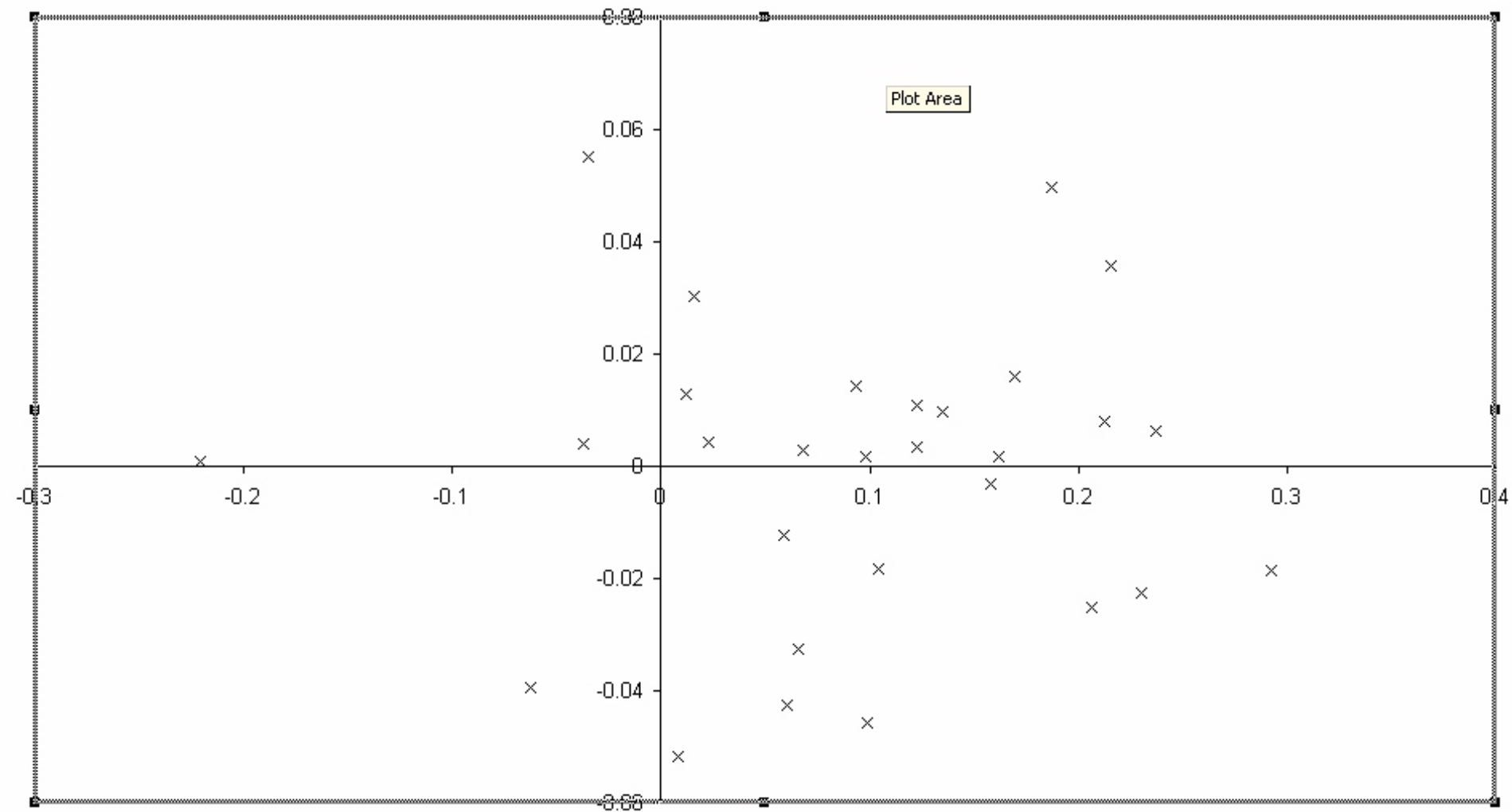
Red blood cells



x: Date (day 1) of analysis of reference samples

y: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

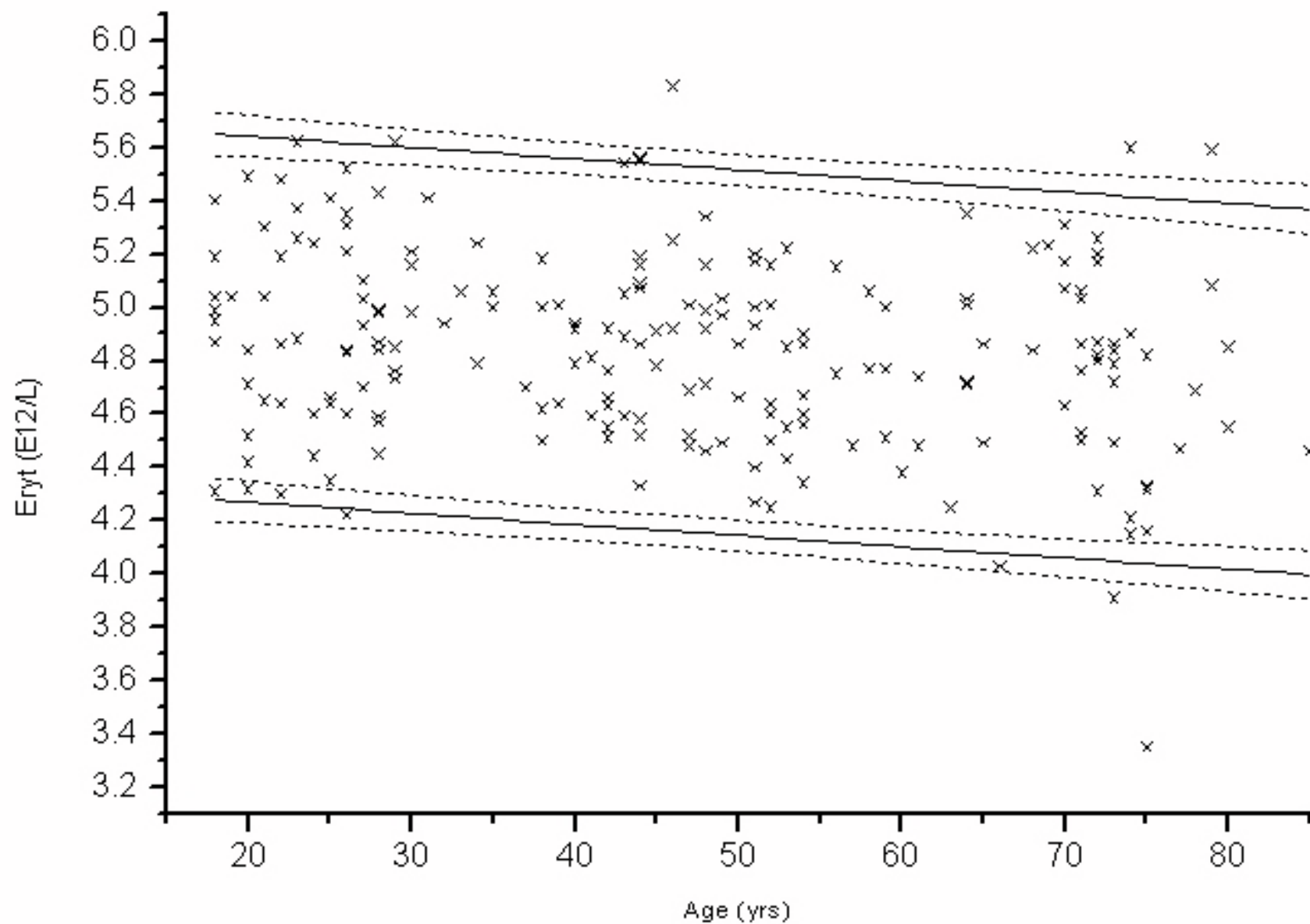
Red blood cells



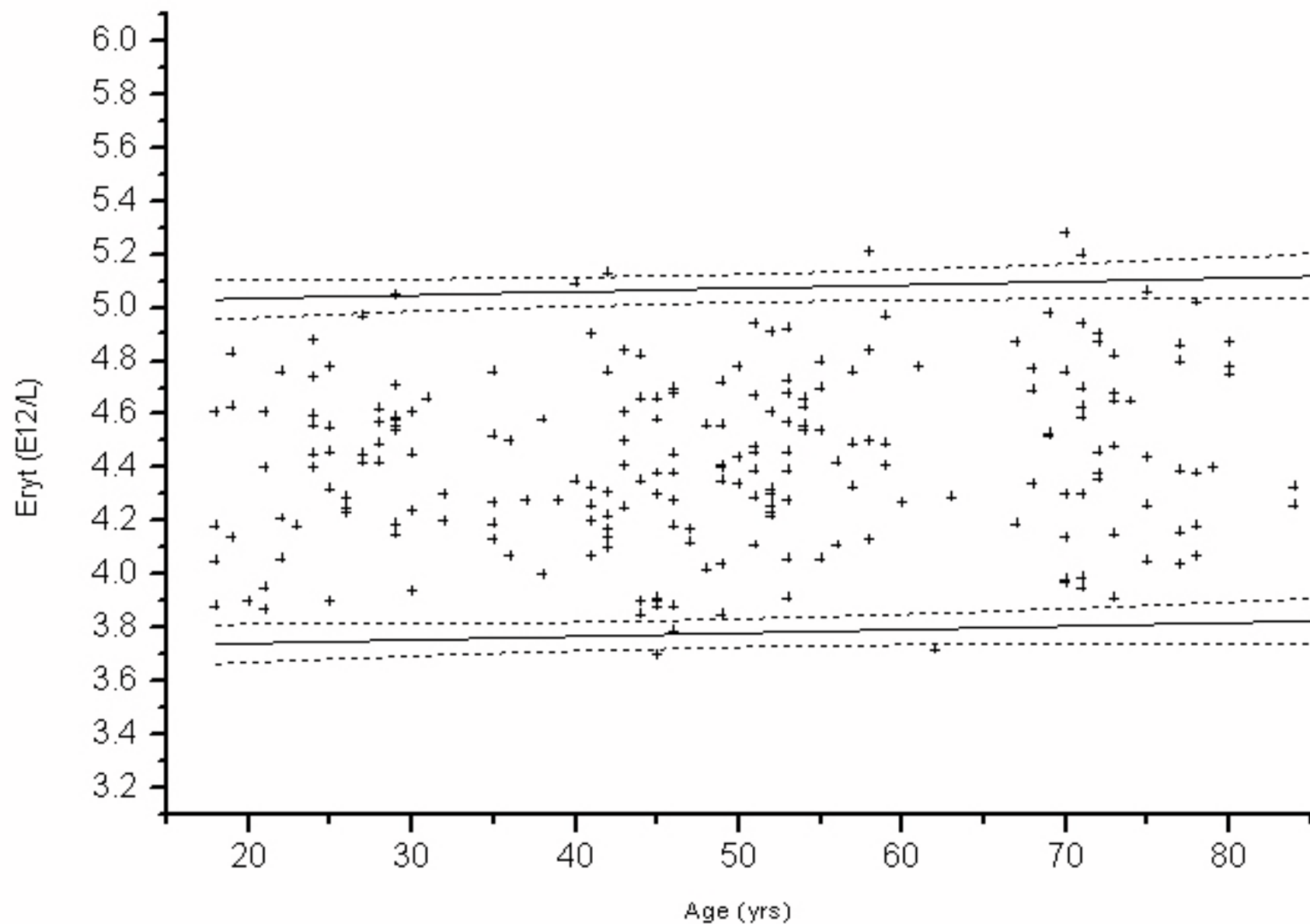
x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

Erythrocytes (men)



Erythrocytes (women)



Red Blood Cells

men: 4.20 - 5.60 x10¹²/L

or

men at 20 yrs 4.30 - 5.60 x10¹²/L (R² of age appr. 5%)

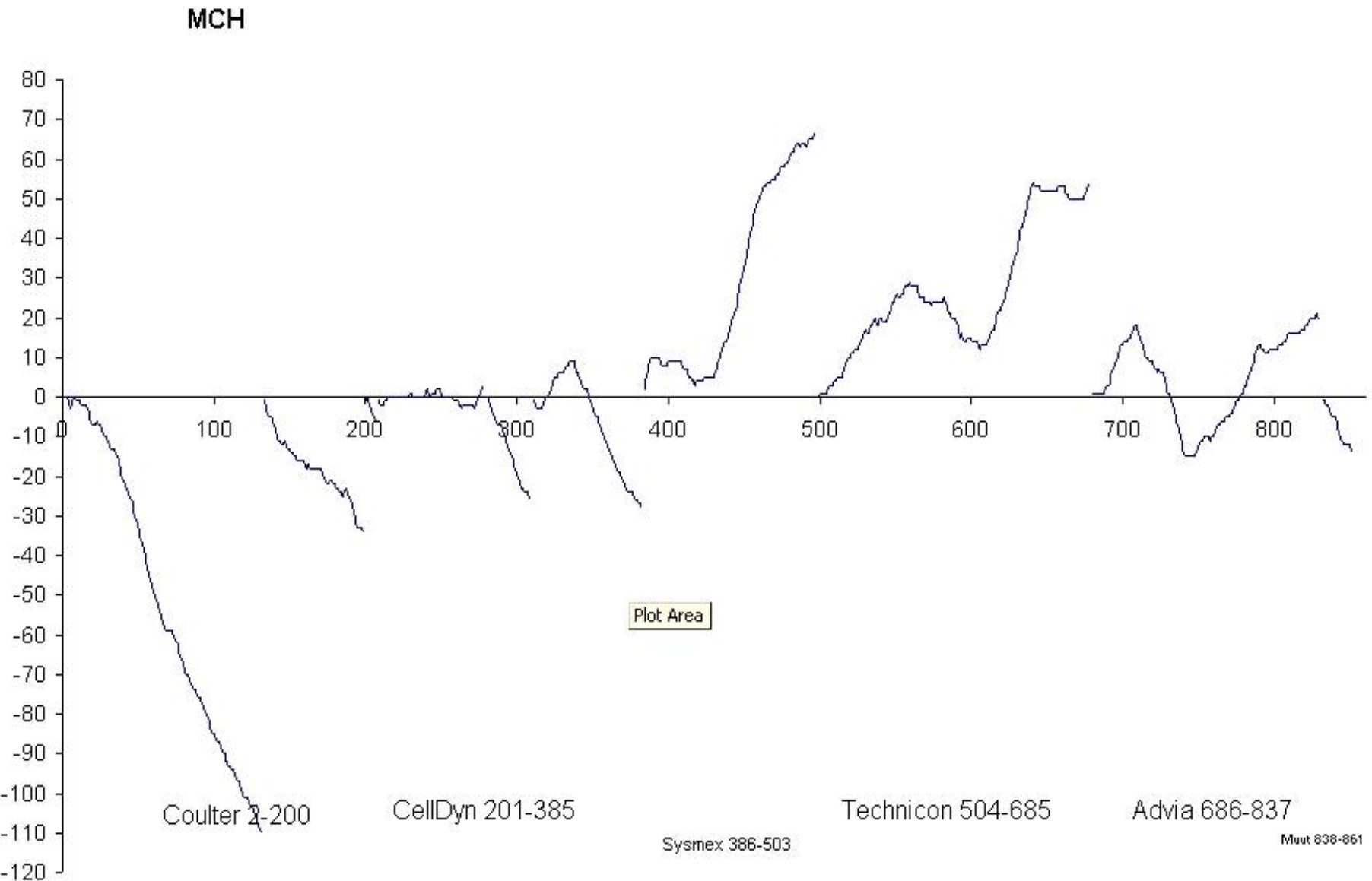
men at 40 yrs 4.20 - 5.60 x10¹²/L

men at 60 yrs 4.10 - 5.50 x10¹²/L

men at 80 yrs 4.00 - 5.40 x10¹²/L

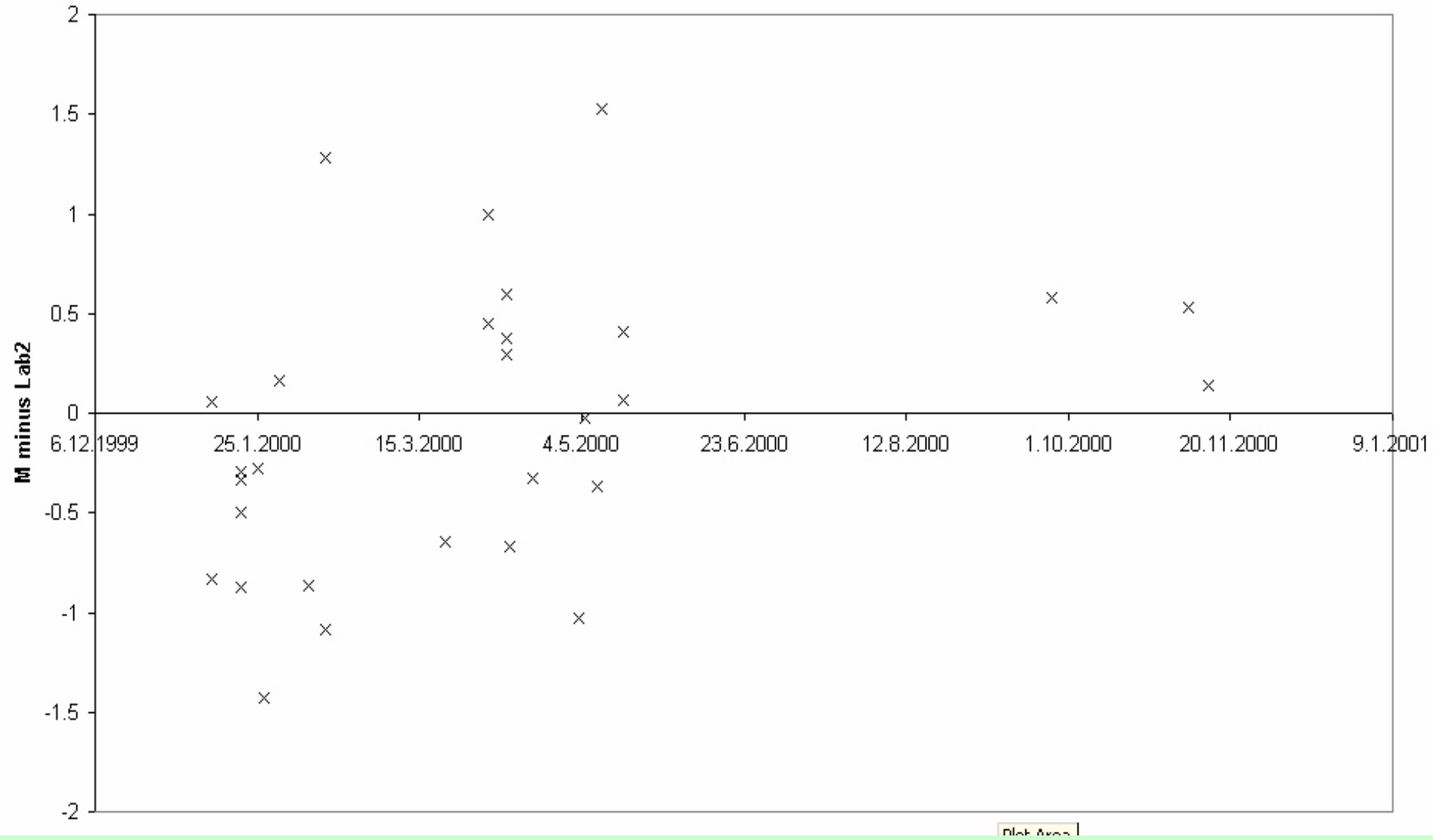
women: 3.80 - 5.10 x10¹²/L

CUSUM-graph



x: number of reference individual (values from one laboratory and laboratories with similar method are consecutive)
y: Cumulative sum of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2 (the value is reset to zero after change of the method group).

MCH

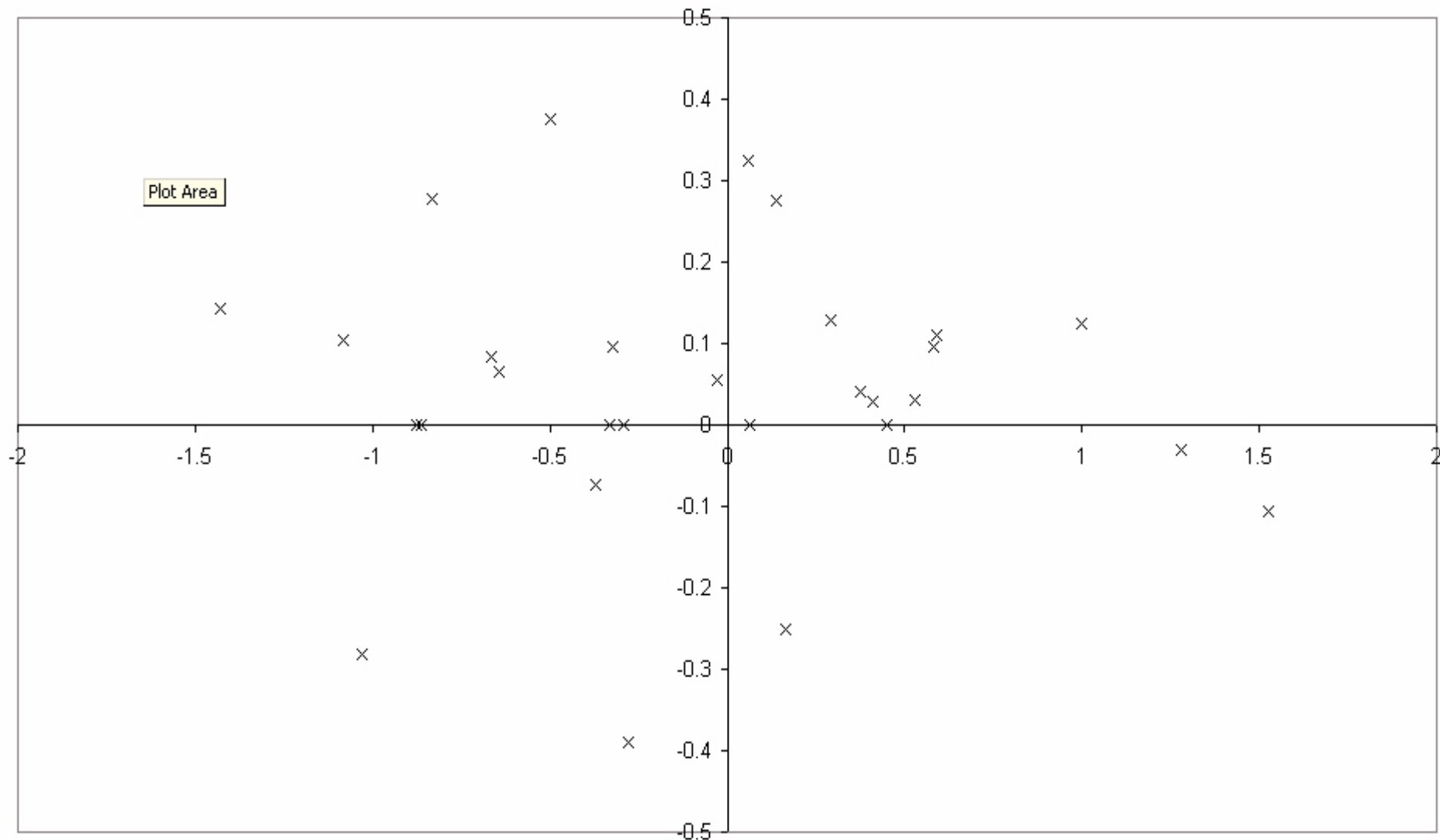


Plot Area

x: Date (day 1) of analysis of reference samples

y: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

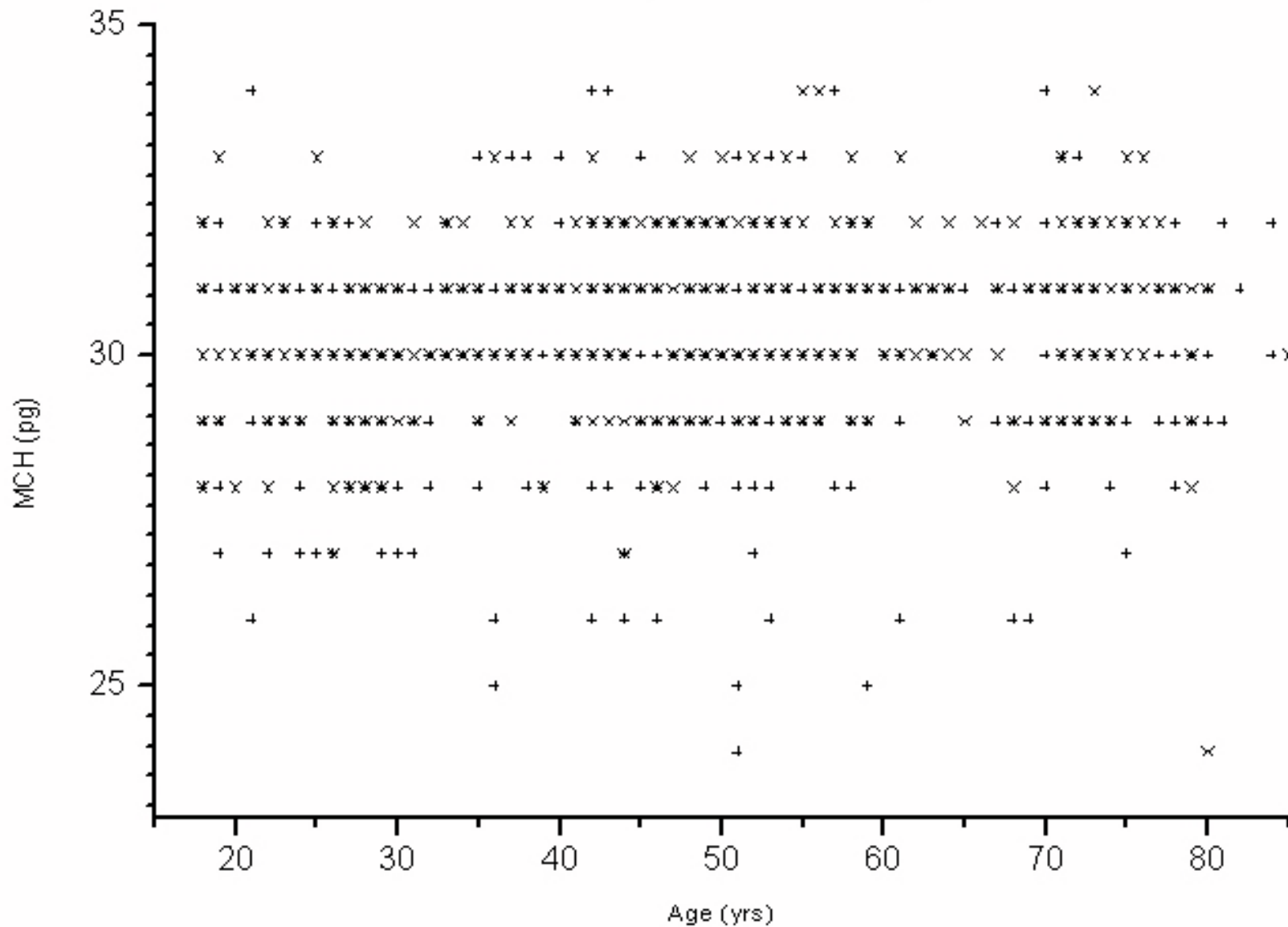
MCH



x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

MCH (men and women)



MCH

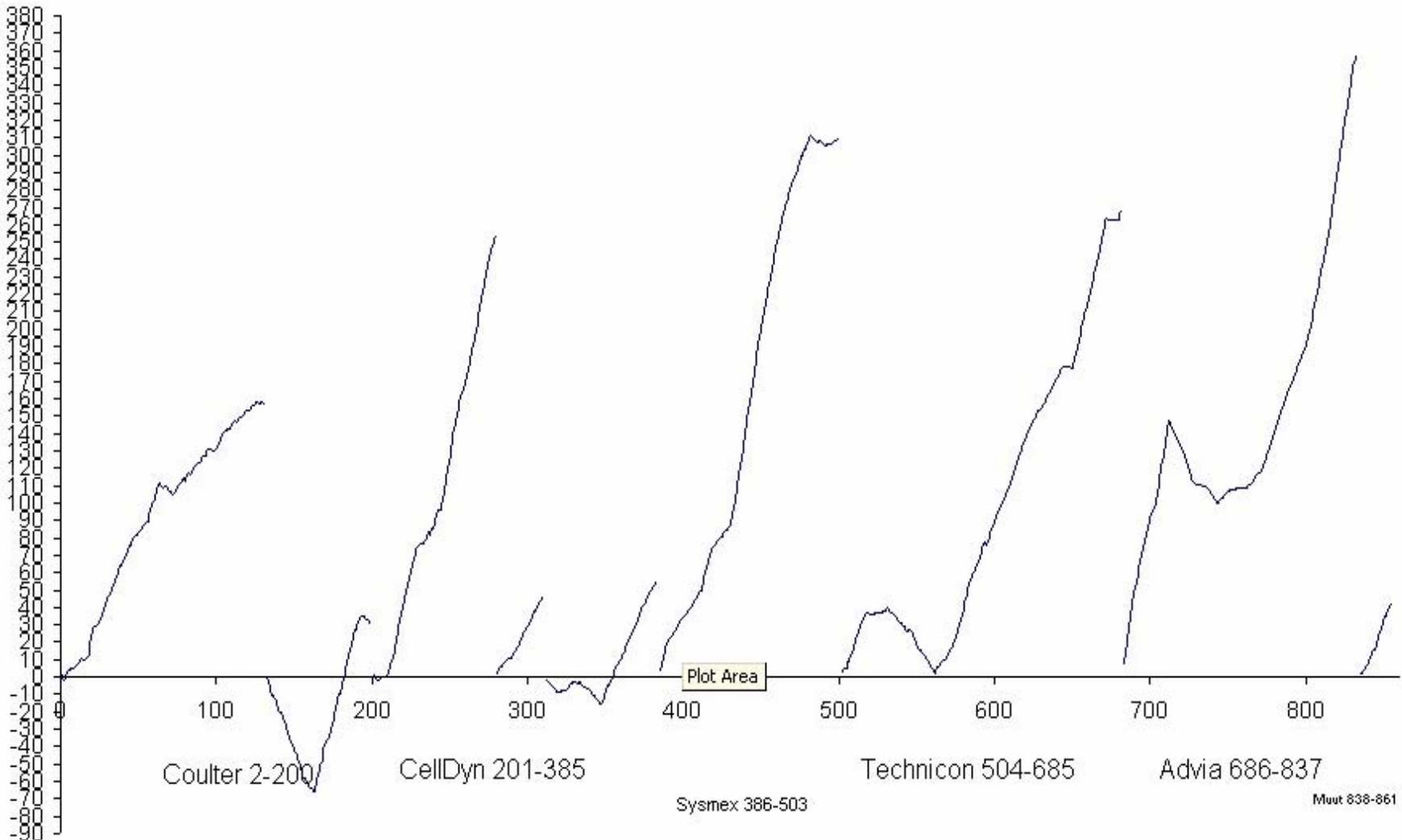
men and women: **27 - 33** **pg**

or

men: **28 - 33** **pg** (R² of gender apprx. 5%)
women: **26 - 33** **pg**

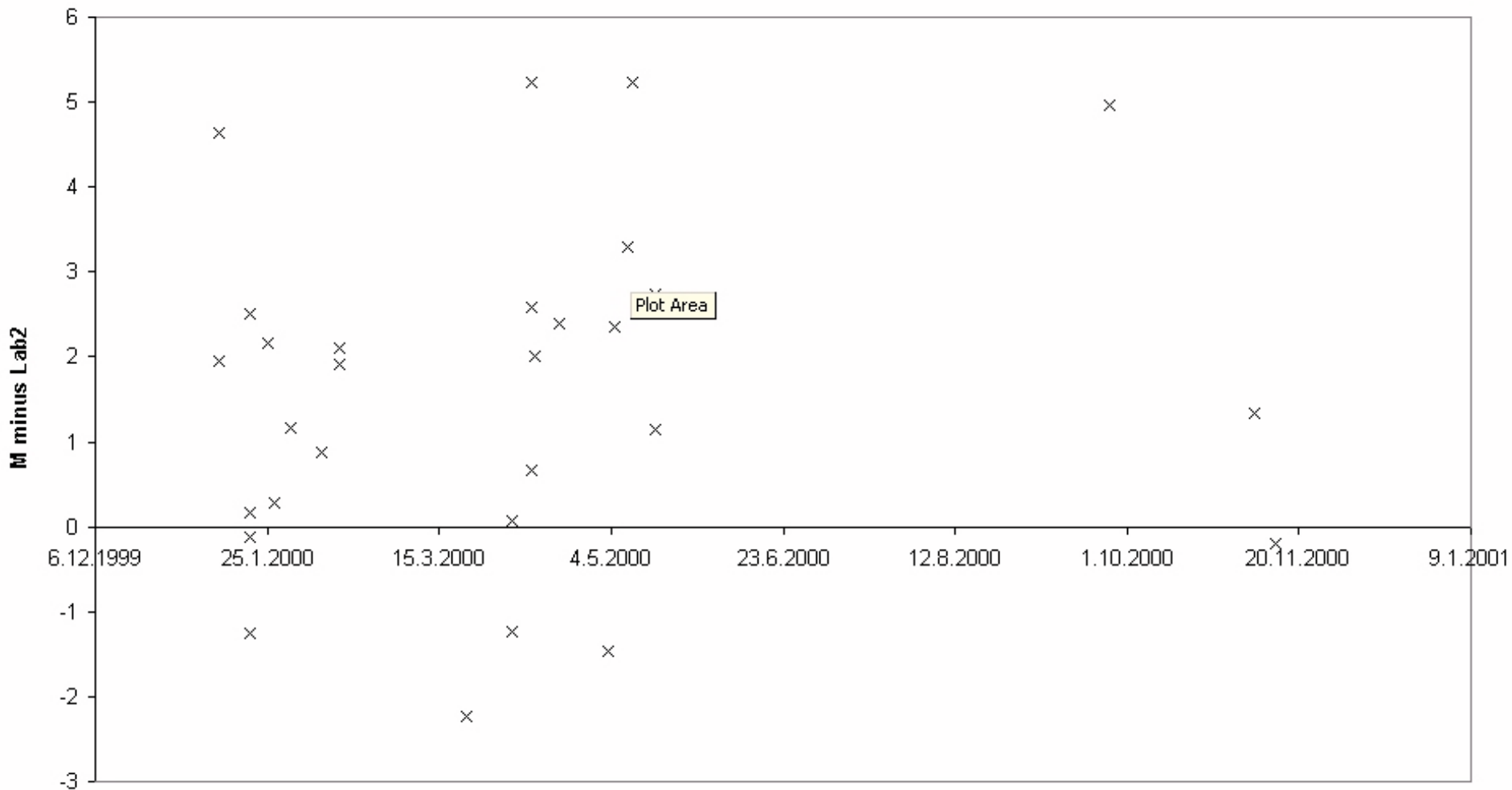
CUSUM-graph

MCV



- x: number of reference individual (values from one laboratory and laboratories with similar method are consecutive)
- y: Cumulative sum of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2 (the value is reset to zero after change of the method group).

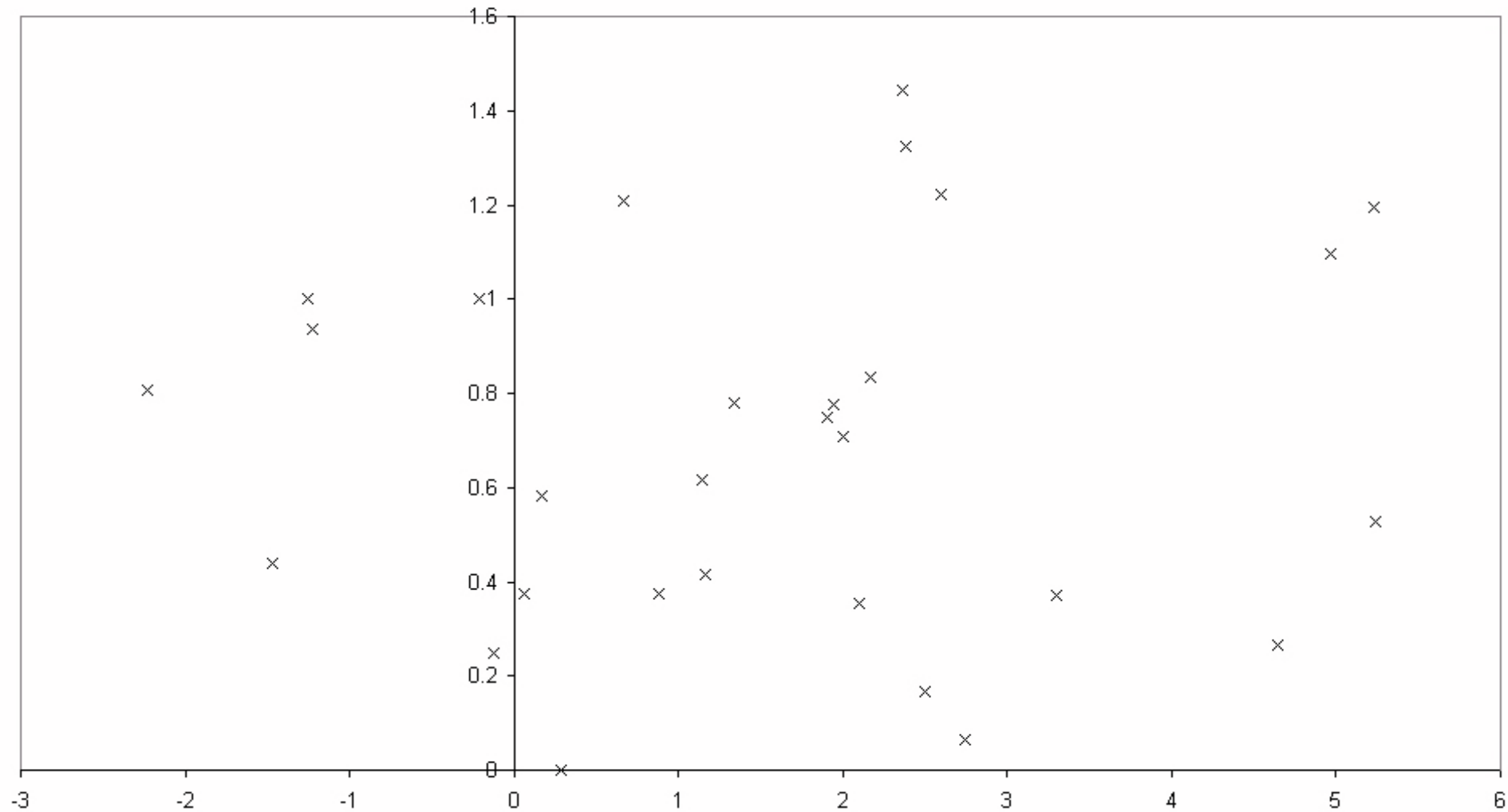
MCV



x: Date (day 1) of analysis of reference samples

y: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

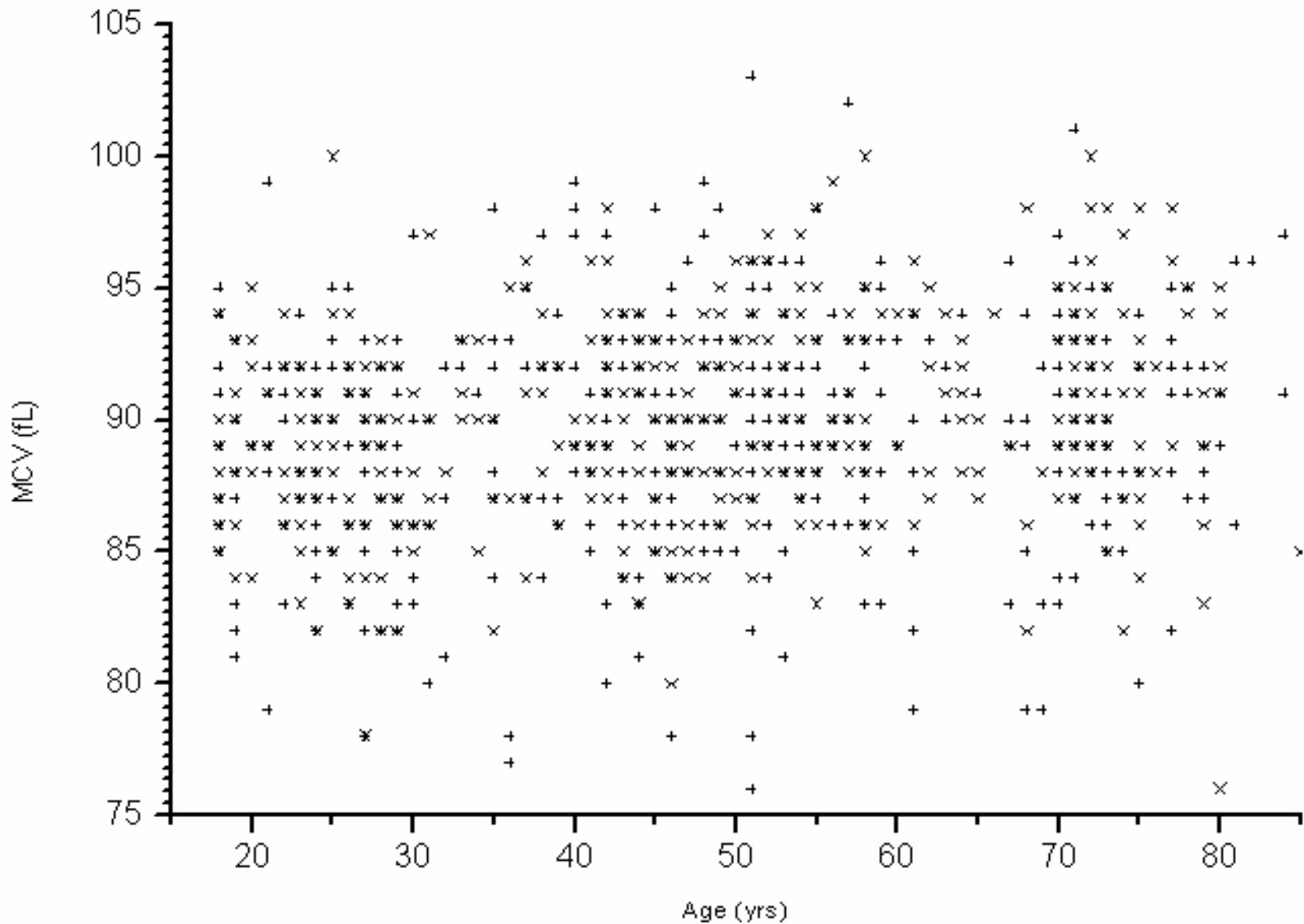
MCV



x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

MCV (men and women)



MCV:

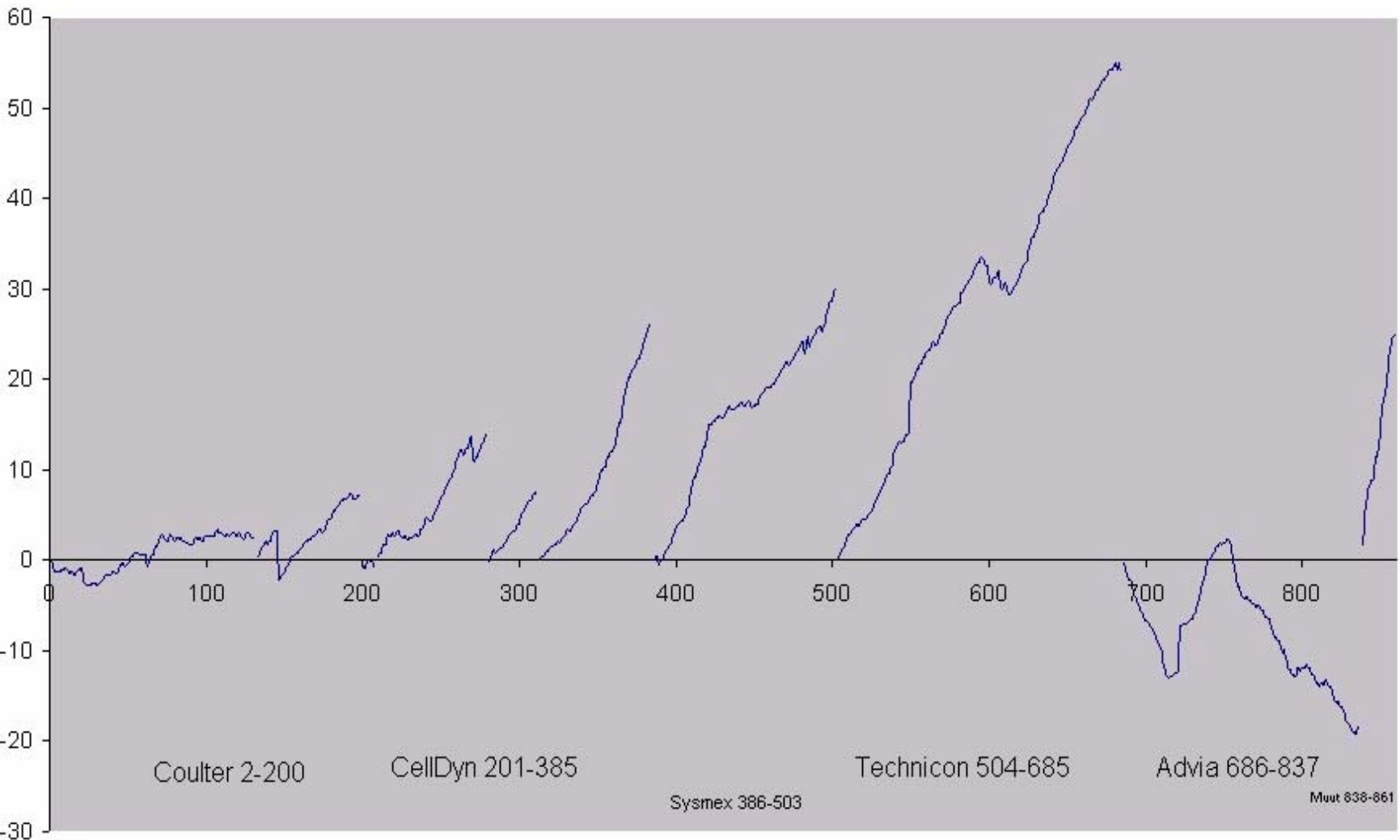
men and women: 82 - 98 fL

or

men:	82 - 98	fL	(R² of gender appr. 4%)
women:	80 - 98	fL	

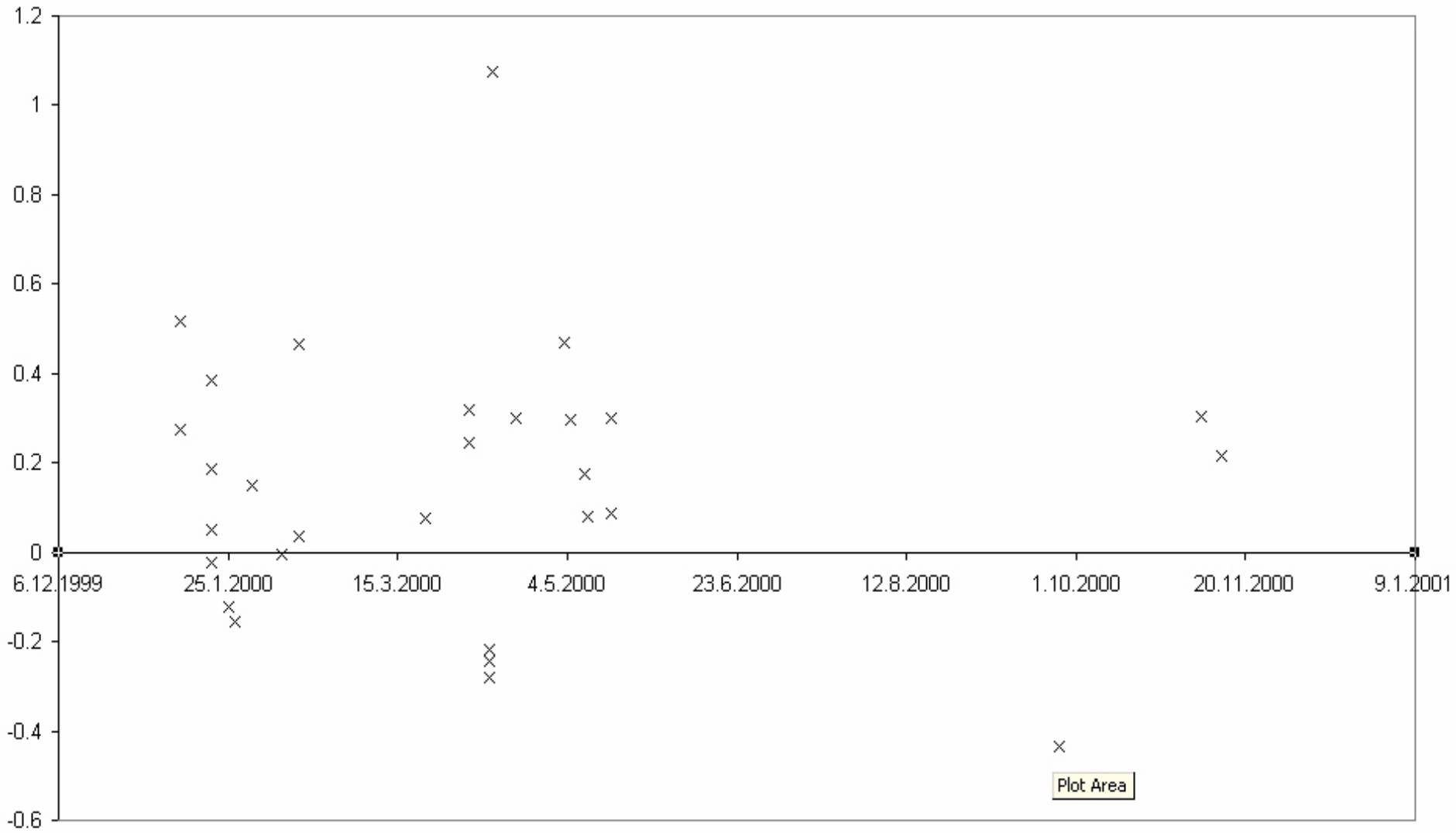
CUSUM-graph

Leukocytes



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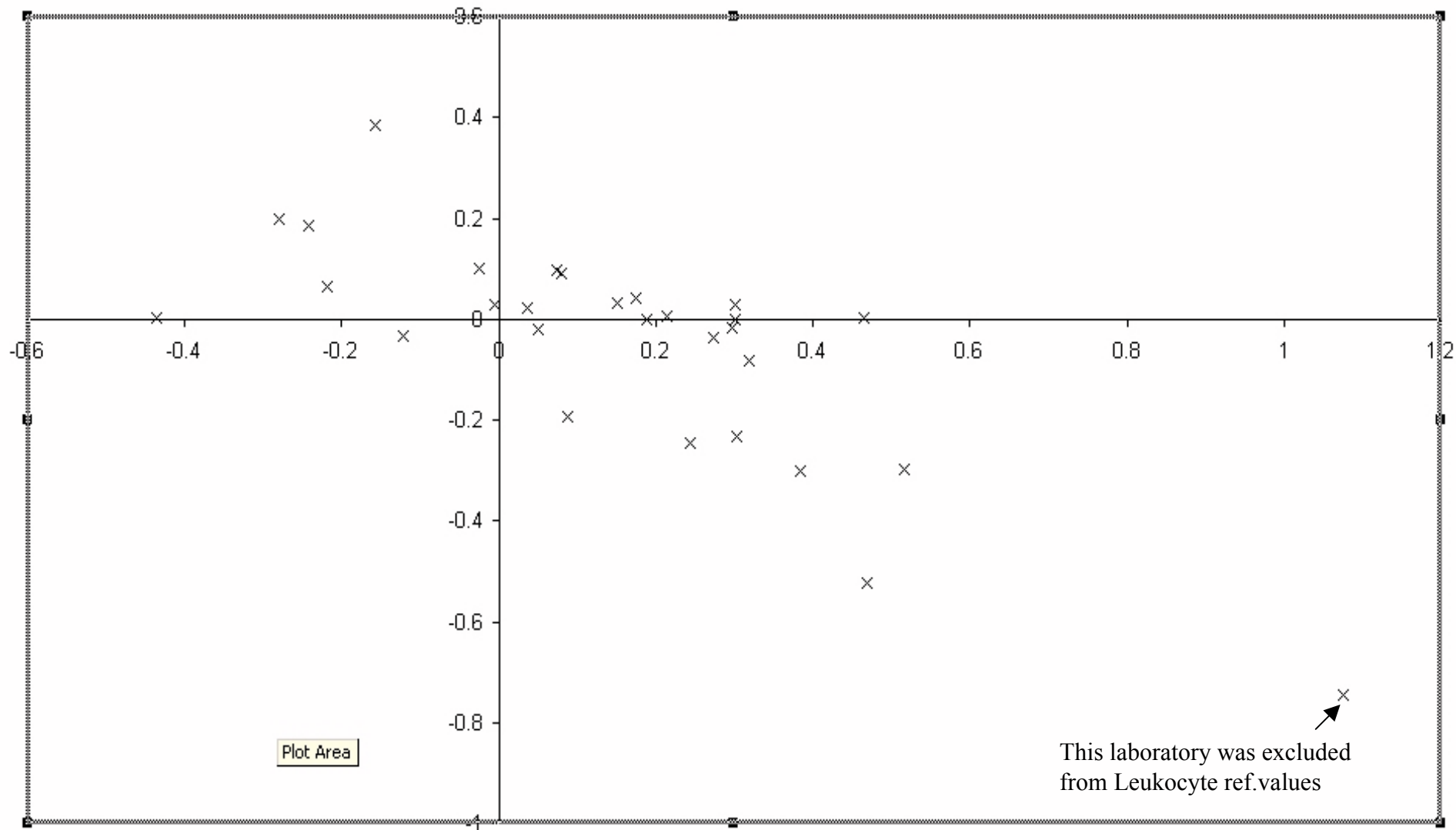
Leukocytes



x: Date (day 1) of analysis of reference samples

y: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

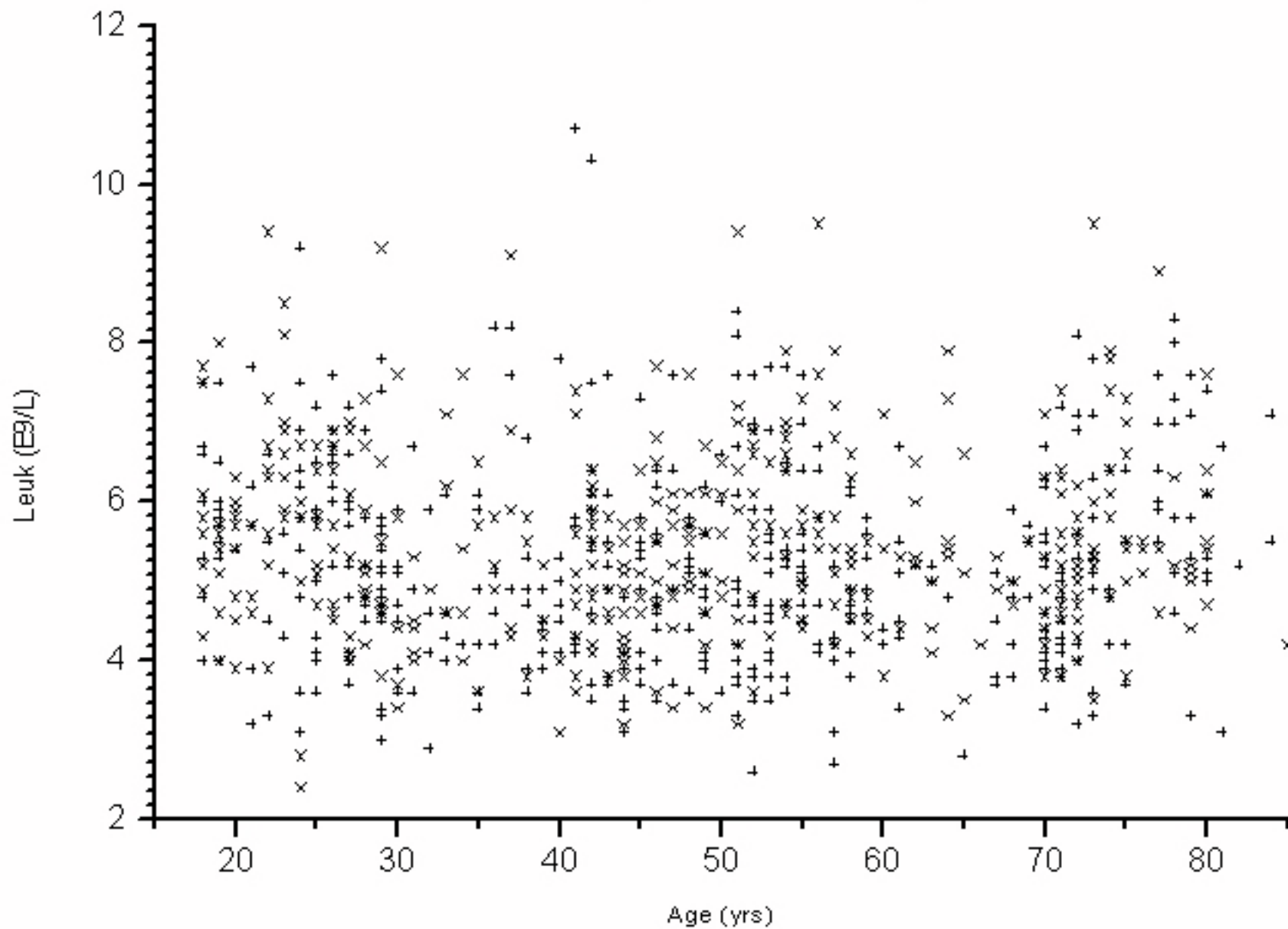
Leukocytes



x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

Leuk (men and women)

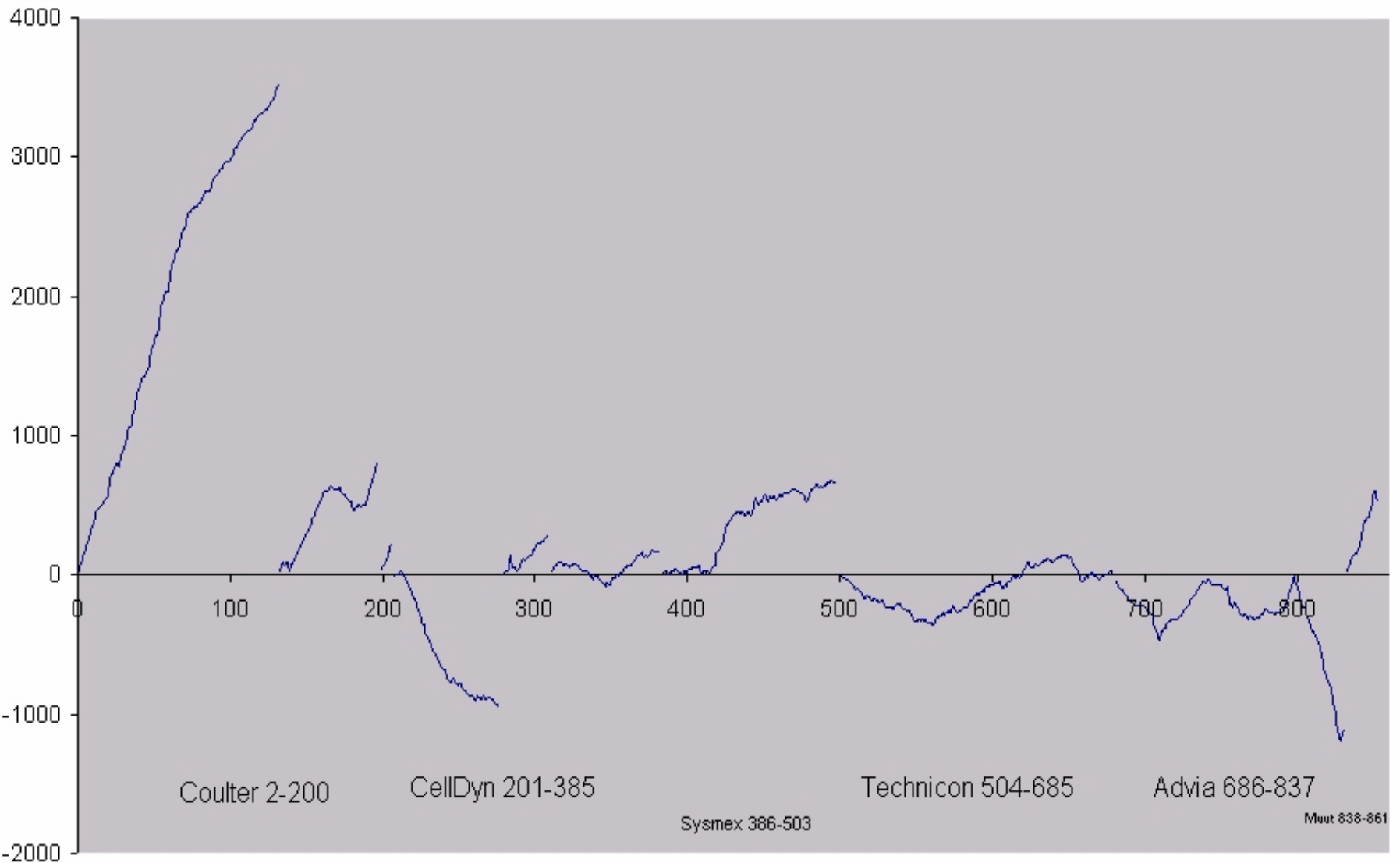


Leukocytes:

men and women: 3.3 - 8.0 $\times 10^9/L$

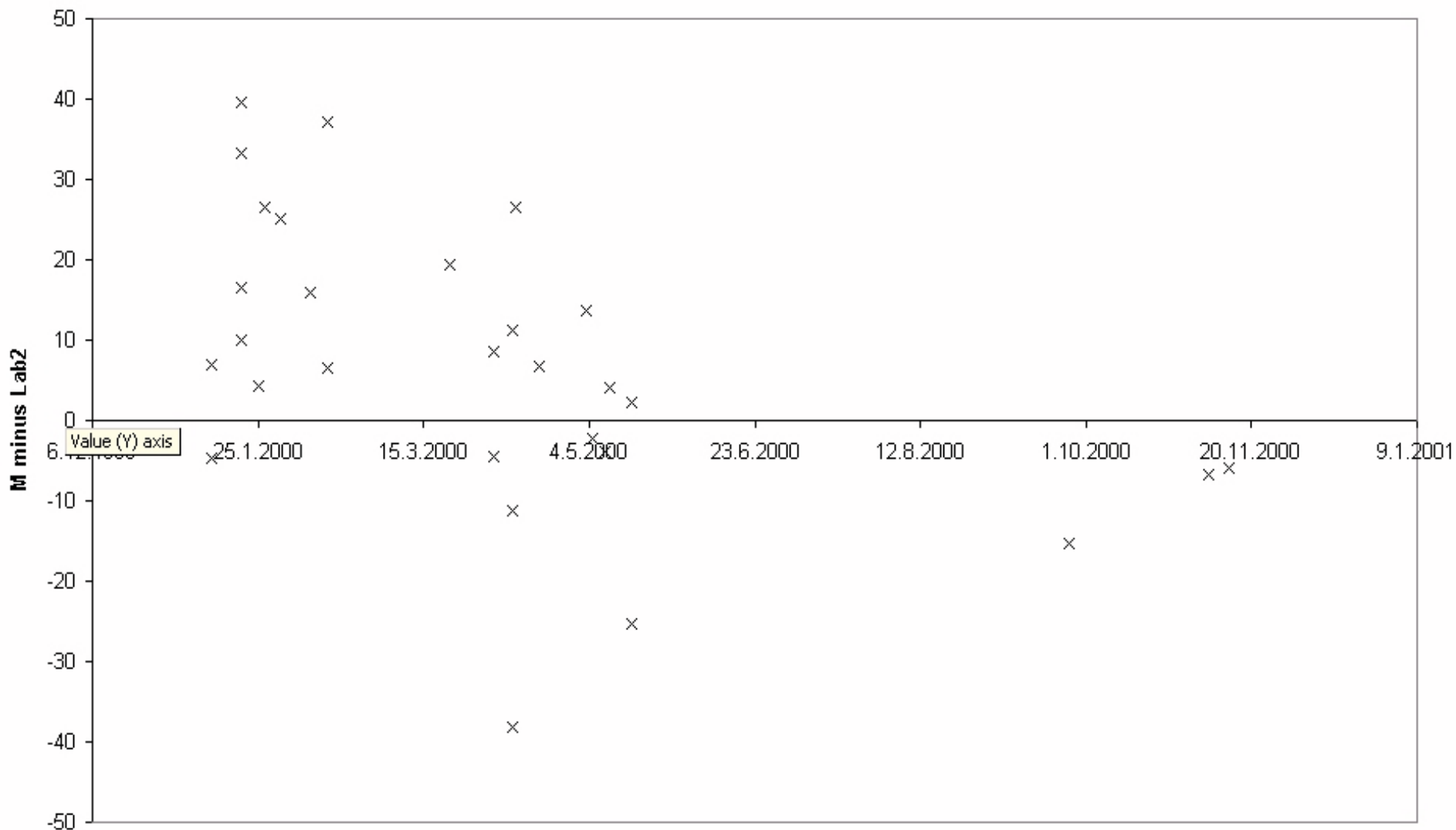
CUSUM-graph

Platelets



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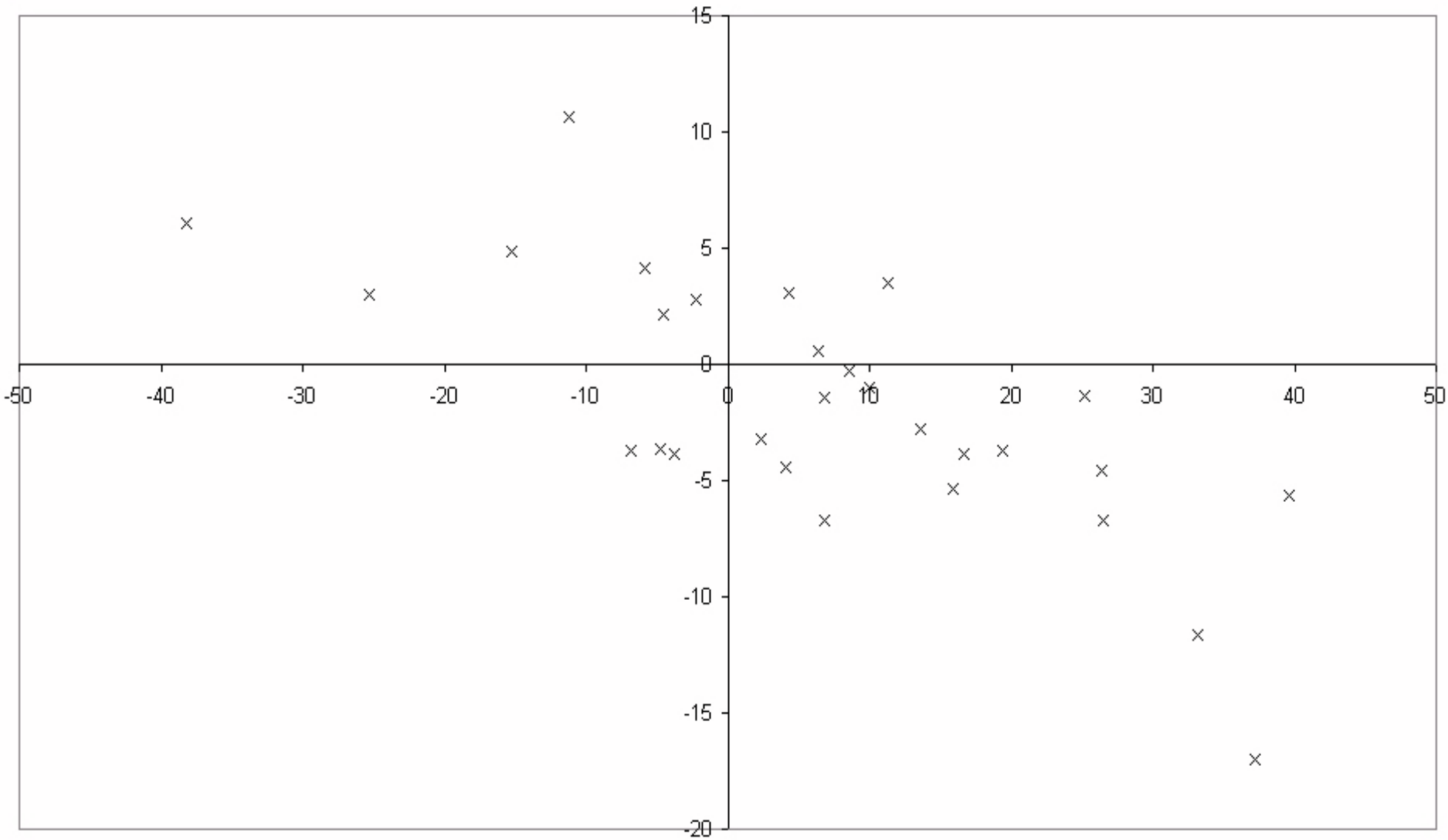
Platelets



x: Date (day 1) of analysis of reference samples

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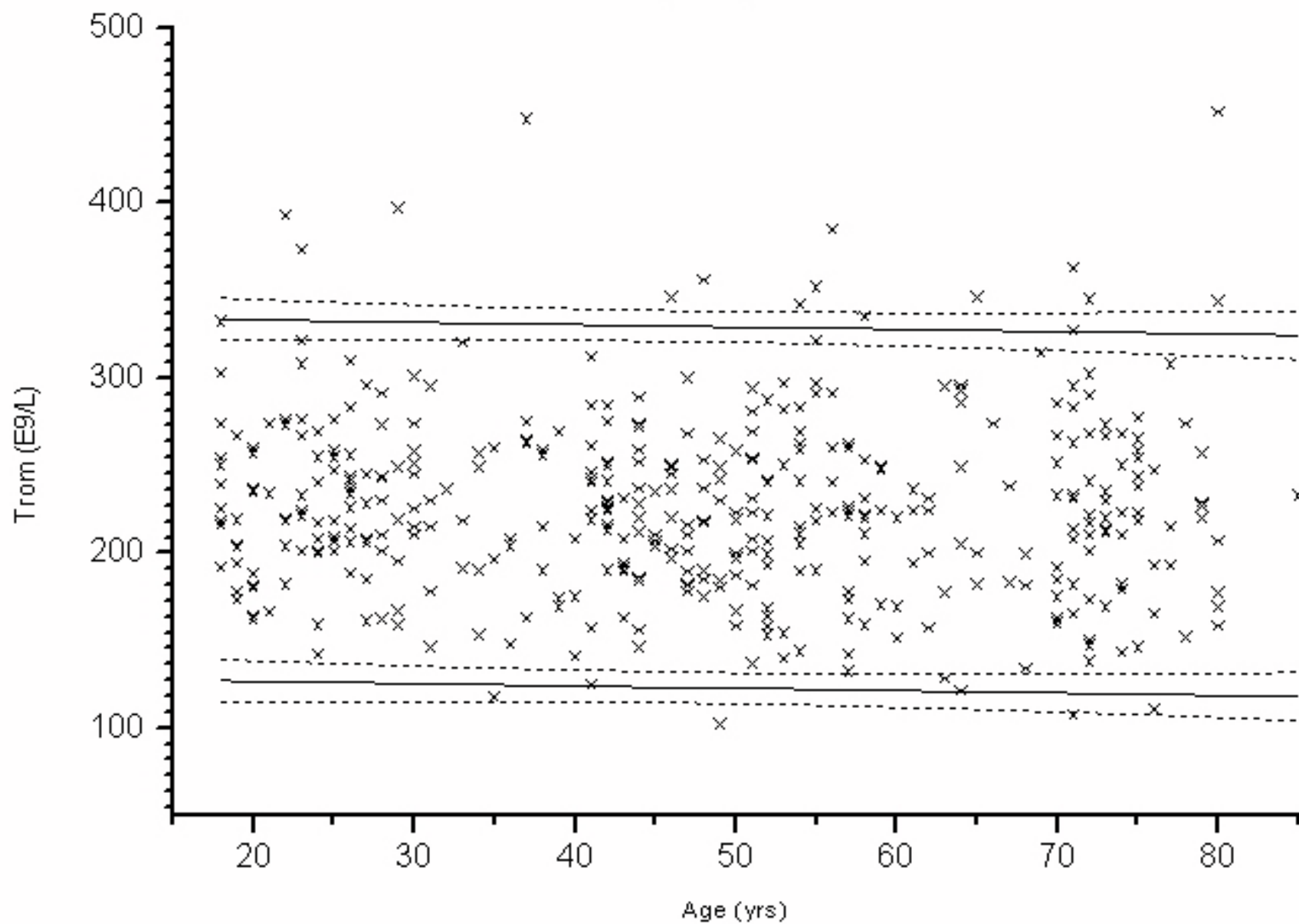
Trombosyytit



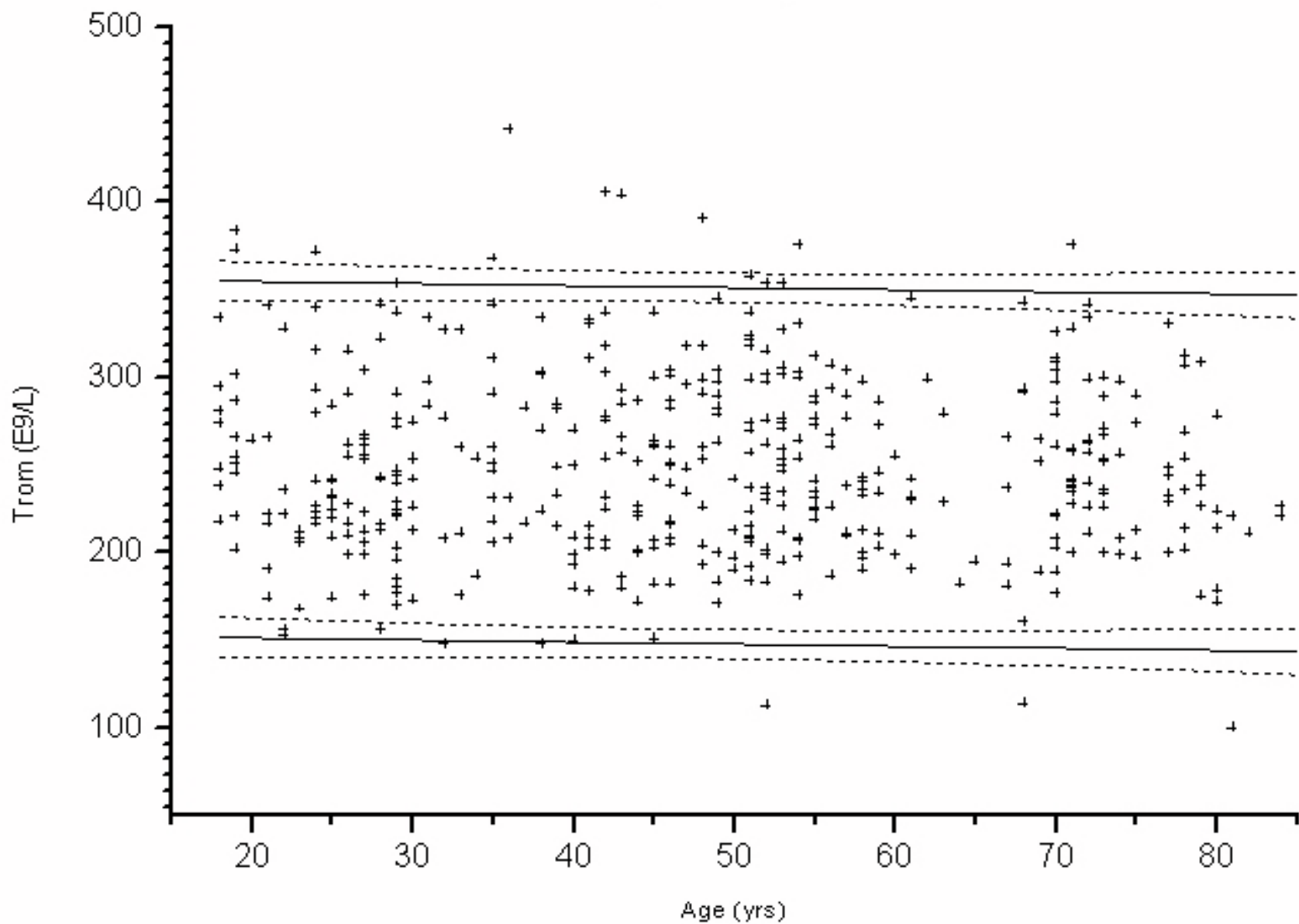
x: Laboratory average of the difference HELSINKI RESULT minus LOCAL RESULT ON DAY 2

y: Laboratory average of the difference LOCAL RESULT ON DAY 2 minus LOCAL RESULT ON DAY 1

Trom (men)



Trom (women)



Platelets:

men and women: 146 - 354 x10⁹/L

or

men: 137 - 346 x10⁹/L (R² of gender appr. 5%)

women: 161 - 358 x10⁹/L

Reference intervals for the basic blood count

Number of reference individuals: **821 (406 men, 439 women)**

Ages: evenly distributed between 18 and 85 years of age

Number of participating laboratories across Finland: **25**

Hemoglobin:	men:	131 - 164	g/L	
	or			
	men at 20 yrs	134 - 166	g/L	(R² of age appr. 3%)
	men at 40 yrs	132 - 165	g/L	
	men at 60 yrs	131 - 163	g/L	
	men at 80 yrs	129 - 162	g/L	
women:	115 - 152	g/L		
	or			
	women at 20 yrs	112 - 148	g/L	(R² of age appr. 3%)
	women at 40 yrs	114 - 150	g/L	
	women at 60 yrs	116 - 152	g/L	
	women at 80 yrs	118 - 154	g/L	
Hematocrit:	men:	38 - 49	%	
	women:	34 - 45	%	
	or			
	women at 20 yrs	34 - 44	%	(R² of age appr. 3%)
	women at 40 yrs	34 - 45	%	
	women at 60 yrs	35 - 45	%	
	women at 80 yrs	35 - 46	%	

Red blood cells:	men:	4.20 - 5.60	x10¹²/L
	or		
	men at 20 yrs	4.30 - 5.60	x10¹²/L (R² of age appr. 5%)
	men at 40 yrs	4.20 - 5.60	x10¹²/L
	men at 60 yrs	4.10 - 5.50	x10¹²/L
	men at 80 yrs	4.00 - 5.40	x10¹²/L
	women:	3.80 - 5.10	x10¹²/L
MCV:	men and women:	82 - 98	fL
	or		
	men:	82 - 98	fL (R² of gender appr. 4%)
	women:	80 - 98	fL
MCH:	men and women:	27 - 33	pg
	or		
	men:	28 - 33	pg (R² of gender appr. 5%)
	women:	26 - 33	pg
Leukocytes:	men and women:	3.3 - 8.0	x10⁹/L
Platelets:	men and women:	146 - 354	x10⁹/L
	or		
	men:	137 - 346	x10⁹/L (R² of gender appr. 5%)
	women:	161 - 358	x10⁹/L