

Lavorare secondo Standards: garanzia di qualità e sicurezza oggi e domani

Luca Mascaretti

*XXVI Congresso Nazionale AIBT
Pavia, 3-5 ottobre 2019*



Standard

Modello, tipo, norma cui si devono uniformare, o a cui sono conformi, tutti i prodotti e i procedimenti, tutte le attività e le prestazioni, di una stessa serie: *fissare uno s., attenersi agli standard*

(Vocabolario Treccani)

Standard: tesoro dell'esperienza
di tanti



Standards

Accreditamento

Accreditamento (1)

Processo in cui un'istituzione autorevole,
riconosciuta ed esterna, valuta
un'organizzazione sulla base di un insieme
predefinito di **Standards** di qualità.

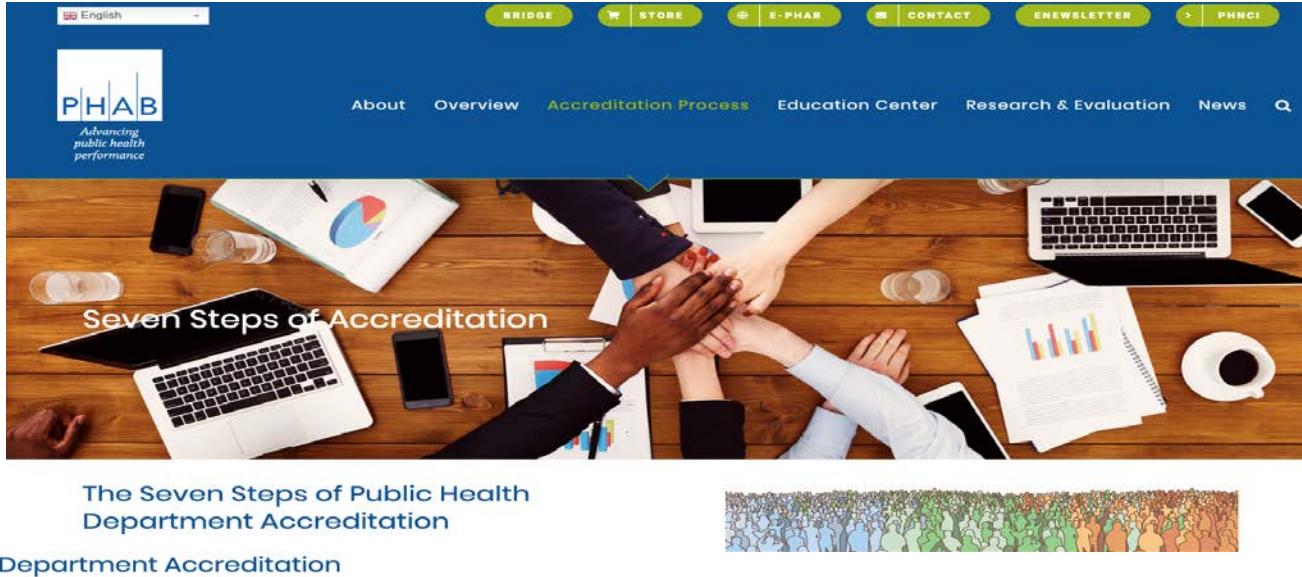
Accreditamento (2)

Prevede una verifica formale (**audit**) all'organizzazione svolta da un team di ispettori. I risultati dell'**audit** forniscono indicazioni sulla concessione o meno dello status di Accreditamento.

Accreditamento (3)

E' diventato uno strumento diffuso per garantire e migliorare nel tempo, la qualità e sicurezza in Sanità.

Esempi di Accreditemento in Sanità



The screenshot shows the PHAB website with a blue header. The header includes a language selector set to 'English', navigation links (BRIDGE, STORE, E-PHAB, CONTACT, ENEWSLETTER, PHNCI), the PHAB logo with the tagline 'Advancing public health performance', and a main menu (About, Overview, Accreditation Process, Education Center, Research & Evaluation, News). The main content area features a large image of hands stacked on a wooden table with the text 'Seven Steps of Accreditation'. Below this is the title 'The Seven Steps of Public Health Department Accreditation' and a sub-header 'Department Accreditation'. A decorative banner of colorful human silhouettes is also present.

PHAB
Advancing public health performance

About Overview **Accreditation Process** Education Center Research & Evaluation News

Seven Steps of Accreditation

The Seven Steps of Public Health Department Accreditation

Department Accreditation

The PHAB accreditation process consists of seven steps:

- + 1. Pre-application
- + 2. Application
- + 3. Document Selection and Submission
- + 4. Site Visit
- + 5. Accreditation Decision

- + 6. Reports
- + 7. Reaccreditation

**ACCREDITATION OF MEDICAL LABORATORIES
– SYSTEM, PROCESS, BENEFITS FOR LABS**

AKREDITACIJA MEDICINSKIH LABORATORIJA – SISTEM, PROCES, DOPRINOS ZA LABORATORIJE

Tomáš Zima

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Prague, Czech Republic*

J Med Biochem 36: 231–237, 2017

- Accreditation demonstrates competence of the laboratory
- A tool to recognise laboratories world-wide
- Periodical audits stimulate maintenance and improvement of quality
- Improves standard of services for clients (patients, health care providers, etc)
- ISO 15189:2012
- Accreditation is not about who is best, but who has a system of standard procedures which aim to improve quality and patient safety
- **Quality system is about people, with people and for people**

STUDY PROTOCOL

Open Access



Accreditation in general practice in Denmark: study protocol for a cluster-randomized controlled trial

Merethe K. Andersen^{1*}, Line B. Pedersen^{1,2}, Volkert Siersma³, Flemming Bro⁴, Susanne Reventlow³, Jens Søndergaard¹, Marius Brostrøm Kousgaard³ and Frans B. Waldorff^{1,3}

Abstract

Background: Accreditation is used increasingly in health systems worldwide. However, there is a lack of evidence on the effects of accreditation, particularly in general practice. In 2016 a mandatory accreditation scheme was initiated in Denmark, and during a 3-year period all practices, as default, should undergo accreditation according to the Danish Healthcare Quality Program. The aim of this study is primarily to evaluate the effects of a mandatory accreditation scheme.

L'Istocompatibilità e l'Immunogenetica
sono in costante (e talvolta vorticoso)
evoluzione.

Pietre miliari H&I

Molecular Biology era

'58: 1st
HLA Ag,
Dausset

1960

'61: Bw4, Bw6,
Payne, Van Rood

1970

'62: 1st Kidney Tx
Starzl, Calne

'64: Micro-
lymphocytotoxicity test,
Terasaki

'64: 1° IHWS
Durham, USA

'67: 1st Heart Tx,
Barnard

'67: HLA Genetics ,
Ceppellini

'68: 1st Bone Marrow
TX, Good

'68: HLA nomenclature

'69: relevance of XM
in kidney Tx, Terasaki

'70: CDC
screening and
XM

1980

'73: HLA-B27 and
Ankylosing
Spondylitis

'74: MHC restriction,
Doharty, Zinkernagel

'80: 8st IHWS Los
Angeles, summary of
HLA specificities:79

'83: PCR , Mullis

1990

'92: PCR-SSP,
Olerup

'93: PCR-SBT,
Santamaria

'95: EFI Accreditation
Program

'97: HLA-Ab
Elisa

2000

'02: HLA-Ab
microbeads

'05: single Ag
beads

'07: MICA Abs

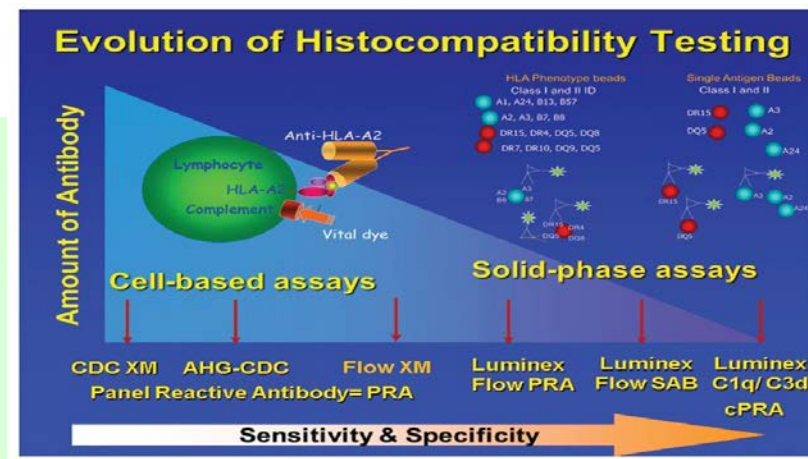
2010

'10: Virtual XM
Cecka

'15: NGS in
clinical HLA Labs

2020

Pietre miliari H&I



'69: relevance of XM
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1960

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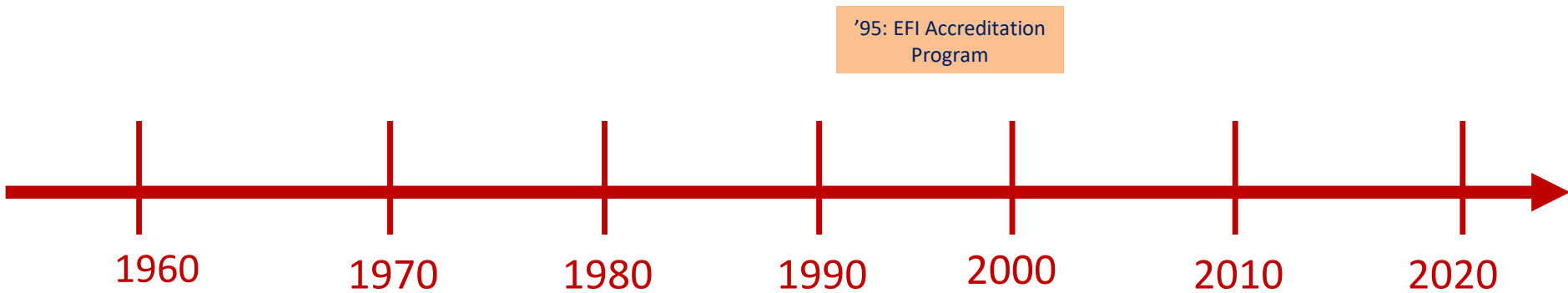
1990

2000

2010

2020

Pietre miliari H&I



Pietre miliari H&I



'95: EFi Accreditation Program

1960

1970

1980

1990

2000

2010

2020

The accreditation toolkit



EFI STANDARDS

Version 0 – Oct 1992

Version 1 – May 1995

Version 2 – September 1996

Version 2.2- March 1998

Version 3 – June 1999

Version 4 – June 2000

Version 5.1 – Granada 2001

Version 5.2 – Strassbourg 2002

Version 5.3 – Baden-Baden April 2003

Version 5.4 – Istanbul April 2005

Version 5.5 – Barcelona October 2007

Version 5.6 – Ulm October 2008

Version 5.6.1 – October 2009

Version: 5.6.2 – Prague October 2011

Version 5.7 (6.0)- Liverpool Oct 2012

Version 6.1 - Maastricht October 2013

Version 6.2 – Liverpool October 2014

Version 6.3 – Geneve October 2015

Version 7.0 – Mannheim January 2018

K - MARROW AND STEM CELL TRANSPLANTATION**K1.000** *Histocompatibility Testing for related donors.*

K1.100 HLA-A, B, DR typing of all available members of the immediate family must be done to establish inheritance of haplotypes.

K1.120 HLA typing for HLA identical siblings must include adequate testing to definitively establish HLA identity. Extended Class I and/or Class II typing by DNA methods or augmented testing (e.g. MLC, T cell precursor frequency) should be performed as appropriate for the transplant protocol and optimal donor selection.

K1.130 HLA typing for intrafamilial potential donors who are not HLA identical siblings must include Class II typing by DNA methods at a level that is appropriate for the transplant protocol and optimal donor selection. Augmented testing (e.g. Class I typing by DNA methods, bidirectional MLC, T cell precursor frequency) should be performed as appropriate for the transplant protocol and optimal donor selection.

K1.140 For final selection of a related donor, HLA typing of both donor and recipient must be repeated using a new typing sample from each such that each individual's identity is confirmed.

K1.150 Laboratories not able to perform extended Class I and/or Class II typing by DNA methods must arrange for a laboratory performing these tests to undertake confirmatory testing as described in K1.130. The latter laboratory must be able to perform DNA based HLA Class I and Class II typing to a level of resolution with 4 digits (e.g. A*0201, DRB1*1107). Where the ambiguities cannot be resolved, all the alternatives must be reported.

K2.000 *Histocompatibility testing for unrelated donors.***K2.100** *Volunteer bone marrow donors registries.*

K2.110 The donor should give his/her informed consent according to the national legislation before blood is taken for typing and before the donor is placed on a list of donors available to be called.

K2.120 Donor records should be maintained so that donors can be rapidly retrieved according to HLA type.

K2.130 Typing of the donors must be performed by serology or DNA methods at a level of resolution with at least 2 digits (e.g. A2 or A*02, DR11 or DRB1*11).

K2.200 *Unrelated donors selected for bone marrow transplantation.*

K2.210 HLA typing for unrelated donors must include Class II typing by DNA methods at a level that is appropriate for the transplant protocol and optimal donor selection. Augmented testing (e.g. Class I typing by DNA methods, including HLA-C, bidirectional MLC, T cell precursor frequency) should be performed as appropriate for the transplant protocol and optimal donor selection.

K2.220 Laboratories typing unrelated donors selected for bone marrow donation must be able to type the donor and the recipient for HLA Class I and Class II by DNA methods, to a level of resolution with 4 digits (e.g. A*0201, DRB1*1107). Where the ambiguities cannot be resolved, all the alternatives must be reported.

K2.230 Laboratories should have a mechanism in place for resolving any tissue typing discrepancies that may occur between laboratories.

K2.240 For final selection of an unrelated donor, HLA typing of both donor and recipient must be repeated using a new typing sample from each such that each individual's identity is confirmed. HLA typing must be performed using a DNA method as described in K1.150.

E5.3 Haematopoietic Stem Cell Transplantation	
E5.3.1	Typing and Antibody screening
E5.3.1.1	There must be a documented transplant agreement with each transplant program the laboratory serves, which must detail the service provided including:
E5.3.1.1.1	Patient
E5.3.1.1.2	Donor
E5.3.1.1.3	Loci typed (e.g. HLA, KIR etc.)
E5.3.1.1.4	Level of resolution
E5.3.1.1.5	Which party takes responsibility of the histocompatibility component of the transplant
E5.3.1.1.6	The transplant agreement must be signed by all parties
E5.3.2	Histocompatibility testing for related transplants
E5.3.2.1	HLA-A, B or DR typing must be carried out on available members of the immediate family
E5.3.2.2	Must include adequate testing:
E5.3.2.2.1	To definitively establish HLA genotype identity (F1.3.2 applies), or
E5.3.2.2.2	To type at high resolution for the relevant loci defined in the transplant protocol, if only phenotype identity has been established, or
E5.3.2.2.3	To include high resolution typing for recipient and potential intra-familial donors who are not HLA identical siblings
E5.3.2.3	HLA-A, B and DR typing as a minimum requirement must be repeated on both the recipient and the potential donor prior to transplantation using a new typing sample from each, so that each individual's typing is confirmed
E5.3.3	HLA typing for Donors (related cord blood unit)
E5.3.3.1	The cord blood unit must be typed using DNA methods for HLA-A, B and DRB1 at a minimum of low resolution (e.g. A*02, B*44, DRB1*11)
E5.3.3.2	Extended typing must be included if required by the transplant protocol (standards E5.3.2 also apply)
E5.3.3.3	Prior to transplantation, a verification typing:
E5.3.3.3.1	Must be performed for HLA-A, B and DRB1 at a minimum of low resolution
E5.3.3.3.2	Must be performed on a segment of the tubing integrally attached to the unit, if available, or otherwise, on a satellite vial
E5.3.3.4	If verification typing was not performed on a segment of the tubing integrally attached, the laboratory must recommend that an additional typing is performed on the content of the thawed unit
E5.3.4	Histocompatibility Testing for Unrelated Transplants
E5.3.4.1	Volunteer Bone Marrow Donor Registries
E5.3.4.1.1	Typing of the donors must be performed
E5.3.4.1.1.1	By serology or
E5.3.4.1.1.2	By DNA methods at a minimum of low resolution (e.g. A2 or A*02, DR11 or DRB1*11)
E5.3.4.2	Typing of Units for Cord Blood Bank
E5.3.4.2.1	Typing must be performed using DNA methods for HLA-A, B and DRB1, at a minimum of low resolution (e.g. A*02, B*44, DRB1*11)
E5.3.4.2.2	Typing of additional loci or high resolution typing must be included if required by the policy of the registry, or if requested
E5.3.4.2.3	The identity of the Cord Blood Unit must be verified by HLA typing on a separate sample to demonstrate concordance of results
E5.3.4.2.4	Additional typing may be performed using any stored DNA sample, provided that the identity of the unit has previously been verified
E5.3.4.2.5	The verification of identity and the source of the sample tested must be reported back to the registry
E5.3.4.3	Histocompatibility Testing for Transplants from Unrelated Donors
E5.3.4.3.1	HLA typing for recipient and unrelated donors must:
E5.3.4.3.1.1	Be performed by DNA based methods
E5.3.4.3.1.2	Include as a minimum requirement:
E5.3.4.3.1.2.1	HLA-A/B/C and DRB1 typing at high resolution
E5.3.4.3.1.3	Include additional loci if required by the transplant protocol
E5.3.4.3.1.4	Include higher resolution levels if required by the transplant protocol
E5.3.4.3.1.5	Be performed by a laboratory having a written agreement with the transplant centre
E5.3.4.3.2	Prior to transplantation using an unrelated donor, HLA typing of the recipient and donor must be repeated for verification:
E5.3.4.3.2.1	By the laboratory having a written agreement with the transplant centre

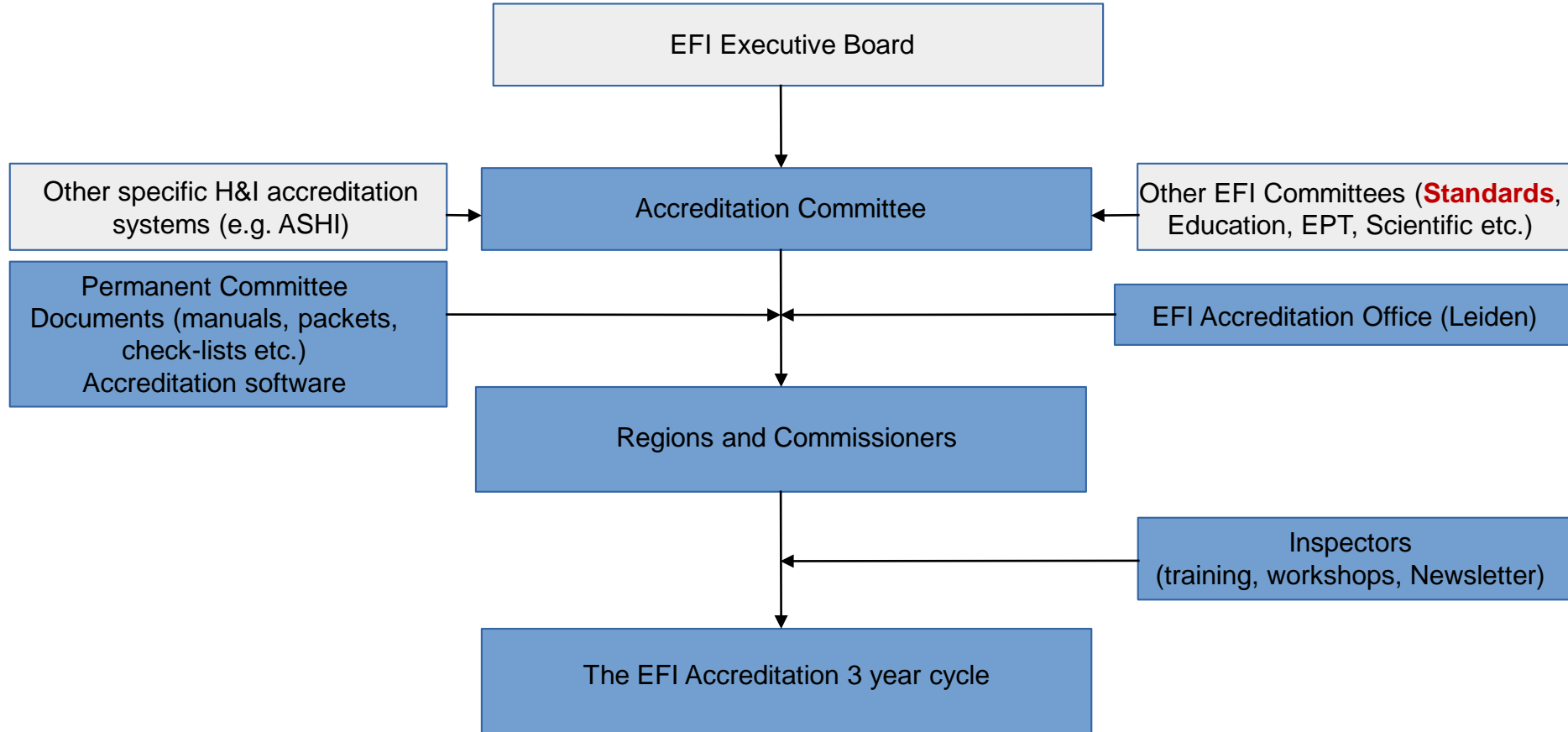
E5.3.4.3.2.2	Using a different typing sample
E5.3.4.3.2.3	For HLA-A, -B, and -DRB1, as a minimal requirement
E5.3.4.3.3	For unrelated donors HLA-A, B, -DRB1 concordant results are required on two separate samples. Registry typing is acceptable as one of the two required results
E5.3.4.4	Unrelated Cord Blood Unit Typing for Donor Selection
E5.3.4.4.1	Verification typing must be performed
E5.3.4.4.1.1	Including as a minimum requirement
E5.3.4.4.1.1.1	HLA-A and -B at low resolution, and
E5.3.4.4.1.1.2	HLA-DRB1 at high resolution
E5.3.4.4.1.1.3	Extended typing if required by the transplant protocol
E5.3.4.5	Unrelated Cord Blood Unit Typing Prior to Transplantation
E5.3.4.5.1	Prior to the conditioning regimen of the recipient, a verification typing must be performed:
E5.3.4.5.1.1	At a minimum level of low resolution for HLA-A, -B, and -DRB1
E5.3.4.5.1.2	Upon reception of the shipped unit
E5.3.4.5.1.3	On a segment of the tubing integrally attached to the unit, if available; otherwise a satellite vial shipped with the unit may be used
E5.3.4.5.2	If no segment is available, this step can be performed after transplantation and must be initiated as soon as possible after thawing the unit
E5.3.5	Crossmatching
E5.3.5.1	Crossmatching must be performed
E5.3.5.1.1	Prior to related and unrelated transplantation if required by the local transplant protocol
E5.3.5.1.2	According to standards E4.2.5 (Crossmatching)
E5.3.6	MICA allelic resolution must be performed if it is requested by the transplant protocol
E5.3.7	Investigation of MICA antibodies
E5.3.7.1	For bead array techniques, standards from section E2.8 (Bead Array) also apply

EFI Standards, version 7.0

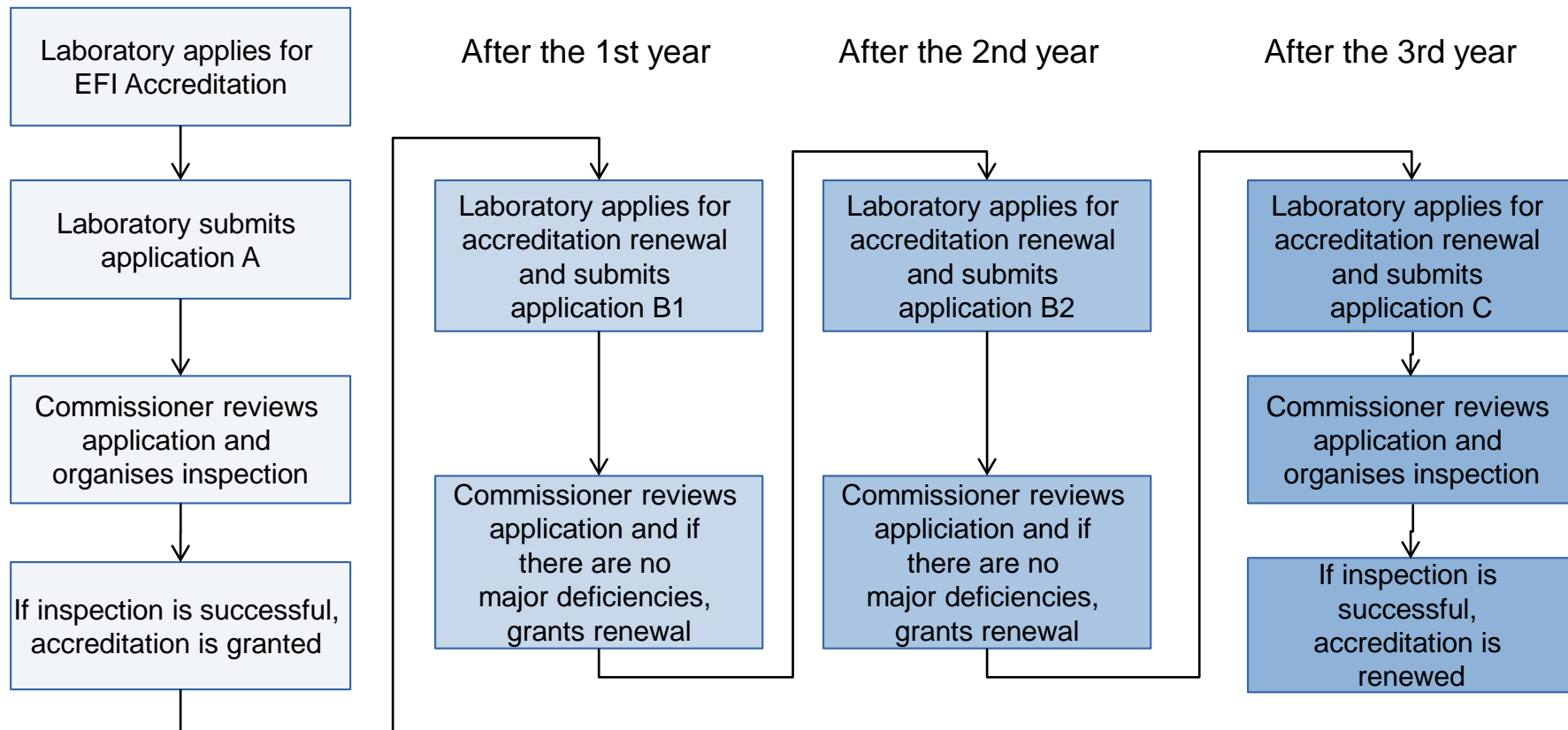
SECTION A – GENERAL POLICIES

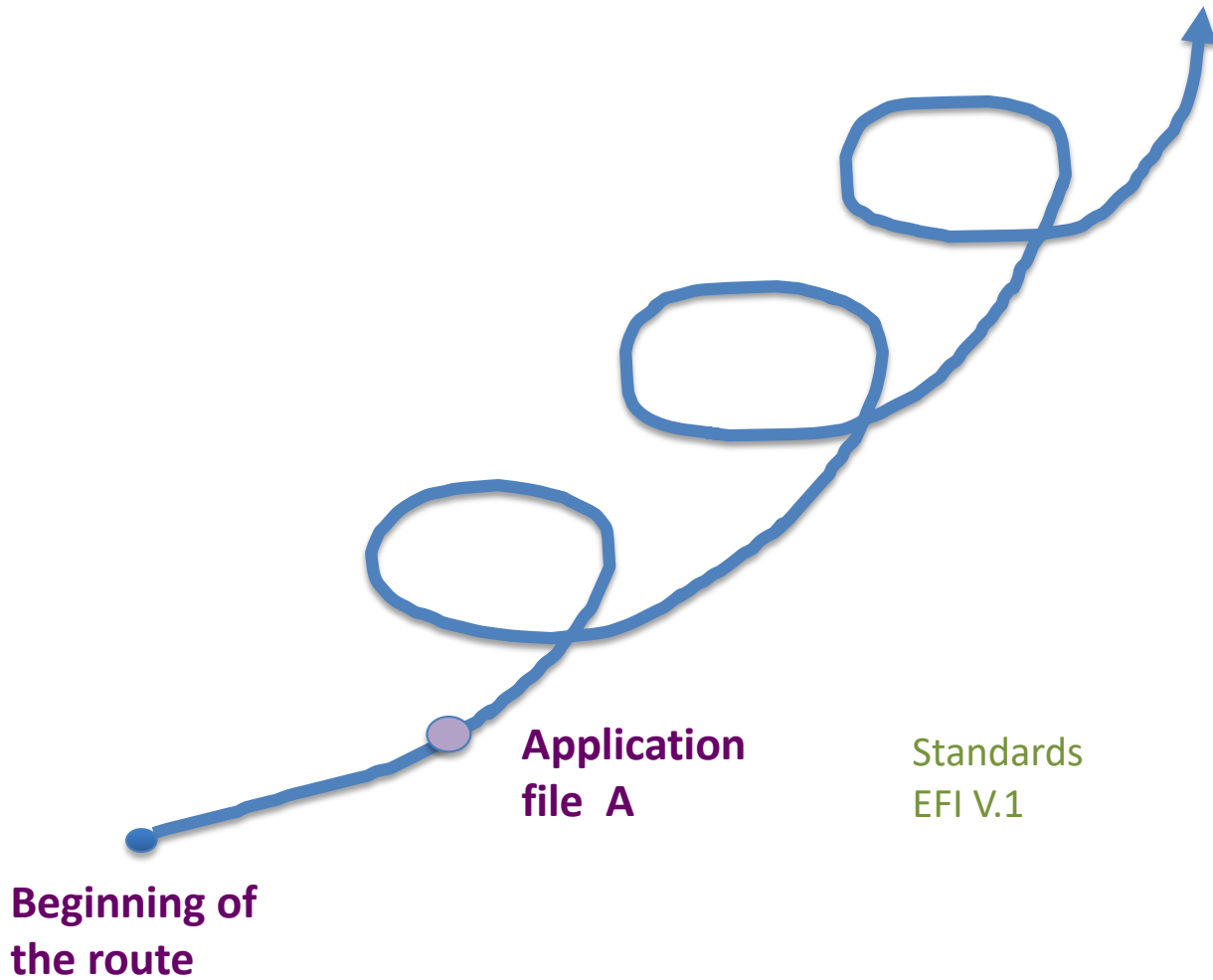
A1	These Standards have been approved and adopted by the EFI Executive Committee
A2	They are based on Standards originally prepared by the American Society for Histocompatibility and Immunogenetics (ASHI)
A3	These Standards have been established for the purpose of <u>ensuring accurate and dependable histocompatibility testing consistent with the current state of technological procedures and the availability of reagents</u>
A4	These Standards establish <u>minimal criteria</u> , which all histocompatibility laboratories must meet if their services are to be considered acceptable
A5	Many laboratories, because of extensive experience, will <u>exceed the minimal requirements</u> of these Standards
A6	Certain Standards are obligatory. In these instances, the Standards use the word "must"
A7	Some Standards are highly recommended but not absolutely mandatory. In these instances the Standards use words like "should" or "recommended"

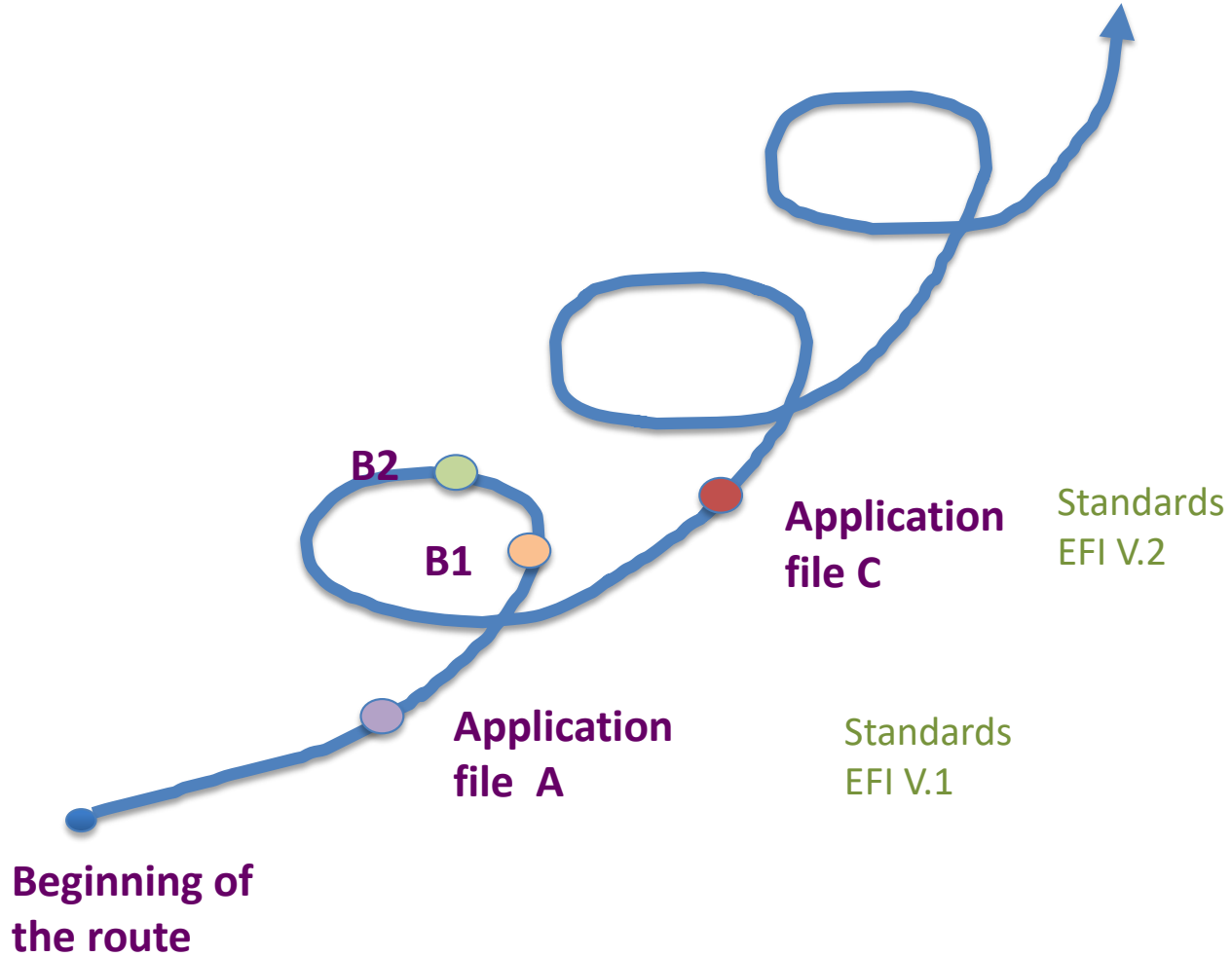
The EFI Accreditation System

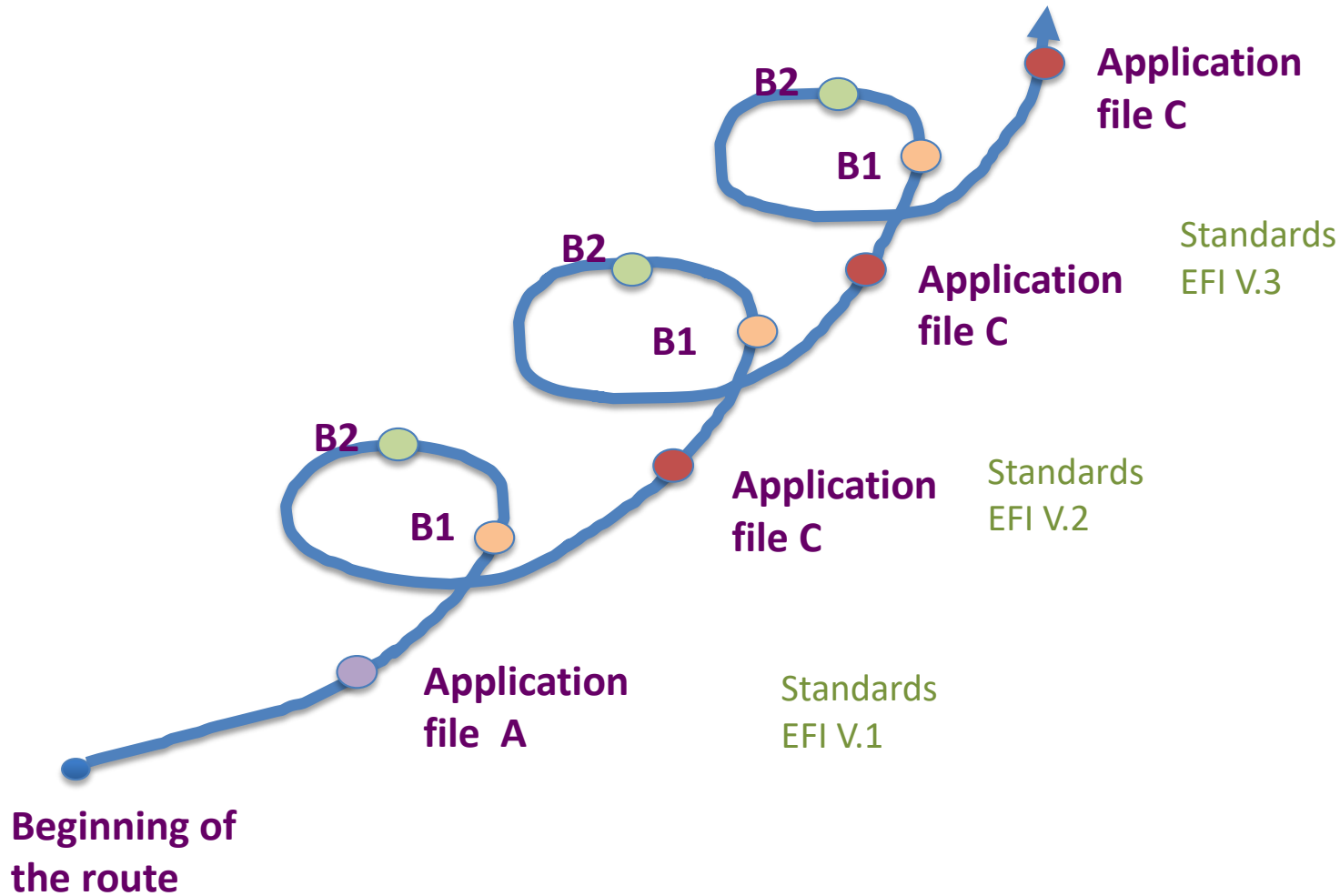


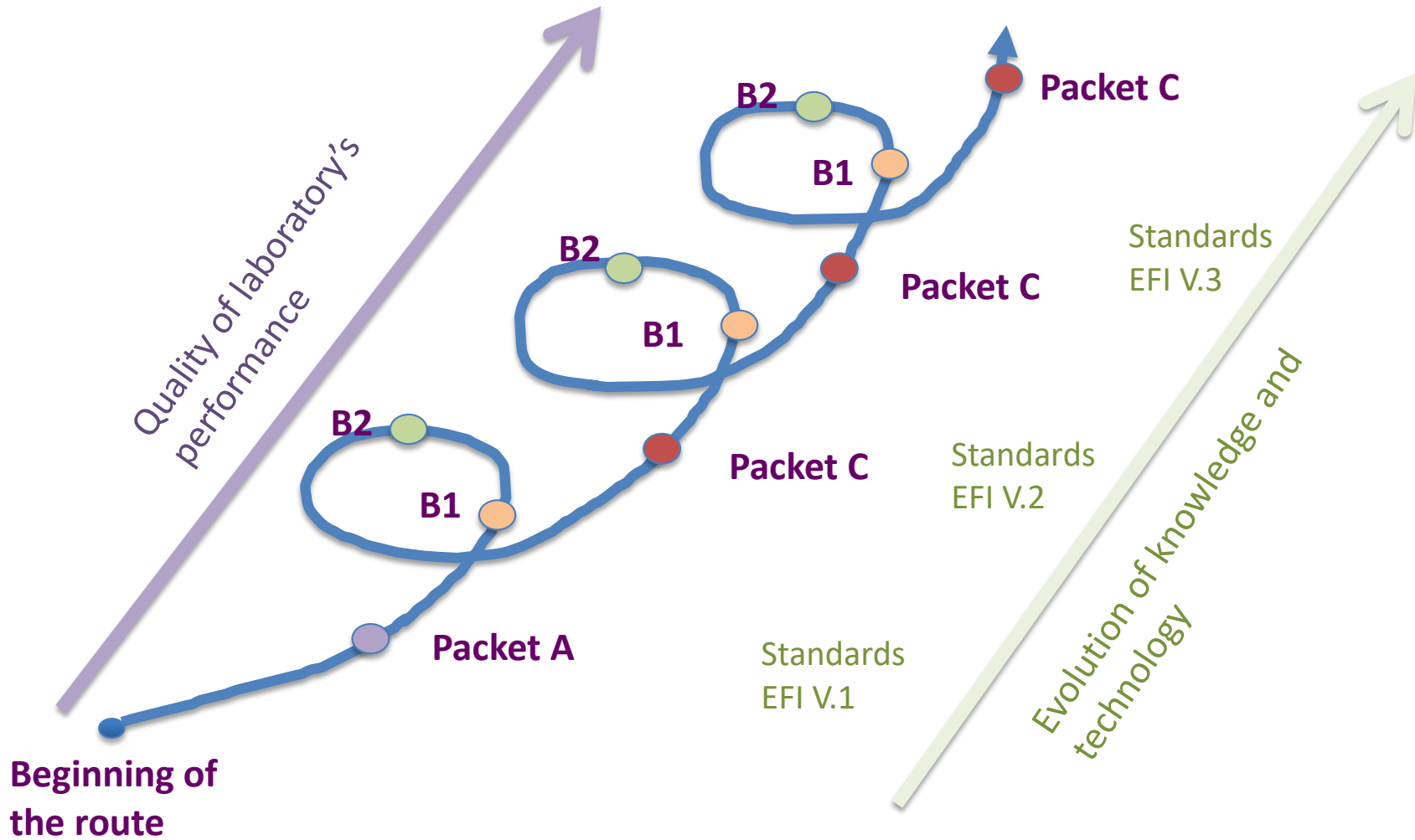
The 3 year cycle of the EFI Accreditation system







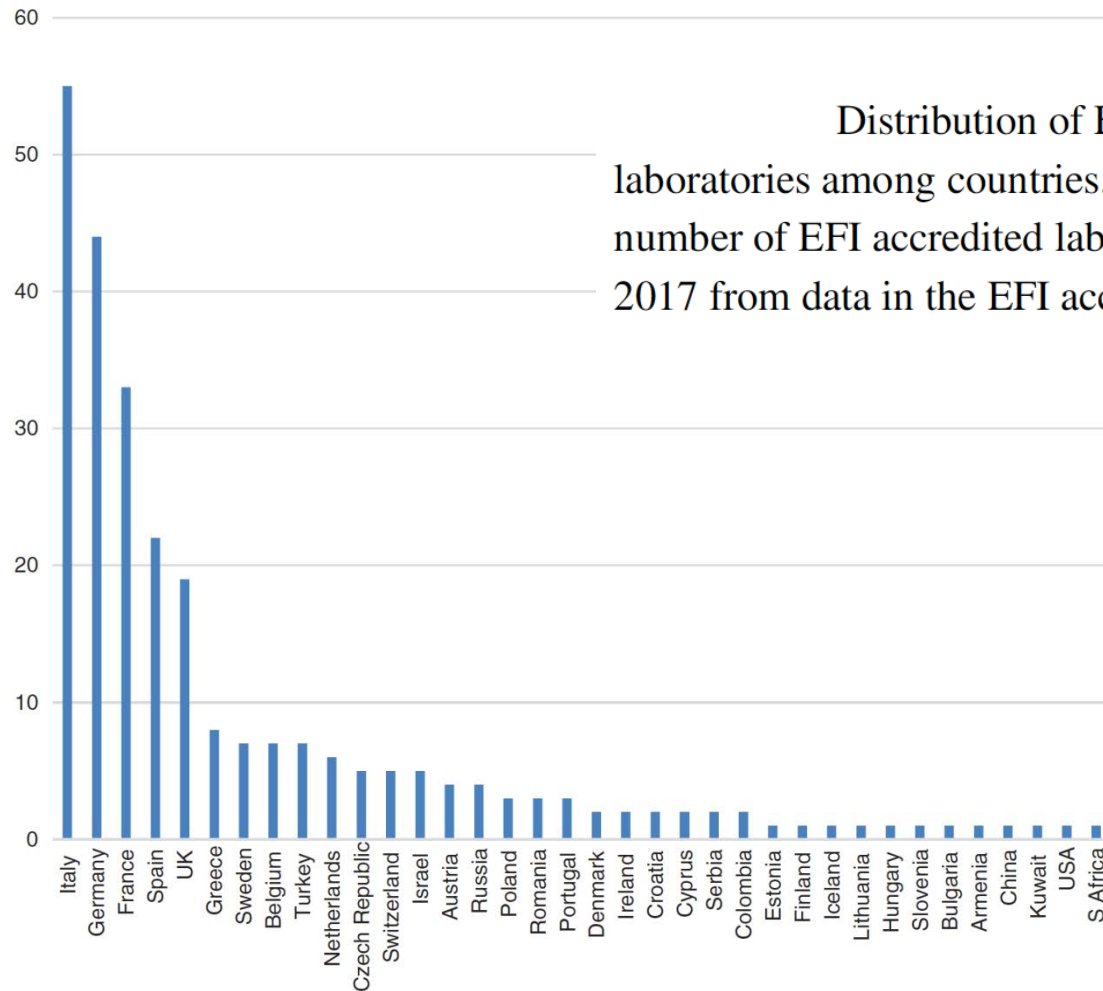


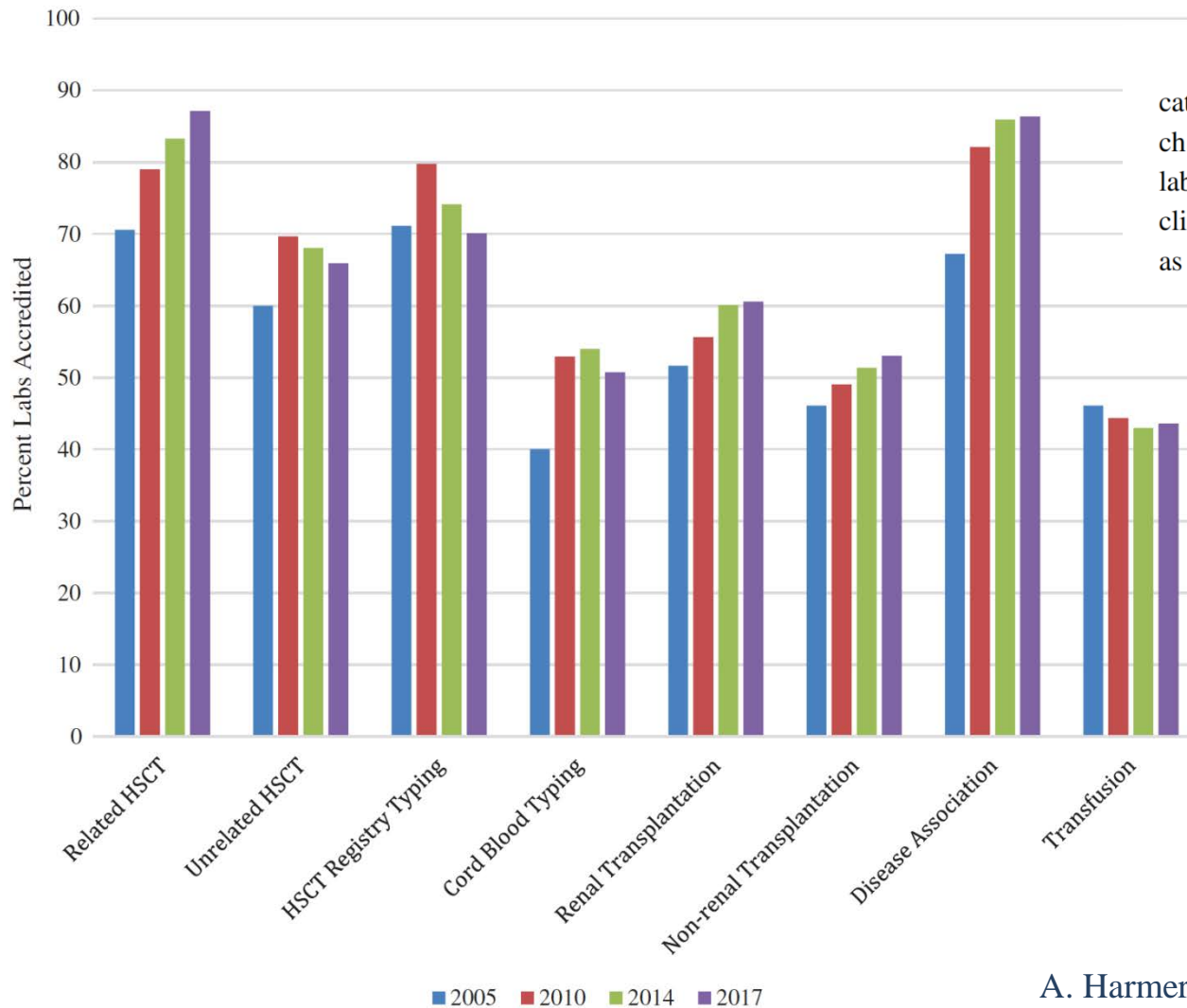


Accreditation of histocompatibility and immunogenetics laboratories: Achievements and future prospects from the European Federation for Immunogenetics Accreditation Programme

A. Harmer^{1,2} | L. Mascaretti^{2,3} | E. Petershofen^{2,4}

In this challenging *scenario*, by continuing to work with the Standards Committee, the EFI Accreditation System can be seen as a framework for clinically significant advancements to be processed and brought to the routine laboratories.





Distribution of accredited clinical categories among laboratories. Showing changes in the percentage of accredited laboratories holding accreditation for specific clinical categories in the period 2005 to 2017 as recorded in the EFI accreditation database

Distribution of accredited HLA-typing techniques among laboratories. Showing changes in the percentage of accredited laboratories with accreditation for different HLA-typing techniques in the period 2005 to 2017 as recorded in the EFI accreditation database

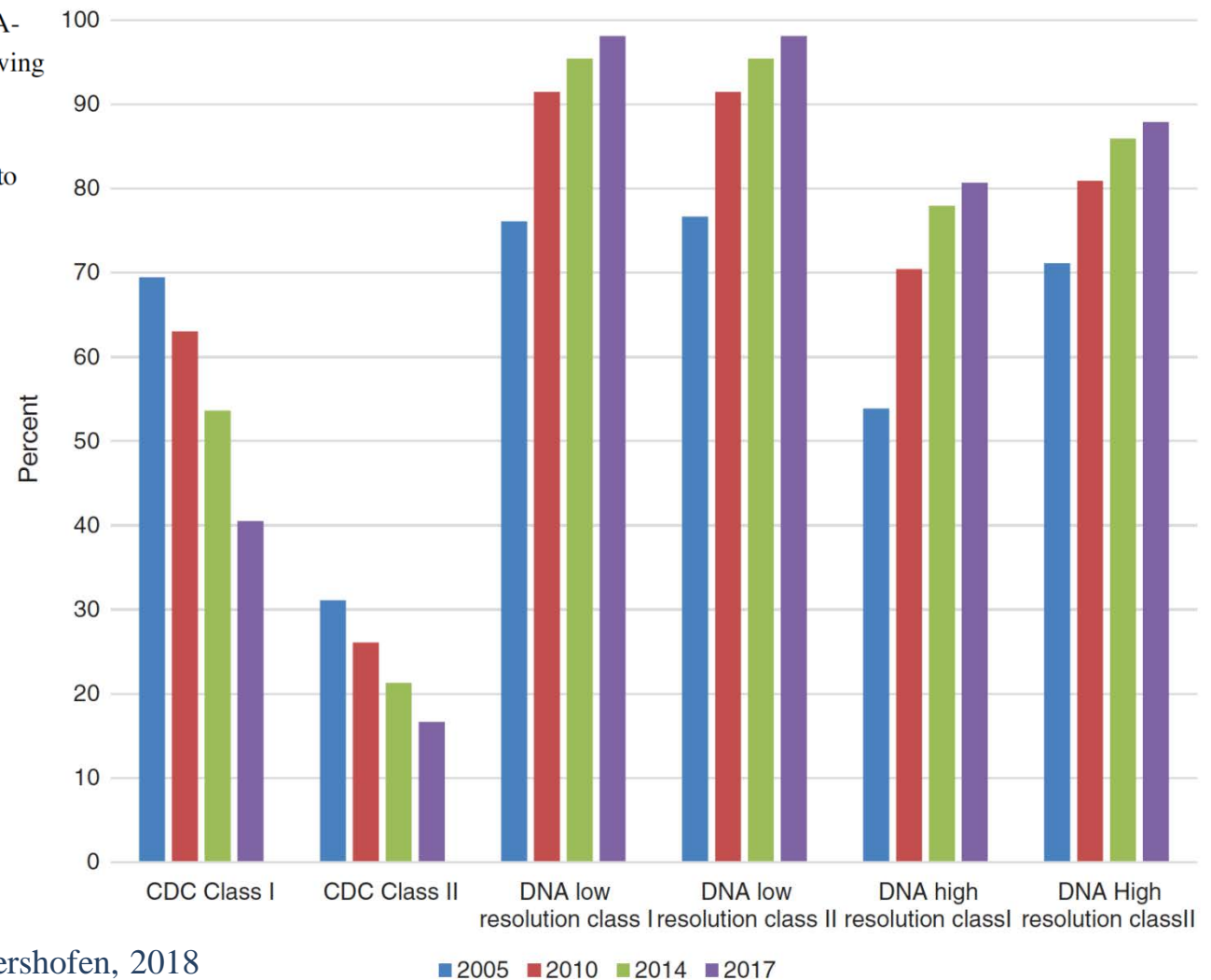


TABLE 2 Most common deficiencies with EFI standards found during inspections

	2012		2014		2016	
	No. of labs with deficiency	Rank of finding	No. of labs with deficiency	Rank of finding	No. of labs with deficiency	Rank of finding
External proficiency testing	29	1	22	1	23	2
Equipment maintenance	26	2				
Continuous monitoring of processes	22	3	13	4=	29	1
Procedure manual	21	4=	14	3=	8	8=
Temperature monitoring	21	4=	10	5=	11	5=
Competence evaluation	18	5	16	2	8	8=
Software validation			14	3=	16	3
Reports			13	4=	12	4
High-resolution typing ambiguities	14	8	10	5=	11	5=

Figures give number of individual findings plus ranking in top 10 plus, for example, in 2012, 29 laboratories had a deficiency in external proficiency testing and this was ranked first in the most common findings.

External proficiency testing

Equipment maintenance

Continuous monitoring of processes

Procedure manual

Temperature monitoring

Competence evaluation

Software validation

Reports

High-resolution typing ambiguities

SECTION D – EXTERNAL PROFICIENCY TESTING

D1	PROCEDURE OF EPT
D1.1	The laboratory must participate in EPT programme(s) to cover
D1.1.1	All the accredited laboratory applications (HLA typing, antibody screening and identification, crossmatching, etc.)
D1.1.2	All techniques used individually or in combination as routinely employed to produce a final result
D1.1.3	If no established scheme exists for a specific category (e.g. HNA antibody detection and identification) laboratory must participate in an EPT workshop or trial offered by an EPT Provider or must take part in an inter-laboratory exchange of samples
D1.1.4	If (an) EPT scheme(s) or EPT workshop(s)/trial(s) for a specific category exist(s) but the laboratory has no access, the laboratory must at least participate in an inter-laboratory exchange of samples.

External proficiency testing

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High-resolution typing ambiguities

C2.2	Equipments
C2.2.1	The laboratory must establish and employ policies and procedures for the proper maintenance of equipment, instruments and test systems by:
C2.2.1.1	Defining its preventive maintenance programme for each instrument and piece of equipment at least once a year
C2.2.1.2	Performing and documenting function checks on equipment with at least the frequency specified by the manufacturer
C2.2.1.3	The laboratory must use calibrated dispensing instruments (e.g. pipettes, etc.) to perform assays
C2.2.1.3.1	Calibration of dispensing instruments must be performed at least once a year
C2.2.1.3.2	Calibration must be documented
C2.2.2	Refrigerators and freezers:
C2.2.2.1	Acceptable ranges for each refrigerator and freezer must be documented
C2.2.2.2	Must be monitored to detect unacceptable temperatures
C2.2.2.3	Should be coupled to recording thermometers
C2.2.2.4	Should be coupled to alarm systems with an audible alarm where it can be heard 24 hours a day
C2.2.2.5	Corrective actions for when the temperature is outside the documented acceptable range must be defined and documented
C2.2.3	In laboratories where liquid nitrogen is utilised for storage of frozen cells, the level of liquid nitrogen in the cell freezers must be monitored at intervals which will ensure an adequate supply at all times
C2.2.4	To ensure that procedures are carried out within temperature ranges specified in the laboratory's procedure manual, the following must be monitored every working day:

External proficiency testing

Equipment maintenance

Continuous monitoring of processes

Procedure manual

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Software validation

Reports

High-resolution typing ambiguities

C1.3	Systems for Continuous Test Evaluation and Monitoring
C1.3.1	The laboratory must establish and employ policies and procedures, and document actions taken when:
C1.3.1.1	Test systems do not meet the laboratory's established criteria
C1.3.1.2	Quality control results are outside of acceptable limits
C1.3.1.3	Errors are detected in the reported patient results. In this instance, the laboratory must:
C1.3.1.3.1	Promptly notify the authorised person ordering or individual utilising the test results of reporting errors
C1.3.1.3.2	Issue corrected reports
C1.3.1.3.3	Maintain copies of the original report as well as the corrected report for at least two years
C1.3.2	The laboratory must have mechanisms in place for continuous monitoring of all test systems and equipment used, including:
C1.3.2.1	Validation/verification, before introduction into routine use, of all new tests, by systematic comparative evaluation of results obtained in parallel with the new and the standard system
C1.3.2.2	Regular evaluation of results obtained in external and internal QC testing
C1.3.2.3	Regular monitoring of test validity in routine testing, by recording observations diverging from the expected results (e.g. cross-reactivity of probes or primer mixes, day-to-day variations)
C1.3.2.4	Comparing test results and documenting inconsistencies, if the same test is performed using different techniques
C1.3.2.5	Identifying and evaluating inconsistencies between test results and clinical data or diagnostic parameters provided
C1.3.2.6	Written evidence of the ongoing monitoring process must be available in the laboratory for each method performed
C1.3.2.7	Controls and procedures to identify sample mix-up

External proficiency testing

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High-resolution typing ambiguities

SECTION C – QUALITY ASSURANCE

C1	MANAGEMENT
C1.1	Laboratory Procedure Manual
C1.1.1	All procedures in use in the laboratory must be detailed in a procedure manual which is immediately available where the procedures are carried out. The use of product inserts provided by manufacturers is not acceptable in place of the procedure manual
C1.1.2	For each procedure:
C1.1.2.1	A review by the Director/Co-Director or a delegated individual with appropriate qualifications must be performed at least biennially
C1.1.2.2	Documented evidence of this review must be available
C1.1.2.3	Any changes in procedures must be approved and documented by the Director/Co-Director/ delegated individual at the time they are initiated

External proficiency testing

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High-resolution typing ambiguities

C2.2.4.1	Ambient temperature
C2.2.4.2	Temperature of incubators in which test procedures are carried out
C2.2.5	Laboratories performing procedures which require cell culture must have the following:
C2.2.5.1	Laminar Flow Hoods or other appropriately aseptic work area
C2.2.5.2	Incubators, which must be:
C2.2.5.2.1	Appropriately humidified and
C2.2.5.2.2	Monitored daily in relation to:
C2.2.5.2.2.1	Temperature (37°C)
C2.2.5.2.2.2	CO ₂ concentration (5% ± 1%)

External proficiency testing

Equipment maintenance

Continuous monitoring of processes

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High-resolution typing ambiguities

B5	Competency Evaluation and Continuous Education
B5.1	The Director/Co-Director or designee must:
B5.1.1	Evaluate the competence of each technologist to accurately perform tests. This must be done at least yearly for each technique the technologist performs and must be based on a defined process
B5.1.2	Maintain records of these evaluations for each individual
B5.2	The Laboratory Director and the technical staff must participate in continuing education relating to each category for which EFI accreditation is sought

External proficiency testing

Equipment maintenance

Continuous monitoring of processes

Procedure manual

Temperature monitoring

Competence evaluation

Software validation

Reports

High-resolution typing ambiguities

E3	COMPUTER ASSISTED ANALYSES
E3.1	The Laboratory Director and/or the Supervisor must
E3.1.1	Review
E3.1.2	Verify
E3.1.3	Sign computer assisted analyses before issue
E3.2	The computer software programme used for analyses must be:
E3.2.1	Identified
E3.2.2	Validated/Verified before use

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F3	RECORDS AND TEST REPORTS
F3.1	The laboratory must maintain the following records:
F3.1.1	Records of subjects tested for two years or longer, depending on local regulations. These records must include:
F3.1.1.1	Log books
F3.1.1.2	Worksheets, that must clearly identify:
F3.1.1.2.1	The sample tested
F3.1.1.2.2	The reagents used
F3.1.1.2.3	The methods used
F3.1.1.2.4	The test performed
F3.1.1.2.5	The date of the test
F3.1.1.2.6	The person performing the test
F3.1.1.3	A summary of results obtained
F3.1.1.4	The identity of the subcontracting laboratory and that portion of the testing for which it bears responsibility must be noted in the reports issued
F3.2	Records may be only saved in computer files, provided that back-up files are maintained to ensure against loss of data
F3.3	For molecular typing, a record must be kept which is appropriate to the technique used, such as a photographic record of a gel, a membrane, an autoradiograph, an electronic file, or the read out from a sequencer

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High-resolution typing ambiguities

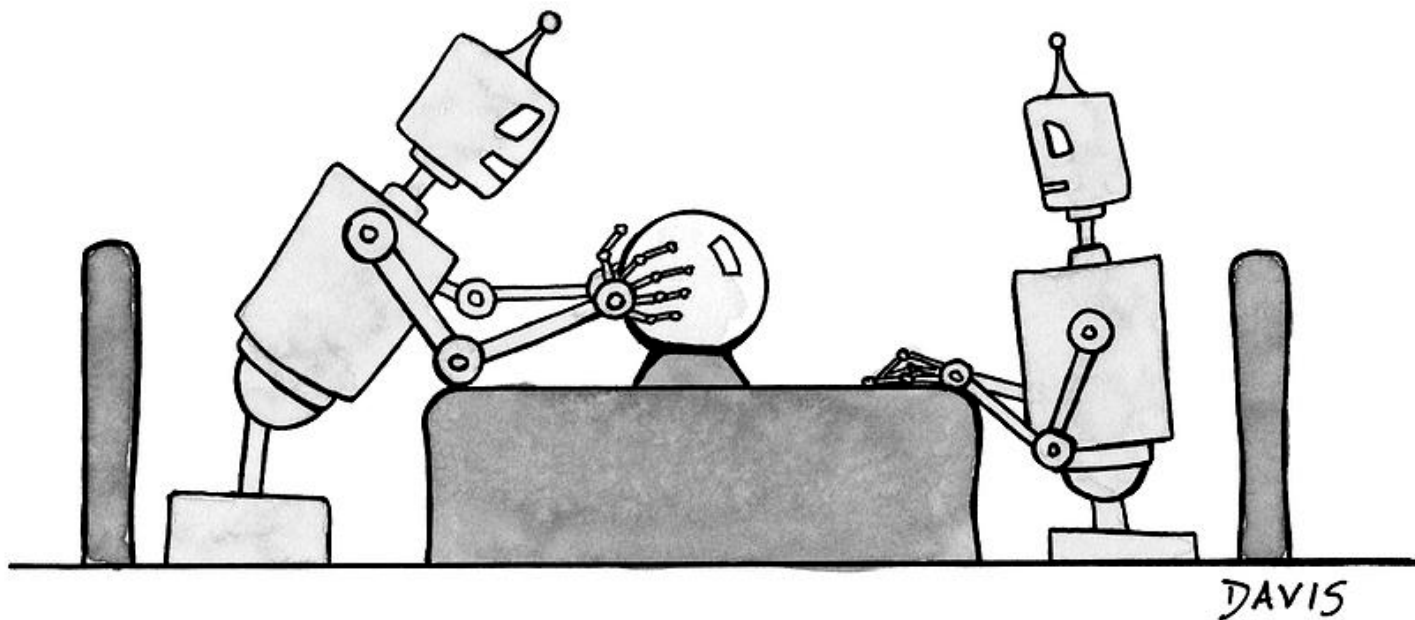
F1.2.4	Reporting High Resolution Typing
F1.2.4.1	When reporting high resolution typing, where ambiguous allele combinations cannot be resolved, all the alternatives must be documented
F1.2.4.2	If all ambiguities are not included on the report, a comment must be added stating that:
F1.2.4.2.1	Other ambiguous HLA (define loci) results have not been excluded and this information is available upon request

Qualità

Sicurezza

	SECTION A – GENERAL POLICIES	3
	SECTION B – PERSONNEL QUALIFICATIONS	4
S	B3 The Director and/or Co-Director	4
	B4 Technical Staff	4
	B5 Competency Evaluation and Continuous Education	4
Q&S	SECTION C – QUALITY ASSURANCE	6
	C1 MANAGEMENT	6
	C2 TECHNICAL	7
	C3 PREANALYTICAL	8
Q	SECTION D – EXTERNAL PROFICIENCY TESTING	10
	D1 PROCEDURE OF EPT	10
	D2 REPORTING OF EPT RESULTS	11
	D3 LABORATORY PERFORMANCE	11
	SECTION E – ANALYSIS PROCESSES	12
	E1 REAGENTS	12
	E2 EQUIPMENT	14
	E3 COMPUTER ASSISTED ANALYSES	16
	E4 METHODS	16
	E4.1 CDC	16
	E4.2 Antibody Screening and Crossmatching	17
Q	E4.3 Enzyme-Linked Immuno Sorbent Assay (ELISA)	19
	E4.4 Flow Cytometry	19
	E4.5 Nucleic Acid Analysis	20
	E4.6 Bead Array	22
	E4.7 Sequence-Specific Primers (SSP)	22
	E4.8 Sequence-Specific Oligonucleotide Probe (SSOP) Hybridization Assays	22
	E4.9 Sanger Sequencing	23
	E4.10 Next Generation Sequencing	24
	E4.11 Haemopoietic Chimaerism and Engraftment (HCE) Monitoring	25
	E4.12 Analysis of Other Immunologic Markers	25
S	E5 CLINICAL APPLICATIONS	27
	E5.1 Renal and/or Pancreas Transplantation	27
	E5.2 Other Organ Transplantation	29
	E5.3 Haematopoietic Stem Cell Transplantation	29
	E5.4 Transfusion	31
	E5.5 Disease Association	32
Q&S	SECTION F – POST-ANALYSIS PROCESSES	33
	F1 HLA ALLELES AND ANTIGENS	33
	F1.1 Terminology	33
	F1.2 Phenotypes and Genotypes	33
	F1.3 Haplotype Assignment	34
	F2 OTHER IMMUNOGENETICS MARKERS	34
	F3 RECORDS AND TEST REPORTS	34
	ABBREVIATIONS	36
	DEFINITIONS	37

E il futuro?



"You will continue to perform the same repetitive tasks that you have always performed."

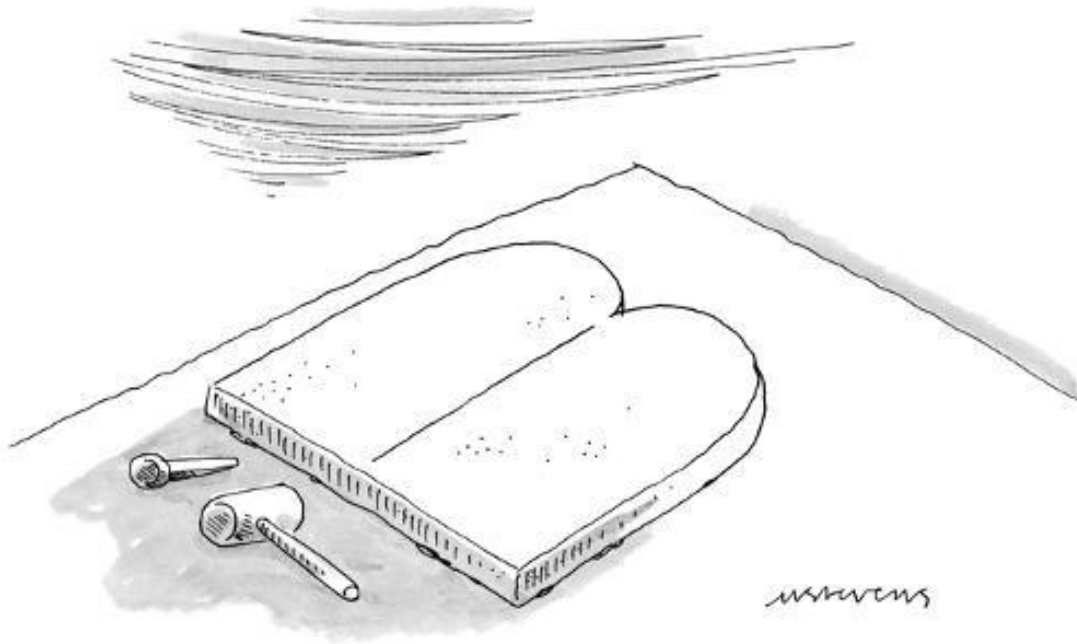


Possibili sentieri davanti a noi

- NGS viene adottata dai principali laboratori e modifica il flusso di lavoro
- Una parte della tipizzazione con NGS viene esternalizzata
- Aumenta la componente informatica del nostro lavoro
- Estensione dell'immunogenetica oltre l'HLA
- Sequenziamento di una singola molecola di DNA?
- Sequenziamento RNA e studio dell'espressione degli antigeni HLA

Qualunque saranno gli sviluppi
dell'Immunogenetica e dell'Istocompatibilità,
potremmo sempre contare sugli **Standards**, che
sapranno indicarci il modo per portare le
innovazioni scientifiche e tecnologiche all'interno
dei laboratori, a beneficio dei nostri pazienti

Grazie per l'ascolto



THE TEN COMMANDMENTS DO-IT-YOURSELF KIT