Definition of EQAS allowable limits for HBA1C: a candidate method

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As members of FEDERATION of EQAS ORGANISERS (FAEEQ)

A collaborative study.

PLAN

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4. Results and discussion:
   - According to the method
   - According to the concentration level
   - According to the material used
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INTRODUCTION, SCOPE and PURPOSE:

- EQAS are implemented to evaluate the reliability of the results provided by medical laboratories and, if necessary, helping to improve the practices.
- Assessment of results provided by the participants' laboratories to EQAS programs, depends on the value defined to be allowable for their intended use.
- HBA_{1C} has been chosen as a model because of:
  - The value of this test for the follow up of diabetic patients
  - The importance of diabetes disease in the world
  - The high level of standardisation for this test: reference method, reference material
- Criteria to evaluate the performances of HBA_{1C} measurements are not harmonised in France, ranging from 6 to 8% according to the organiser.
- Total error based on biological variation is +/- 3%.

Objectives

- To harmonise criteria used by EQAS to evaluate the quality of the results for HBA1c.
- To evaluate the behaviour of different QC samples.
- To evaluate the impact of the method used
- to evaluate the impact of the determination of allowable limits (AL) on the classification of the participants' results.

MATERIALS AND METHODS:

- Data from **4 FRENCH EQAS** non profit organisations including the results provided during **2015, 2016 and 2017** by a thousand laboratories for 1250 sites.
- **30 000** data were collected and analysed using the same model according to:

- The level of concentration,
- The nature of QC samples and
- The method used.

- The number of acceptable results was determined for different allowable limits values ranging from 2 to 20 %.
- Quality control (QC) samples were lyophilized haemolysed human blood from different commercial origin (AALTO, BEATRIX, BIOLABO, DIASERVE, EUROTROL, POLYMED, RANDOX..).
- A fresh human blood sample was also provided.
- Results are also evaluated according to the methods used (HPLC, immunological, enzymatic...).

Preliminary statement

- Switch to **IFCC units** is not yet accepted in France.

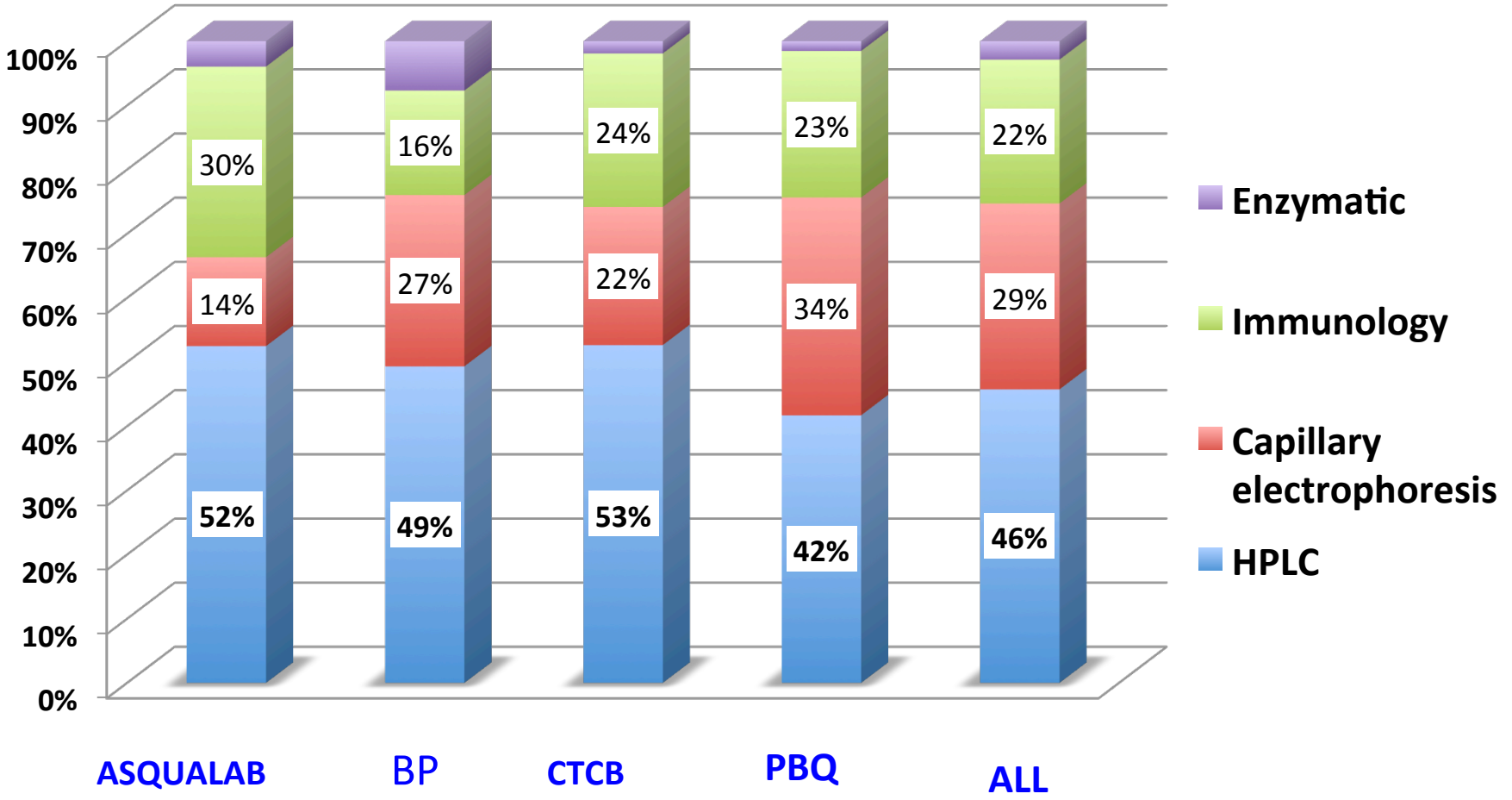
So, all the data presented are expressed using percentage as units.

- For samples with assigned values using a reference method, general means **do not demonstrate difference up to 1%** as compared to the reference value

So, the results are compared to the general mean.

- A **few data** for enzymatic method, affinity chromatography and for DCA 2000 were collected.

Methods used by the participants 2016-2017
total: 1250 lab sites



Allowable limits actually proposed

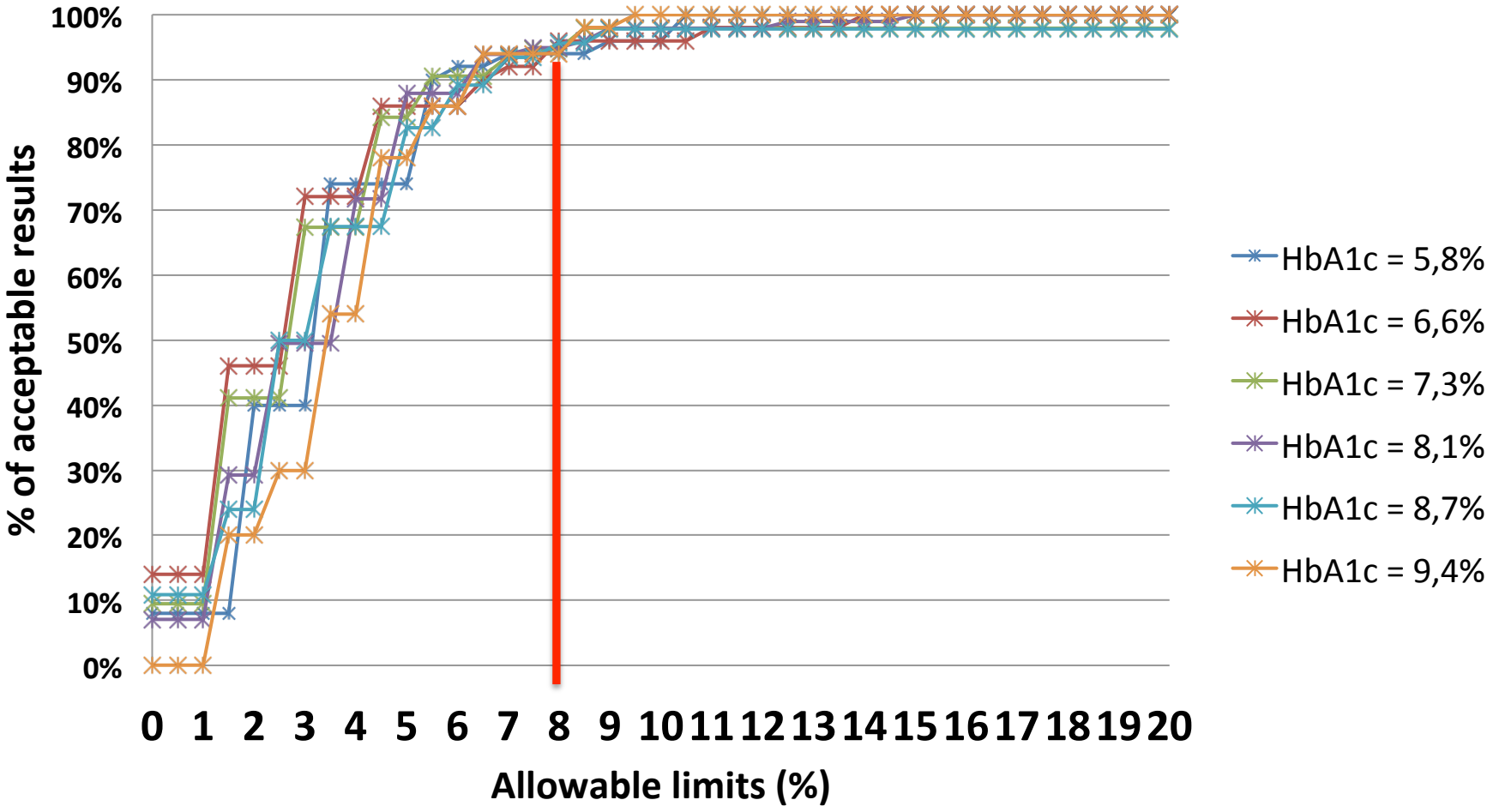
	ASQUALAB	BIOLOGIE PROSPECTIVE	CTCB	PBQ
%	+/-8 Target value + peer group	+/-7 Target value + peer group	+/-8 Target value + peer group	+/-6 Target value + peer group
	QUALAB	PROPOSAL BP	Allowable total error RICOS	NGSP
	+/- 15%	+/- 12%	+/- 3%	+/- 6%

Results and discussion

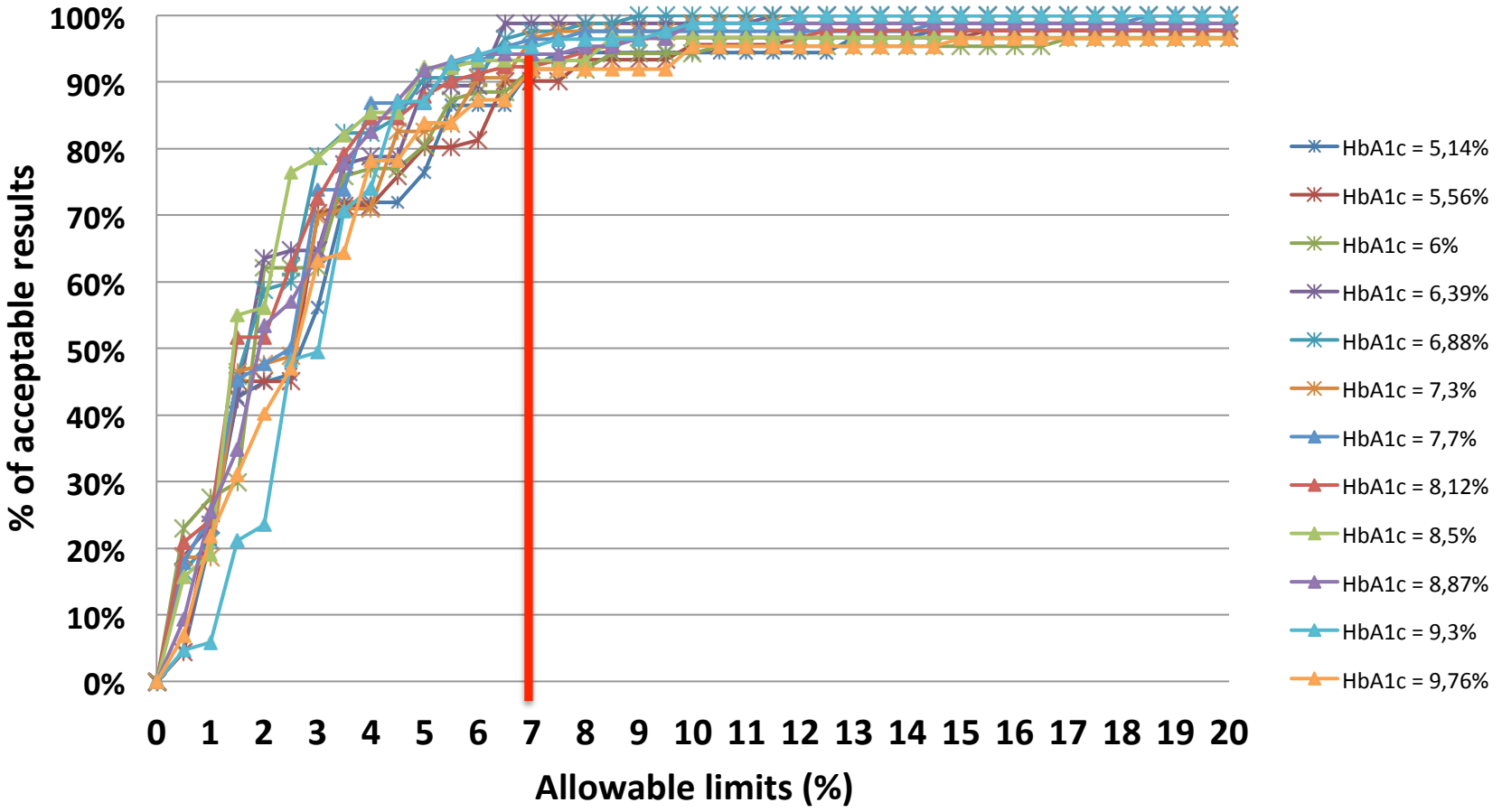
Allowable limits - variation factors to evaluate:

- Concentration levels
- Analytical method
- Nature of QC materials

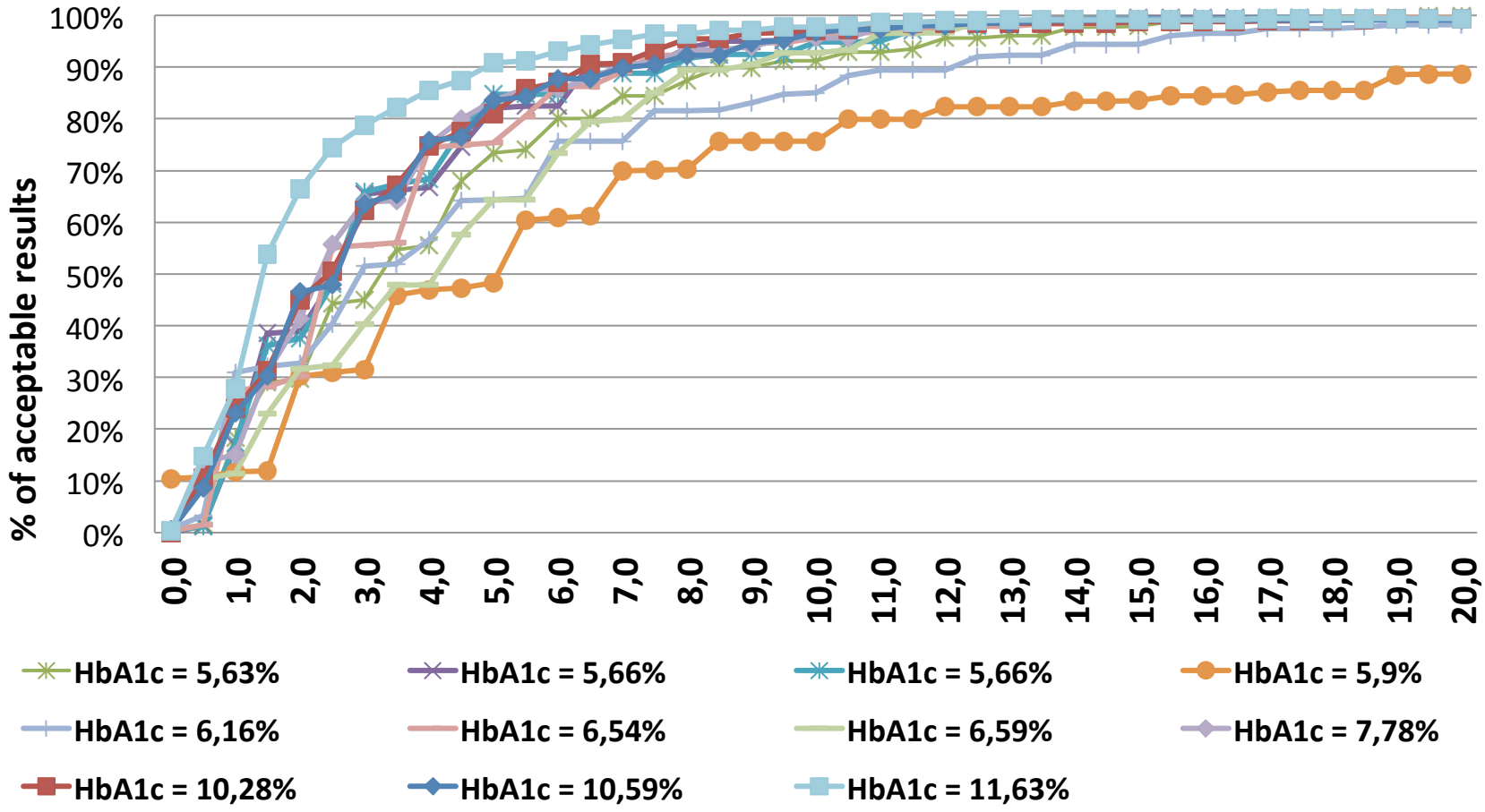
HbA1c EQAS - ASQUALAB 2017 (Aalto) - HPLC Method



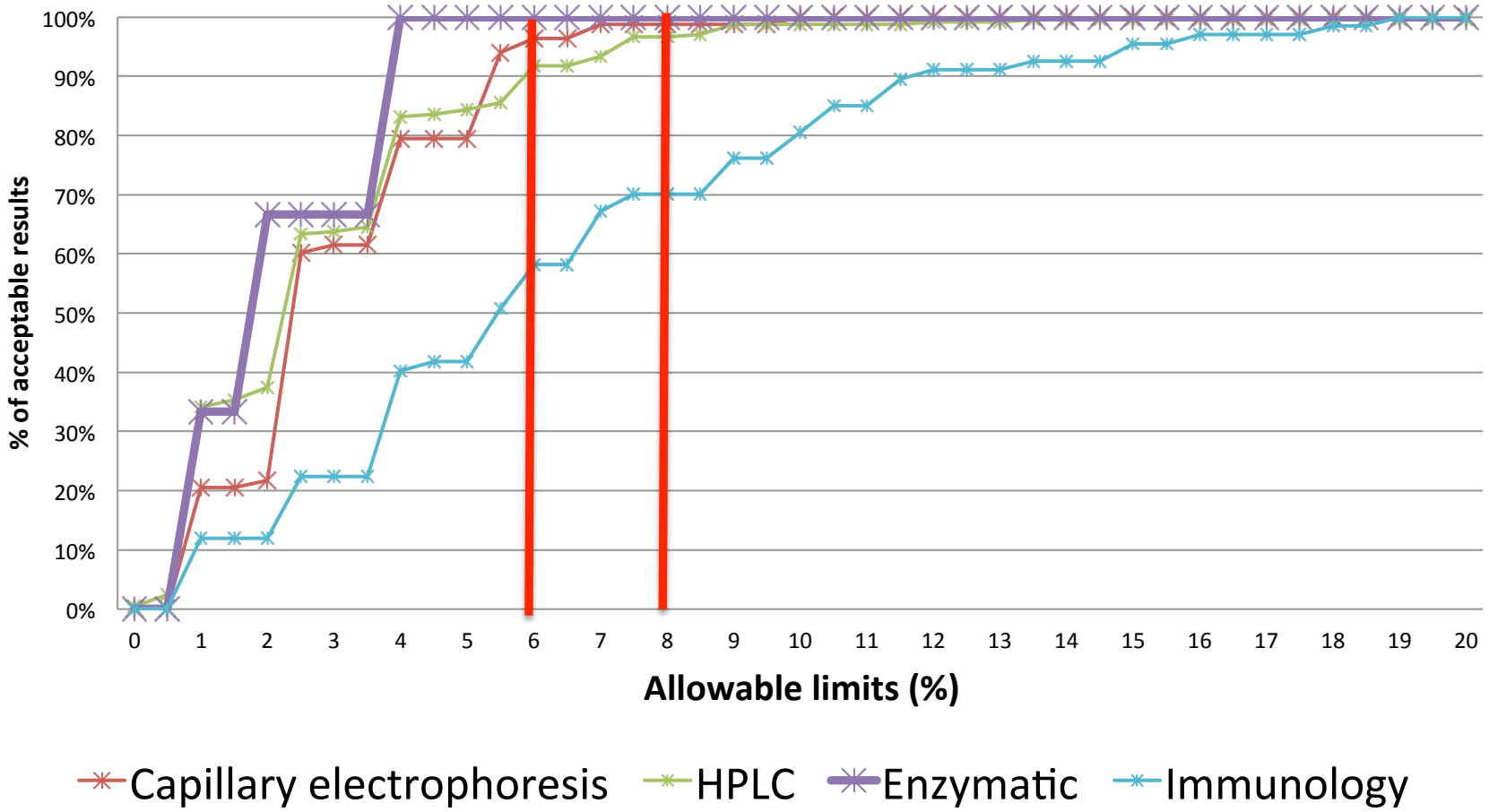
HbA1c EQAS - Biologie Prospective 2016 (Beatrix) - HPLC Method



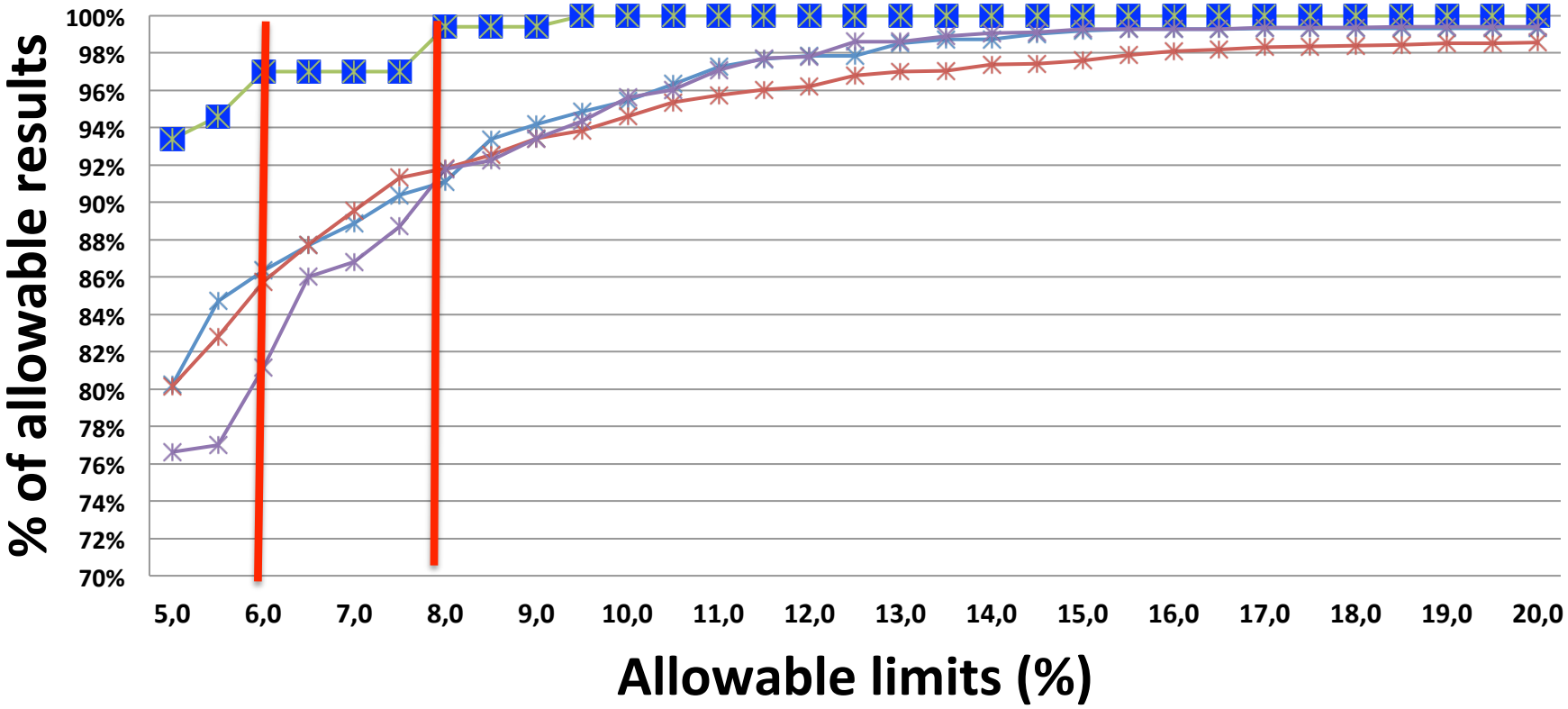
EEQ HbA1c PROBIOQUAL 2016-2017 - Evolution of the results according to the acceptable limits (%)- different kind of QC samples



PROBIOQUAL EQAS 2016 (same sample)



EQAS (2016 data) - Evaluation of participants' results according to allowable limits (+/- 5 to +/- 20%)



Unsatisfied results

AL: +/-6 %	HPLC	Capillary Electr.	Imunologic methods
Lyophilised 1	1%	1%	**15%**
Lyophilised 2	8%	3%	**40%**
Lyophilised 3	8%	10%	**29%**
HUMAN WHOLE BLOOD	1%	0%	**8%**

AL: +/-8 %	HPLC	Capillary Electr.	Imunologic methods
Lyophilised 1	0%	0%	1%
Lyophilised 2	1%	0%	30%
Lyophilised 3	1%	1%	10%
HUMAN WHOLE BLOOD	1%	0%	8%

Acceptable Limits for 90% and 95% of the participants

	LYO 1	LYO 2	LYO 3	LYO 4
General mean HBA1c (%)	6,60	6,42	7,08	6,40
90% of satisfactory results	6,5%	7,5%	7,5%	7,0%
95% of satisfactory results	9,5%	9,5%	10 %	9,0%

RESULTS AND DISCUSSION:

- The number of acceptable results does not depend on the concentration level but greatly on the control materials used.
- For AL at 6%, results obtained for all data provided with fresh human blood demonstrate higher performance: 97% of the results are acceptable instead of 80-86% when using lyophilised haemolysed blood.

CONCLUSION:

- The consequence of the definition of allowable limits was evaluated for different methods, different QC matrices and different concentration levels.
- Between methods variation observed discrepancies depends on the QC matrix material.
- No influence of the concentration level was observed.
- The impact of QC materials behaviour (commutability) used as compared to fresh human blood is shown to be one of the major factors of variation.
- Furthermore, the quality of the results observed depends on the analytical method used by the participants.
- The method used for this study could be used as a model for harmonization of the allowable limits taking into account the state of the art.

Proposal

Acceptance criteria used in European external quality assessment schemes (EQAS) for HBA1C concentrations showed **a high level of variation (+/- 6 to 15%).**

The percentage of unsatisfactory results obtained by the different organizers for the data studied varied widely according to.

For this reason, we propose to implement a working group from the European Organisation for External Quality Assurance Providers in Laboratory Medicine (EQALM) with the aim of establishing appropriate acceptance limits (AL) allowing harmonization between the evaluation procedures of European EQAS organizers.


THANK YOU FOR ATTENTION