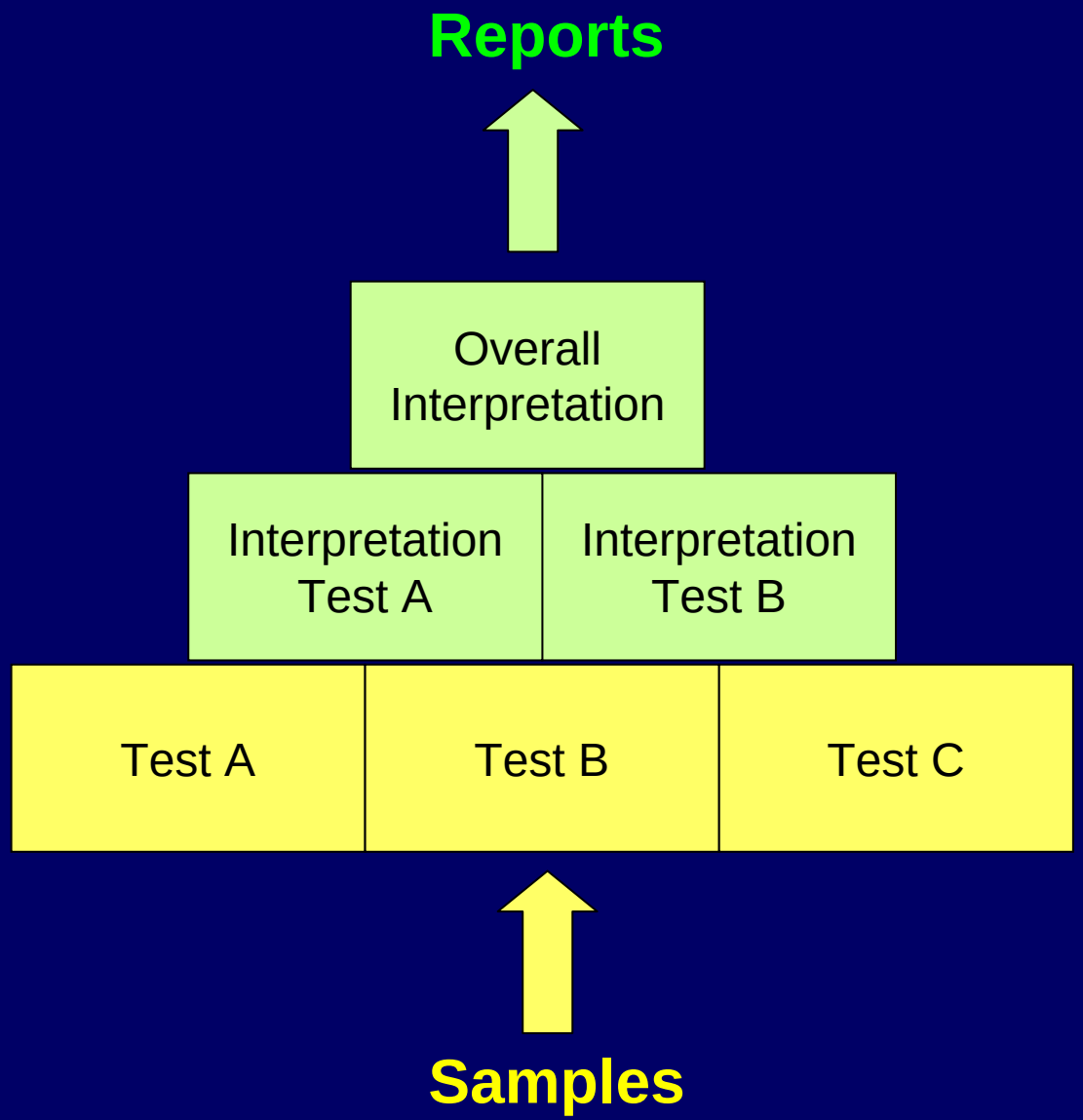
Big Brother Watching You

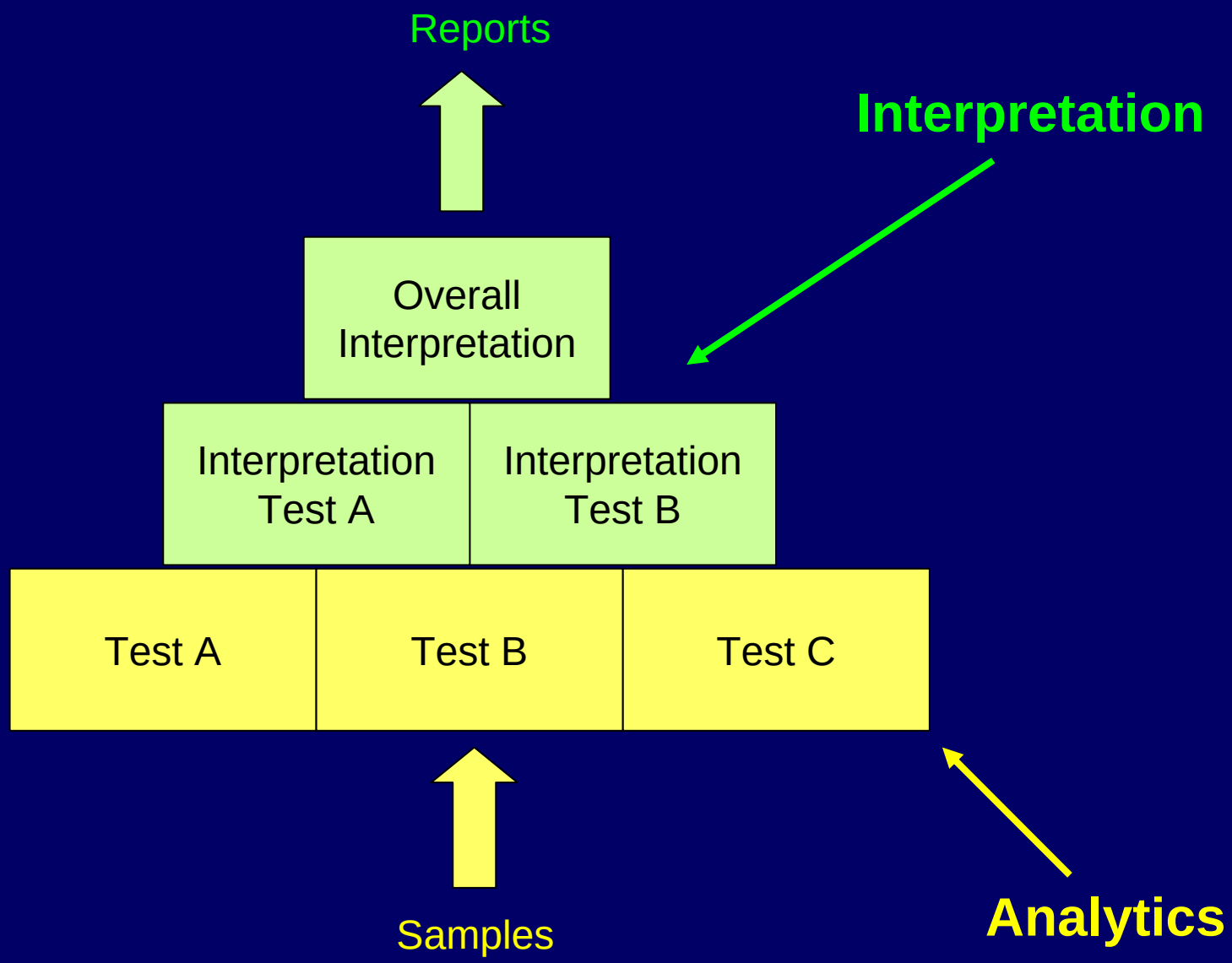
Explanation of a Proposal
for scoring in Assessment of Performance of
Quantitative Schemes

Cas Weykamp, scheme organiser
On behalf of The Board of Scientific Advisors and Orson Welles
Prague, ERNDIM/EUGT meeting, 6 October 2006

Laboratory Inborn Errors of Metabolism

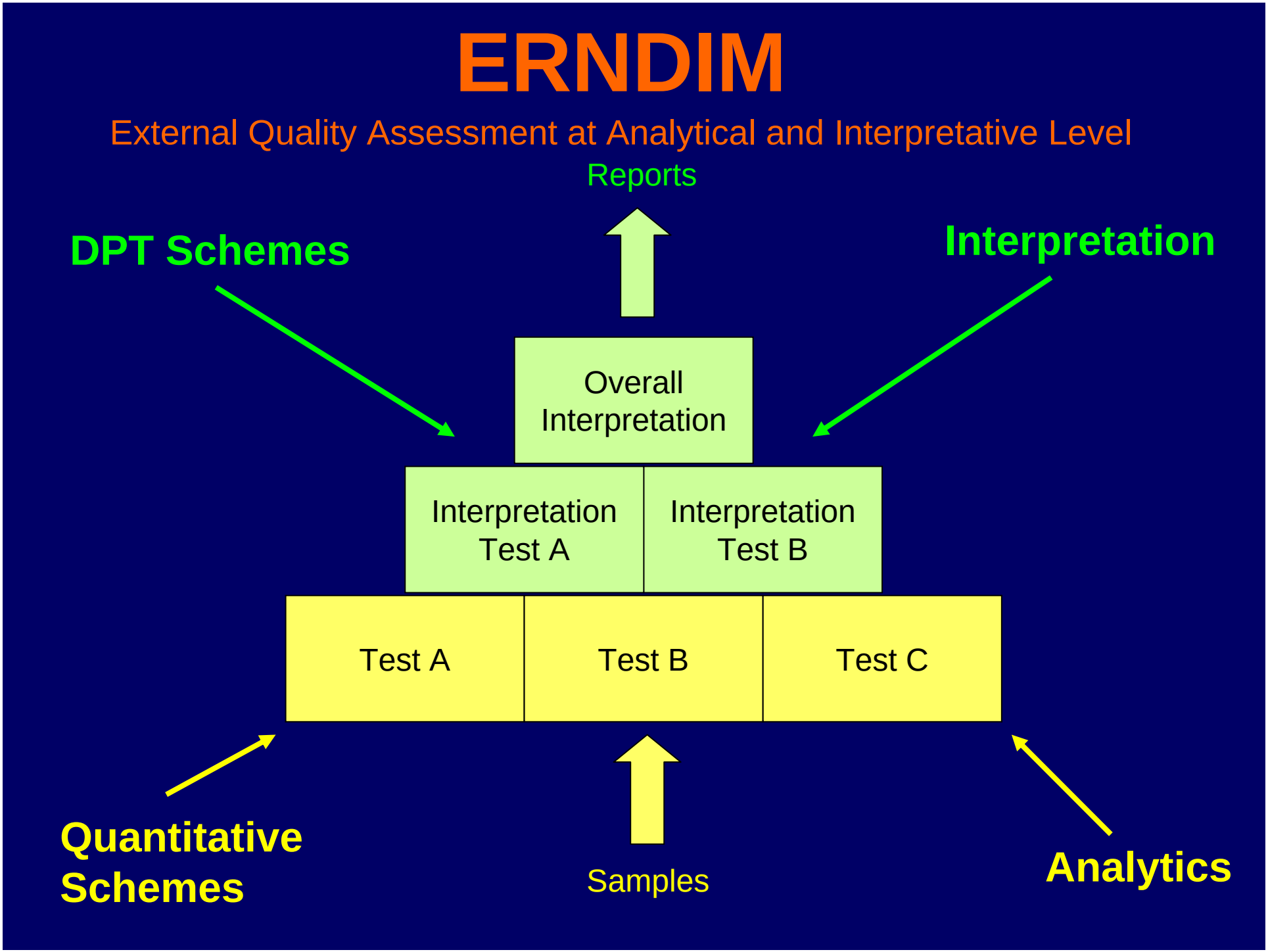


Laboratory Inborn Errors of Metabolism



ERNDIM

External Quality Assessment at Analytical and Interpretative Level

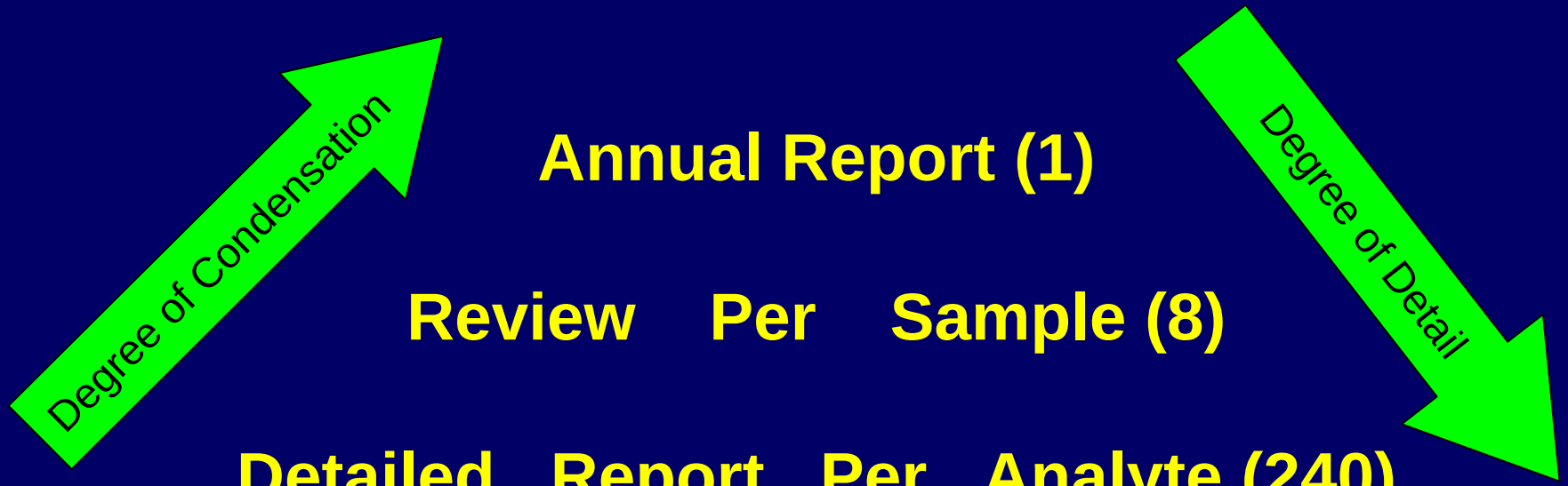


Quantitative Schemes: Groups of Analytes

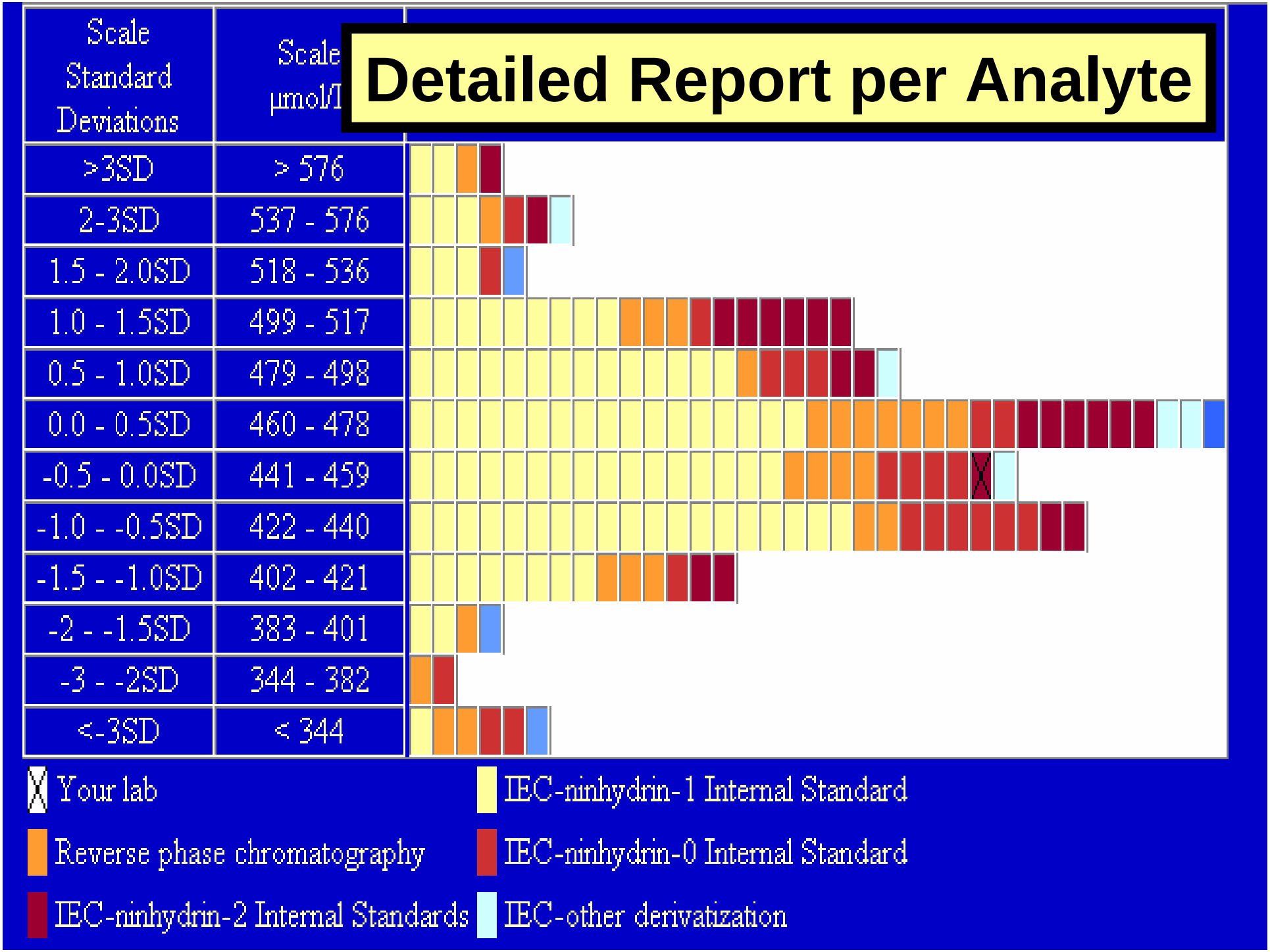
Group	Year	Labs	Analytes
Amino Acids	1993	182	30
Special Assays Serum	1993	120	16
Special Assays Urine	1993	115	15
Organic Acids	1995	60	17
Purines Pyrimidines	2000	42	20
Cystine WBC's	2005	27	3
Lysosomal Enzymes	2006	44	10
Total	**7**	**590**	**111**

Reports Quantitative Schemes Information Pyramide

Three Reports



Detailed Report per Analyte



AA 118

Institute Name

Department

ContactPerson

Review per Sample

Analyte	Your Lab	Median All Labs	n	Percentile of Your Result									
				10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Alanine	458	461	172				1	2					
alpha-Amino butyric acid	21.0	24.0	151			2	1						
Arginine	89.0	88.0	168					1	2				
Asparagine	27.0	24.0	141						2	1			
Aspartic Acid	34.0	31.0	164							2	1		
Citrulline	244	238	166					1	2				
Cystathionine	29.0	20.0	124									1	2
Cystine	49.0	50.0	151		1			2					
Glutamic acid	293	328	169			1		2					
Glutamine	957	1070	168			2					1		
Glycine	721	793	173		2	1							
Histidine	71.0	62.0	170						1			2	
Histidine 1-Methyl	5.00	4.00	134			1					2		
Homocystine	4.00	4.45	126					2		1			
Hydroxyproline	47.0	48.0	132			1		2					
Isoleucine	140	140	173						1 2				

Cycle 2005

Annual Report

Analyte	Accuracy (Mean)		Precision (CV% duplicates)		Linearity (r)		Recovery (% added analyte)		Data all labs	
	Your Lab	All Labs	Your Lab	All Labs	Your Lab	All Labs	Your Lab	All Labs	Nr. of Labs	Inter Lab CV
Alanine	415	403	9.7%	4.8%	0.9929	0.9962	101%	98%	182	7.5%
alpha-Amino adipic acid	122	122	4.3%	6.7%	0.9992	0.9976	112%	109%	163	15.8%
alpha-Amino butyric acid	12.6	13.3	6.3%	9.8%	0.9542	0.9457	91%	103%	167	20.2%
Arginine	123	124	4.3%	5.1%	0.9986	0.9979	93%	97%	181	10.3%
Asparagine	28.3	27.7	5.3%	10.5%	0.9880	0.9856	100%	94%	159	25.0%
Aspartic Acid	30.8	27.3	4.3%	7.8%	0.9981	0.9916	109%	96%	178	18.9%
beta-Alanine	59.3	50.4	26.6%	11.7%	0.9739	0.9918	115%	94%	157	108.9%
Citrulline	82.1	80.3	7.2%	6.3%	0.9964	0.9959	102%	98%	178	21.4%
Cystine	31.1	31.2	4.7%	10.9%	0.9971	0.9847	74%	76%	166	75.3%
Glutamic acid	167	160	4.2%	7.4%	0.9976	0.9899	114%	110%	180	11.6%
Glutamine	609	627	7.3%	6.8%	0.9966	0.9959	92%	93%	179	10.2%
Glycine	293	301	2.0%	5.0%	0.9996	0.9967	96%	99%	182	8.0%
Histidine	162	153	6.6%	4.9%	0.9938	0.9964	95%	94%	181	9.4%
Histidine 1-Methyl	19.6	18.6	17.3%	9.2%	0.9915	0.9956	108%	103%	158	128.0%

ERNDIM Approach 1993 - 2006

"Labs you get three Reports
-That's it –
Make Your own Conclusions
And do what you feel appropriate"

***Passive* Approach to EQA**

ERNDIM 2006

For follow-up of EQA do we want……

A more Active Approach?

View Board ERNDIM 2006

Yes, ERNDIM should have a more Active Role because:

-It contributes to better quality of laboratory tests and thus to patient care

-By law it is required that an EQA organiser has a Poor Performer Policy

ERNDIM Poor Performer Policy

At analyte Level Poor Performance of an Individual Laboratory must be made visible in the annual report of that Laboratory.

At Scheme Level there must be a scoring system
On basis of which the scientific advisor of that scheme can detect poor performing laboratories and
Send them a warning letter

This requires Criteria

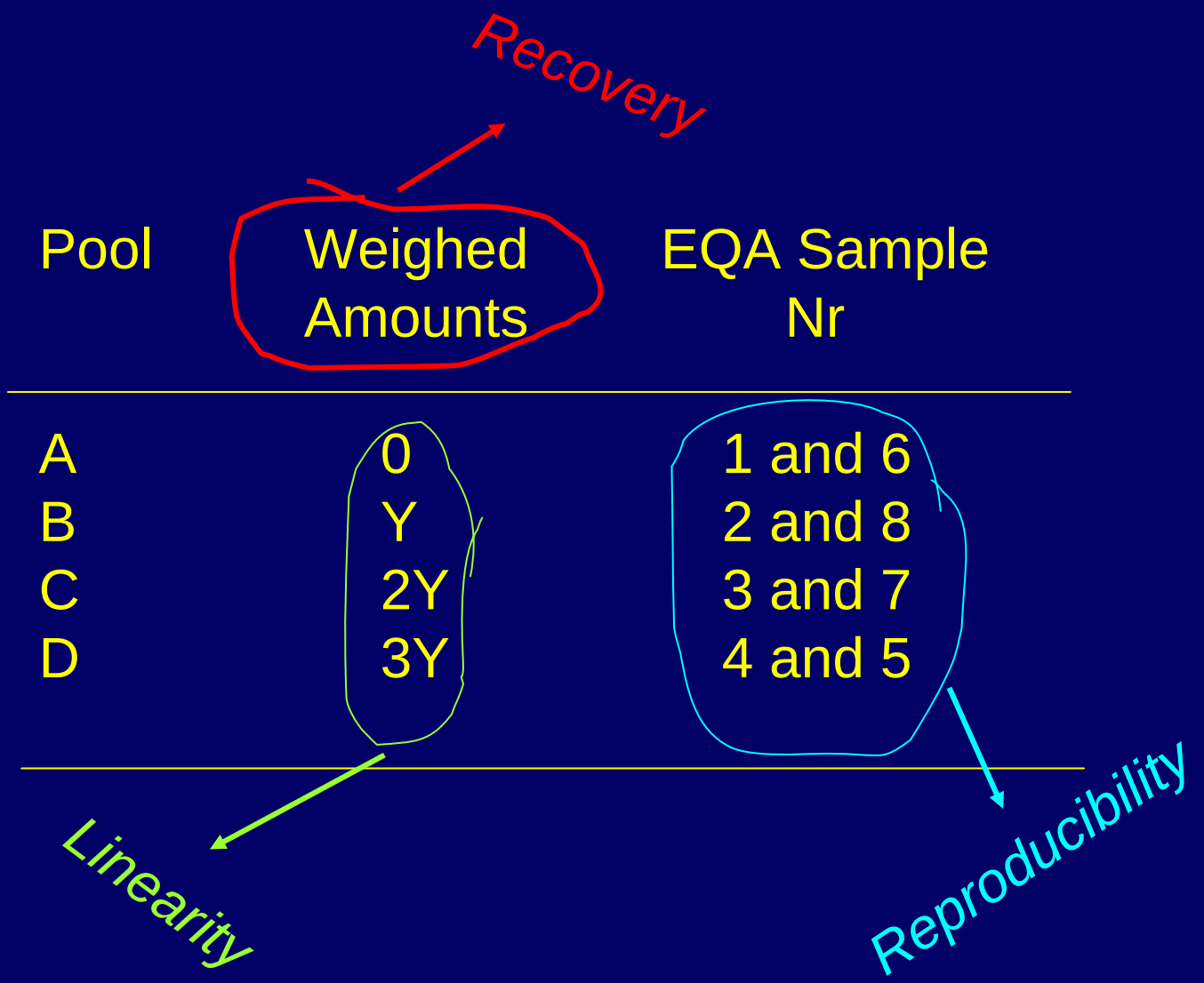
Criteria?

Derived from the
Design of the
Quantitative Schemes

Design: Annual Scheme with 8 Specimens

Pool	Weighed Amounts	EQA Sample Nr
A	0	1 and 6
B	X	2 and 8
C	2X	3 and 7
D	3X	4 and 5

Annual Scheme: 8 Specimens



Criteria

In the annual report the result of a lab Will be flagged in red :

Accuracy Column: 2.5% of lowest and highest results

Recovery Column: 2.5% of lowest and highest results

Precision Column: 5% of Highest CV's

Linearity Column: 5% of lowest r's

What does it look like?

Annual Report

Amino acids 2005

Analyte	Accuracy (Mean)		Precision (CV% duplicates)		Linearity (r)		Recovery (% added analyte)	
	Your Lab	All Labs	Your Lab	All Labs	Your Lab	All Labs	Your Lab	All Labs
Alanine	423	411	0.0%	4.7%	0.9984	0.9963	118%	98%
alpha-Amino adipic acid		123		6.6%		0.9975		109%
alpha-Amino butyric acid		13.3		9.8%		0.9445		103%
Arginine	116	125	16.7%	5.0%	0.9894	0.9979	90%	97%
Asparagine		28.4		10.6%		0.9850		93%
Aspartic Acid	25.8	27.3	10.5%	7.8%	0.9916	0.9906	90%	95%
beta-Alanine		50.5		11.8%		0.9914		95%
Citrulline	84.4	80.0	101.0%	6.4%	0.9972	0.9956	110%	98%
Cystine	49.0	34.6		11.8%		0.9826		74%
Glutamic acid	146	165	15.4%	7.6%	0.9319	0.9890	88%	110%
Glutamine	496	624	1.2%	6.9%	0.9987	0.9956	73%	94%
Glycine	287	305	10.0%	4.9%	0.9863	0.9968	93%	98%
Histidine	146	156		4.9%	0.9939	0.9964	99%	95%

Criterion “Good enough” at Analyte Level

Inspection of Annual Reports shows that for some analytes
-Boxes are red (poor performance)
-Empty (no –or not enough- submission of results

Performance is not good enough if
-Two or more boxes are red
-Two or more boxes are empty
-Two or more boxes are red or empty

If analyte passes criterion: “Green”

Again……

What does it look like

Annual Report

Amino acids 2005

Analyte	Accuracy (Mean)		Precision (CV% duplicates)		Linearity (r)		Recovery (% added analyte)	
	Your Lab	All Labs	Your Lab	All Labs	Your Lab	All Labs	Your Lab	All Labs
Alanine	423	411	0.0%	4.7%	0.9984	0.9963	118%	98%
alpha-Amino adipic acid		123		6.6%		0.9975		109%
alpha-Amino butyric acid		13.3		9.8%		0.9445		103%
Arginine	116	125	16.7%	5.0%	0.9894	0.9979	90%	97%
Asparagine		28.4		10.6%		0.9850		93%
Aspartic Acid	25.8	27.3	10.5%	7.8%	0.9916	0.9906	90%	95%
beta-Alanine		50.5		11.8%		0.9914		95%
Citrulline	84.4	80.0	101.0%	6.4%	0.9972	0.9956	110%	98%
Cystine	49.0	34.6		11.8%		0.9826		74%
Glutamic acid	146	165	15.4%	7.6%	0.9319	0.9890	88%	110%
Glutamine	496	624	1.2%	6.9%	0.9987	0.9956	73%	94%
Glycine	287	305	10.0%	4.9%	0.9863	0.9968	93%	98%
Histidine	146	156		4.9%	0.9939	0.9964	99%	95%

Now part II:

When to send a…..

….Warning Letter……

….for Poor Permance?

Alanine	394	411	1.1%	4.7%	0.9990			%
alpha-Amino adipic acid	111	123	1.0%	6.6%	0.9999	0.9975	99%	109%
alpha-Amino butyric acid	14.4	13.3	6.5%	9.8%	0.9439	0.9445	106%	103%
Arginine	121	125	1.8%	5.0%	0.9998	0.9979	91%	97%
Asparagine	26.3	28.4	2.7%	10.6%	0.9965	0.9850	84%	93%
Aspartic Acid	27.5	27.3	3.1%	7.8%	0.9982	0.9906	96%	95%
beta-Alanine	52.8	50.5	9.9%	11.8%	0.9955	0.9914	95%	95%
Citrulline	77.6	80.0	8.8%	6.4%	0.9948	0.9956	97%	98%
Cystine	30.9	34.6	4.7%	11.8%	0.9974	0.9826	70%	74%
Glutamic acid	155	165	1.3%	7.6%	0.9995	0.9890	108%	110%
Glutamine	588	624	2.6%	6.9%	0.9994	0.9956	89%	94%
Glycine	289	305	1.9%	4.9%	0.9995	0.9968	95%	98%
Histidine	153	156	1.7%	4.9%	0.9986	0.9964	94%	95%
Histidine 1-Methyl	17.8	18.7	2.8%	9.1%	0.9995	0.9958	89%	104%
Hydroxyproline	25.8	21.4	8.9%	18.3%	0.9842	0.9784	98%	98%
Isoleucine	179	186	1.6%	4.6%	0.9997	0.9984	91%	96%
L-allo Isoleucine	103	107	0.9%	5.6%	0.9999	0.9966	94%	98%
Leucine	487	502	1.3%	4.4%	0.9988	0.9964	96%	97%
Lysine	227	229	2.0%	4.5%	0.9990	0.9969	92%	94%

Excellent Performer

beta-Alanine		30.5		11.8%		0.9914	
Citrulline	61.8	80.0		6.4%	0.9999		
Cystine	39.0	34.6	5.6%	11.8%	0.9892	0.9826	107%
Glutamic acid	134	165	21.8%	7.6%	0.9648	0.9890	150%
Glutamine	529	624	3.6%	6.9%	0.9983	0.9956	84%
Glycine	316	305	8.6%	4.9%	0.9514	0.9968	102%
Histidine	154	156	4.2%	4.9%	0.9916	0.9964	95%
Histidine 1-Methyl		18.7		9.1%		0.9958	
Hydroxyproline		21.4		18.3%		0.9784	
Isoleucine	179	186	4.6%	4.6%	0.9904	0.9984	85%
L-allo Isoleucine		107		5.6%		0.9966	
Leucine	514	502	1.0%	4.4%	0.9962	0.9964	101%
Lysine	260	229		4.5%	0.9703	0.9969	104%
Methionine	155	107	5.9%	4.8%	0.9925	0.9971	107%
Ornithine	105	107	5.5%	4.8%	0.9972	0.9974	105%
Phenylalanine	363	342	17.5%	4.0%	0.9849	0.9989	80%
Proline		219		6.1%		0.9965	
Saccharopine		107		6.8%		0.9948	
Serine	86.4	65.8		8.5%	0.9999	0.9802	103%
Taurine	52.9	137	12.4%	5.0%	0.9926	0.9973	87%
Threonine	68.9	127		4.9%	1.0000	0.9963	77%
Tyrosine	225	212	7.8%	4.0%	0.9781	0.9973	79%
Valine	222	302		4.2%	1.0000	0.9974	119%

Poor performer

Alanine	408	411	8.1%	4.7%	0.9937	?????????	
alpha-Amino adipic acid	114	123	16.7%	6.6%	0.9878	0.9975	101%
alpha-Amino butyric acid	15.4	13.3	12.9%	9.8%	0.9583	0.9445	95%
Arginine	133	125	9.2%	5.0%	0.9944	0.9979	102%
Asparagine	32.1	28.4	25.2%	10.6%	0.9523	0.9850	96%
Aspartic Acid	27.4	27.3	18.8%	7.8%	0.9629	0.9906	93%
beta-Alanine	63.7	50.5	6.4%	11.8%	0.9716	0.9914	78%
Citrulline	72.8	80.0	3.8%	6.4%	0.9854	0.9956	84%
Cystine	32.3	34.6	56.2%	11.8%	0.4750	0.9826	34%
Glutamic acid	186	165	11.9%	7.6%	0.9868	0.9890	131%
Glutamine	613	624	7.3%	6.9%	0.9940	0.9956	91%
Glycine	304	305	10.6%	4.9%	0.9940	0.9968	99%
Histidine	155	156	2.5%	4.9%	0.9964	0.9964	78%
Histidine 1-Methyl		18.7		9.1%		0.9958	
Hydroxyproline	27.6	21.4	12.3%	18.3%	0.9873	0.9784	112%
Isoleucine	191	186	7.9%	4.6%	0.9973	0.9984	101%
L-allo-Isoleucine	109	107	4.0%	5.6%	0.9960	0.9966	95%

When to send a Warning Letter?

The more red boxes
The worse the performance

Thus, we send a Warning Letter
To labs who exceed x% red boxes

X is arbitrarily chosen

Percentages red boxes Amino Acids

We made a ranking list 2005 scheme:

Lab 052	28.3% red boxes	
Lab 123	27.0% red boxes	>20%
Lab 009	24.7% red boxes	Warning Letter
Lab 042	23.8% red boxes	
Lab 158	22.4% red boxes	
Lab 178	20.7% red boxes	
Lab 061	17.6% red boxes	
Lab 018	16.2% red boxes	<20%
…….	……% red boxes	No warning letter
Lab	00.0% red boxes*	

** 34 labs had 0% red boxes and thus excellent performance!*

Thus:

Laboratories with more Than 20% red boxes

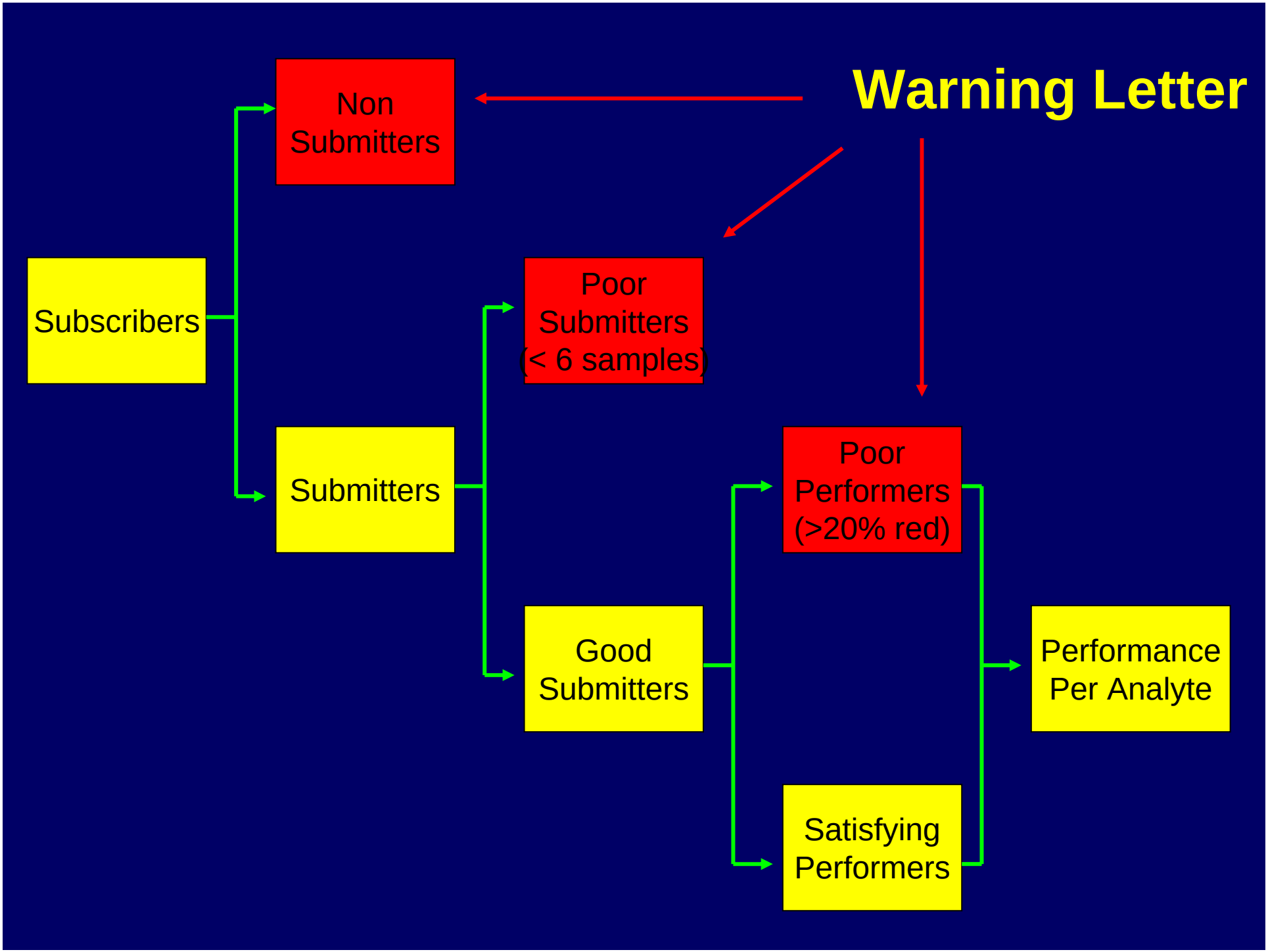
Will get a Warning Letter of Poor Performance

But also:

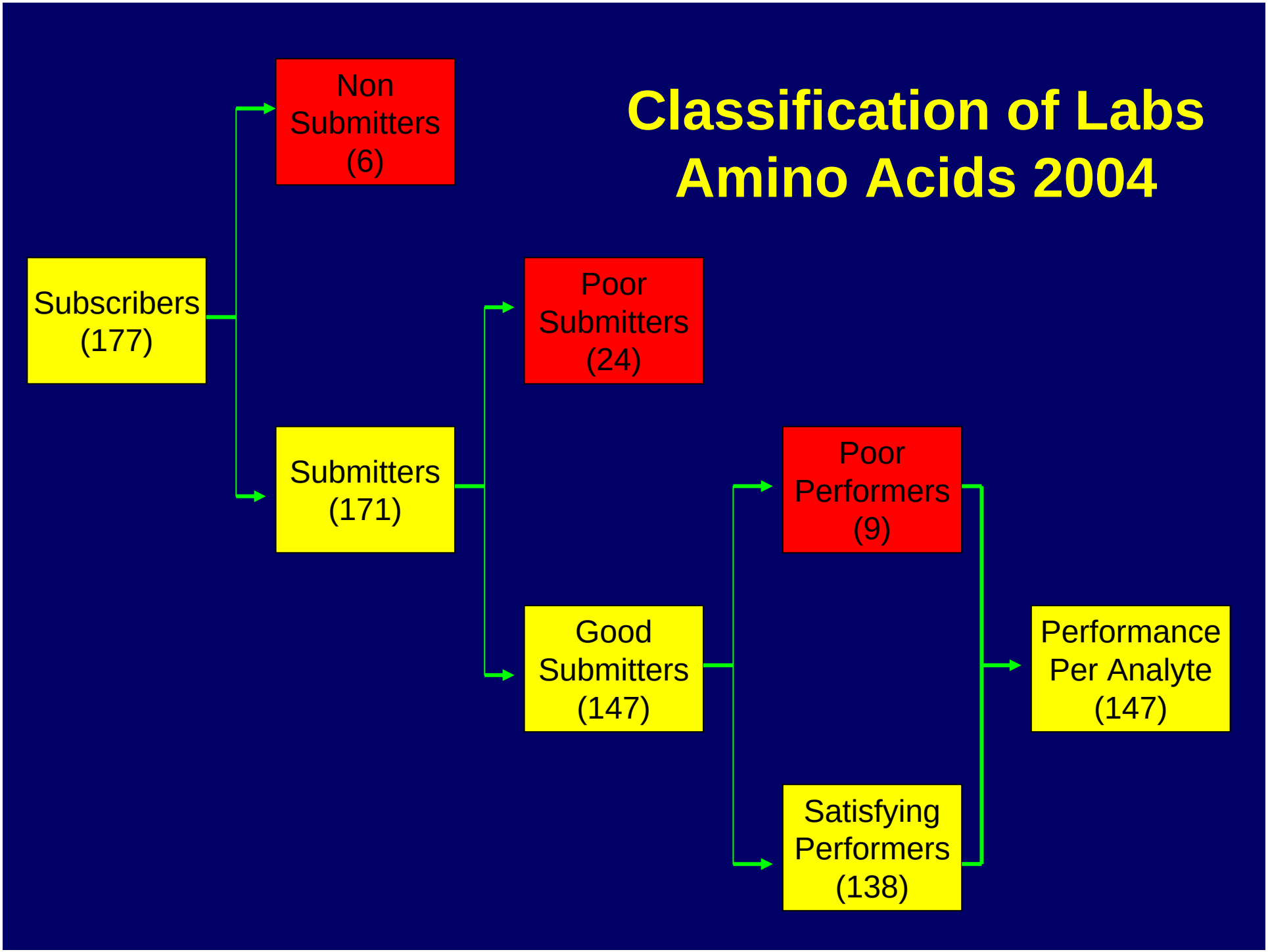
Labs who did not submit results get a *Warning Letter of Non-Submittence*

……and

Labs who did not submit enough results (<6 samples) wil get a *Warning Letter of Poor Submittance*


Warning Letter
Non Submitters
Subscribers
Poor Submitters (< 6 samples)
Submitters
Poor Performers (>20% red)
Good Submitters
Performance Per Analyte
Satisfying Performers

Classification of Labs
Amino Acids 2004



Subscriptions, Submissions and Performances 2004

(At Scheme-Level)

Scheme	Subscribers	Submissions			Performance:Score			
		None	Too Few	Enough	>25	20-25	15-20	<15
AA	177	3%	14%	83%	3%	3%	3%	91%
OA	60	10%	12%	78%	2%	0%	6%	92%
PP	44	20%	9%	71%	3%	3%	3%	91%
SA-S	155	4%	5%	91%	2%	4%	3%	91%
SA-U	117	5%	3%	92%	4%	3%	5%	88%
Cys-WBC	29	21%	17%	62%	17%	5%	0%	78%

Summary

The Board of Scientific Advisors of ERNDIM advocates an active follow-up of EQA schemes with:

In the Annual Report at Analyte Level

- Poor performance of accuracy, recovery, linearity, precision indicated with red flags
- Analytes with qualified performance indicated with a green flag

Warning Letters at Scheme-level

- Poor Performers
- Non Submitters
- Poor Submitters

Discussion

Any scoring system is Arbitrary
(and thus open to discussion)

Thus, Jim:
The Floor is Yours to open the Discussion

And you, the Audience:
Thank you for your attention so far