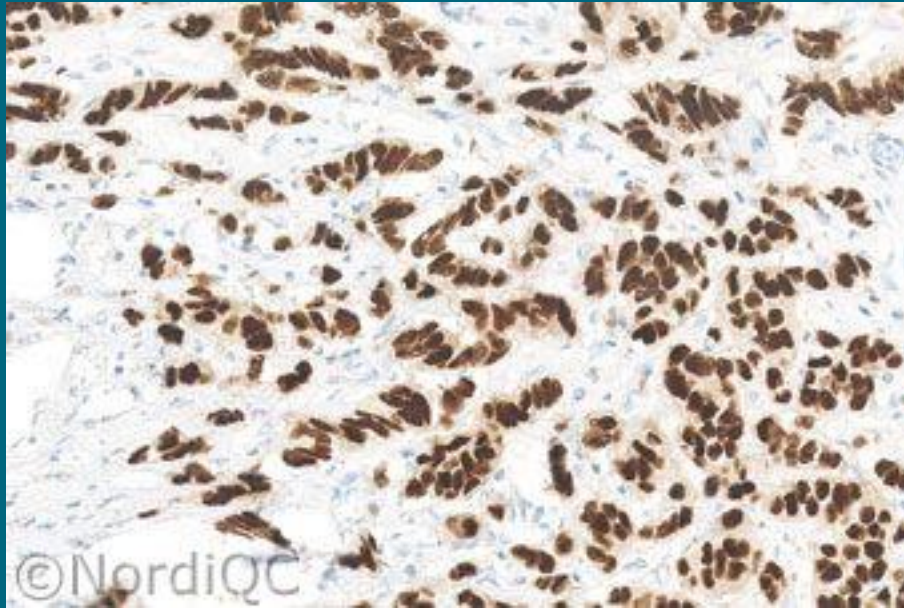


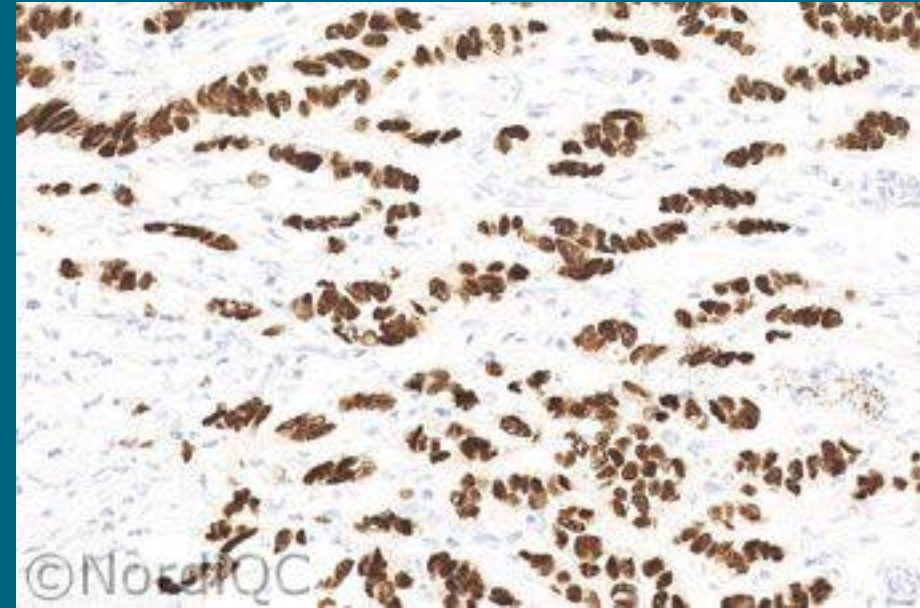
NordiQC External Quality Assurance in Immunohistochemistry

Mogens Vyberg
Professor of Clinical Pathology
Director of NordiQC
Aalborg University Hospital,
Aalborg, Denmark

Serial sections stained for Estrogen receptor



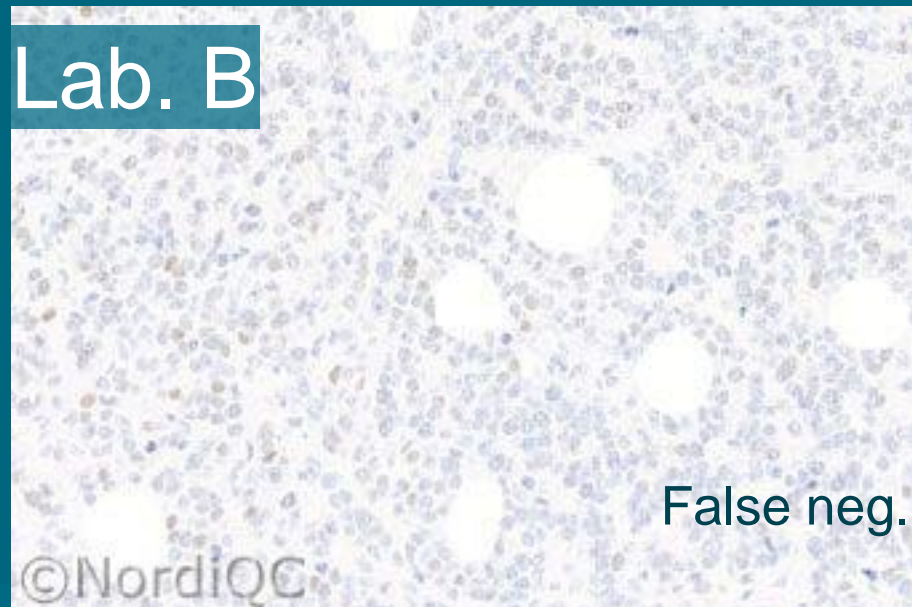
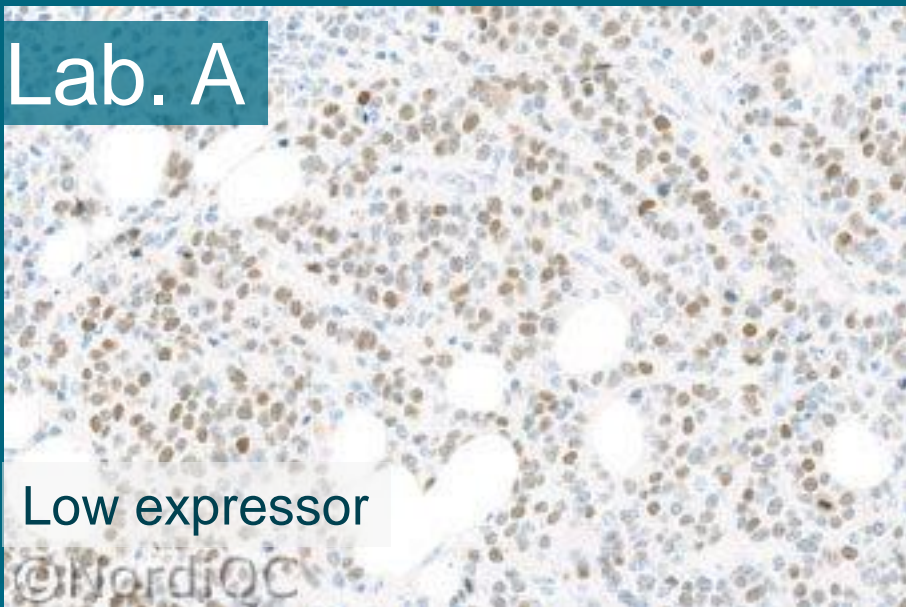
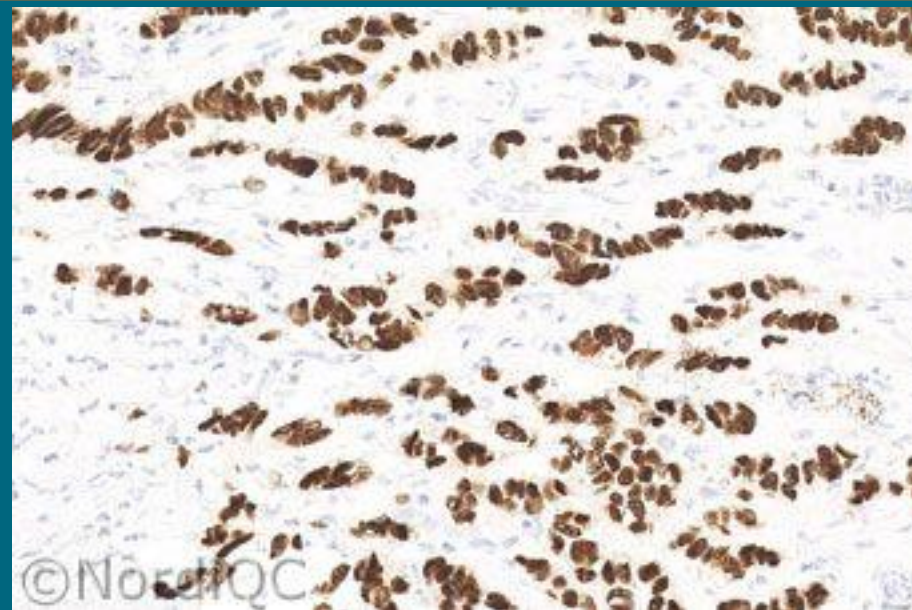
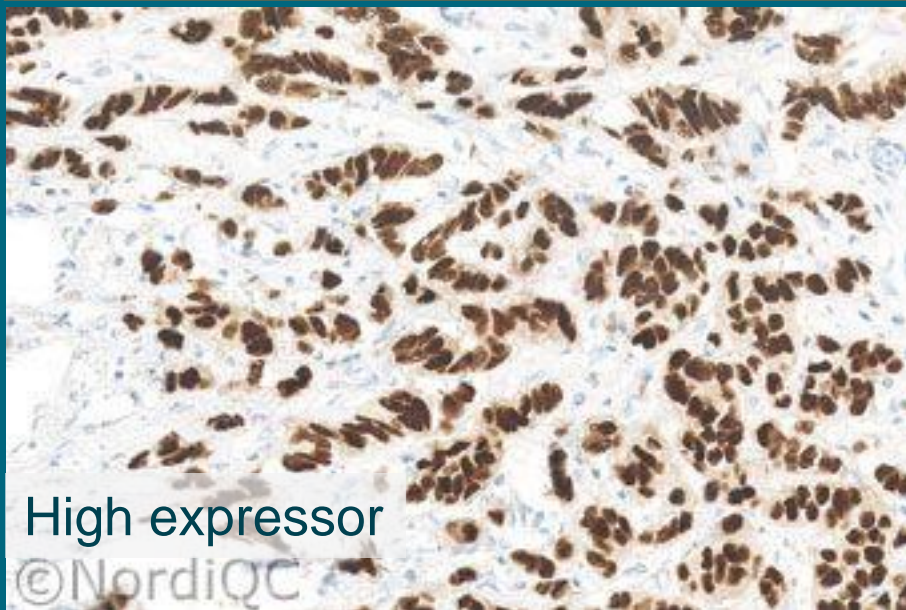
Lab. A



Lab. B

Optimally processed ductal breast carcinoma tissue

Serial sections stained for Estrogen receptor



Serial sections stained for Estrogen receptor

Tonsil

Uterine cervix

Controls

Lab. A

Lab. B

False neg.

Serial sections stained for Estrogen receptor

Tonsil

Uterine cervix

Controls

Clone SP1/EP1/1D5 in 225 labs

Clone 6F11 in 15/37 labs

External
Quality
Assurance !

False pos.
(mRNA=0)

JNCI Journal of the National Cancer Institute Advance Access published June 10, 2008

NEWS |

Breast Cancer Testing Scandal Shines Spotlight on Black Box of Clinical Laboratory Testing

By Karyn Hede

“Through the inquiry, the public learned that between 1997 and 2005 nearly 400 of about 1,000 breast cancer patients received incorrect test results of the ER status of their breast tumors.”

“There are no good data on the quality of ER testing in the United States. The scary thing about the debacle in Canada is that we would never have known about this if results hadn’t been checked in a central lab.”

Craig Allred

Suboptimal IHC assays may be due to:

- Preanalytical issues
 - Fixation too short, too late, decalcification too soon...
- Analytical issues:
 - Less successful / too dilute antibody clones/RTUs
 - Insufficient epitope retrieval
 - Insensitive visualization systems
 - Platform problems
- Post-analytical issues
 - Interpretation criteria, interobserver variation ...

Should be
identified
with proper
controls

- International organization for **proficiency testing** of IHC
- Founded 2003 by Nordic pathologists
- Independent, scientific, not-for-profit organisation
- Institute of Pathology, Aalborg University Hospital, DK
- General module: 3 runs/year
 - 15-18 different marker challenges
- Breast cancer IHC module: 2 runs/y
 - HER-2, ER/PR, Ki67/E-Cad ...
- HER-2 ISH module: 2 runs/year
 - BRISH, FISH
- Companion module: 2 runs/year
 - PD-L1 ...



Virchows Arch (2016) 468:19–29

DOI 10.1007/s00428-015-1829-1

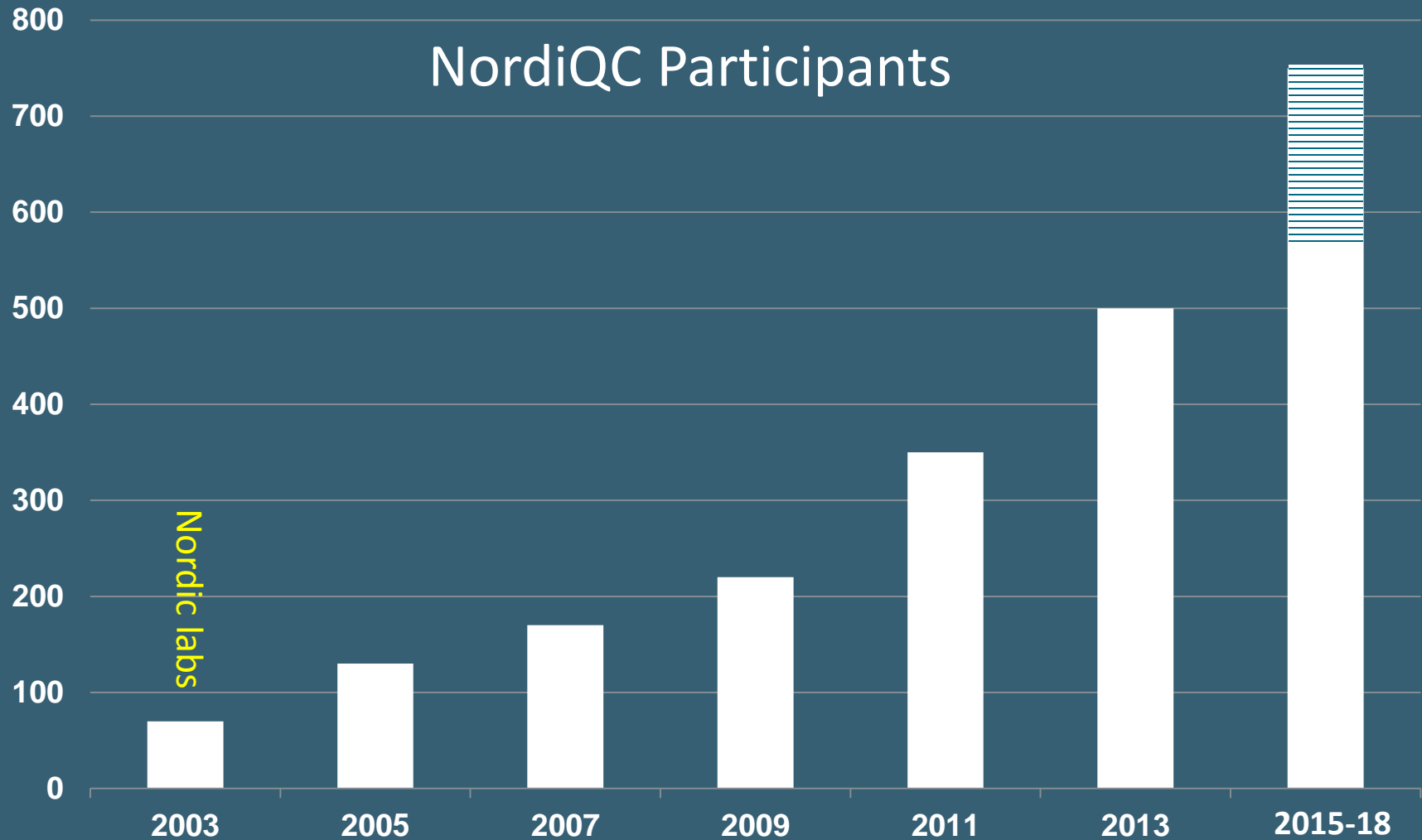


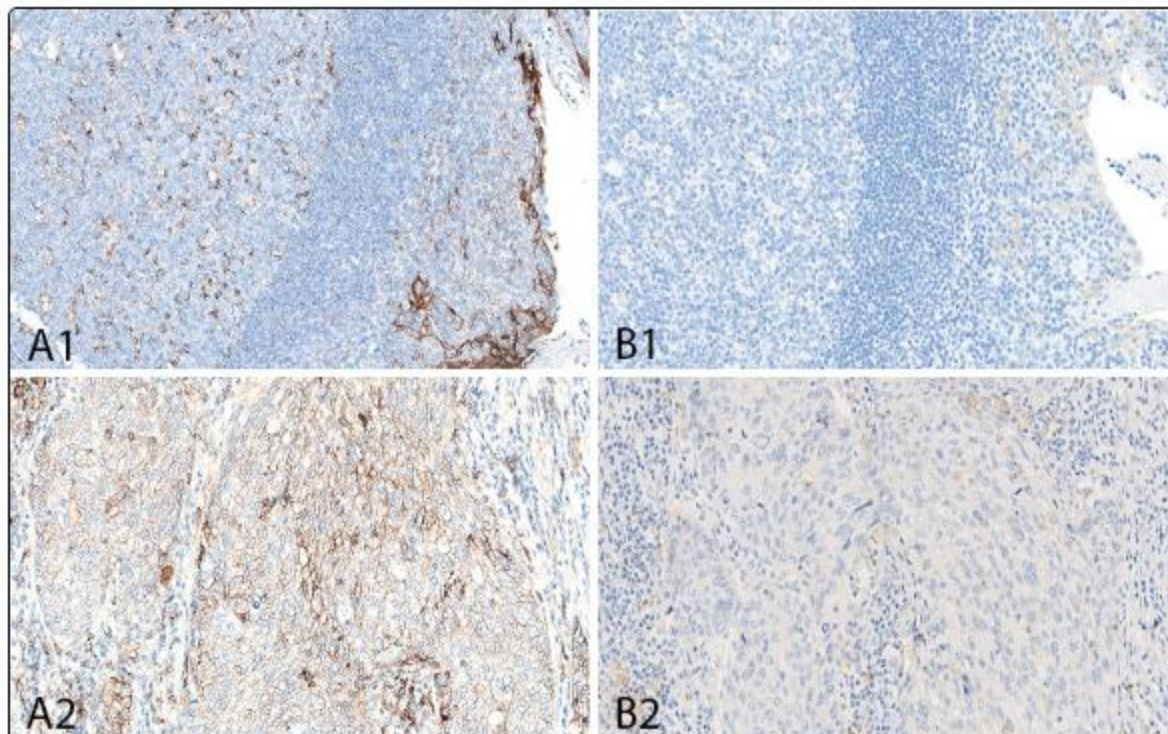
ANNUAL REVIEW ISSUE

[Free PMC Article](#)

Proficiency testing in immunohistochemistry—experiences from Nordic Immunohistochemical Quality Control (NordiIQC)

Mogens Vyberg^{1,2} • Søren Nielsen¹





Serial sections stained for PD-L1 in two Labs A and B: A1 shows optimal staining of tonsil, while B1 shows a false negative reaction in the histiocytes and a too faint reaction in the epithelial cells. A2 shows optimal staining of a non-small cell lung carcinoma, >50% of the tumour cells are positive, while B2 shows a faint reaction in few cells. Only with the result obtained in Lab A would the patient be offered 1. line treatment.

Results - run 52, B25, H13 & C3

20-Apr-2018

The general results for the runs **52**, **B25**, **H13** & **C3** are available on the website. Individual results are available after logging in.

[All news](#)

Events

[QulP/NordIQ Workshop in Applied Immunohistochemistry](#)
13-15 Jun 2018: Brugge, Belgium

[NordIQ Workshop in Diagnostic Immunohistochemistry](#)
19-21 Sep 2018: Aalborg, DK

[Academy of Immunohistochemistry](#)
10-12 Oct 2018: Krakow, Poland

Important dates

[Run 53](#)
Publication of results
9 Jul 2018

Jobs

[Scientist, IHC](#)
Peter MacCullum Cancer Centre,
Australia

Questions

Check out our [FAQ](#) (Frequently asked questions) or [contact us](#)

WWW.NORDIQ.ORG
FREE ACCESS

NordiQC assessment scheme 2019

Module	Winter	Spring	Autum
General	Run 55 <u>ASMA Bcl-6 CK5</u> <u>SOX10 WT1</u>	Run 56 <u>C-MYC EpCAM</u> <u>MLA MLH1 p16</u> <u>PAX8</u>	Run 57 <u>ALK (lung) Bcl-2</u> <u>CD117 CK8/18</u> <u>MSH2</u>
Breast	Run B27 <u>ER HER2 IHC</u>		Run B28 <u>ER HER2 IHC</u>
HER2	Run H15 <u>HER2 ISH</u>		Run H16 <u>HER2 ISH</u>
Companion		Run C5 <u>PD-L1</u>	Run C6 <u>PD-L1</u>

Dates	Winter	Spring	Autum
Protocol submission opens	3 Dec 2018	1 Feb	1 Aug
Protocol submission closes	3 Jan	13 Mar	4 Sep
Shipping of slides	9 Jan	21 Mar	12 Sep
Deadline for slide return	13 Feb	1 May	11 Oct
Assessment General	6 Mar - 8 Mar	22 May - 24 May	23 Oct - 25 Oct
Assessment Breast	15 Mar - 16 Mar		7 Nov - 8 Nov
Assessment HER2	21 Mar		16 Nov
Assessment Companion		28 May - 29 May	20 Nov
Publication of results	20 Apr	9 Jul	7 Dec

New protocol ID 635, CDX2, run 48

Staining platform

Staining platform Ventana Benchmark Ultra ▾

Primary antibody

Primary antibody clone Cell Marque (235-Rxx) - EPR2764Y ▾

Lot number 1523802K

Dilution factor : 1:400 400

Diluent buffer Dako - Antibody Diluent (K8006) ▾

Incubation time (minutes) 32

Incubation temperature (Celcius) 36

Epitope Retrieval, HIER

Epitope retrieval, HIER ☒ YES ☐ NO

Device On Board / On Machine ▾

HIER buffer Ventana - Ultra CC1 (950-224) ▾

Efficient Heating Time (minutes) 48

Max. heating temperature (Celcius) 99

Epitope Retrieval, proteolysis

Epitope retrieval, proteolysis ☐ YES ☒ NO

Visualization system

Visualization system OptiView DAB IHC Detection Kit - 760-700 ▾

Amplification None ▾

Incubation time linker (minutes) 8

Incubation time polymer (minutes) 8

Incubation temperature (Celcius) 36

Modify protocol ID 635, CDX2, run 48

Staining platform

Staining platform Ventana Benchmark Ultra ▾

Primary antibody

Primary antibody clone Cell Marque (235-Rxx) - EPR2764Y ▾

Lot number 1523802K

Dilution factor : 1:400 400

Diluent buffer Dako - Antibody Diluent (K8006) ▾

Incubation time (minutes) 32

Incubation temperature (Celcius) 36

Epitope Retrieval, HIER

Epitope retrieval, HIER ☒ YES ☐ NO

Device On Board / On Machine ▾

HIER buffer Ventana - Ultra CC1 (950-224) ▾

Efficient Heating Time (minutes) 48

Max. heating temperature (Celcius) 99

Epitope Retrieval, proteolysis

Epitope retrieval, proteolysis ☐ YES ☒ NO

Visualization system

Visualization system OptiView DAB IHC Detection Kit - 760-700 ▾

Amplification None ▾



















Incubation time linker (minutes) 8

Incubation time polymer (minutes) 8

Incubation temperature (Celcius) 36

Protocol submission

Participant site

Run ▲	Module	Epitope	Protocol status	Slide received by NordiQC	Action
49	General Module	CD5	✓	2017-02-13	 
49	General Module	CK-LMW	✓	2017-02-13	 
49	General Module	MLA	✓	2017-02-13	 
49	General Module	MLH1	✓	2017-02-13	 
49	General Module	NKX3.1	✓	2017-02-13	 
49	General Module	PSA	✓	2017-02-13	 
B23	Breast Cancer Module	ER	✓	2017-02-13	 
B23	Breast Cancer Module	HER2 IHC	✓	2017-02-13	 
C1	Companion Diagnostic Module	PD-L1	✓		 

Module status

49	General Module	Slides sent
B23	Breast Cancer Module	Slides sent
H11	HER2-ISH Module	Slides sent
C1	Companion Diagnostic Module	Slides sent

Open Homepage open for protocol submission. New protocols can be created, edited and deleted.

Closed Homepage closed for new protocol submission. Protocols already submitted can be edited. NordiQC are preparing to send slides.

Slides sent Slides for the submitted protocols have been sent to participants. Only protocol corrections are allowed.

Multi-tissue FFPE blocks

10% NBF 24-48 h (ASCO/CAP guidelines ...)

- Normal and clinically relevant tumour tissues
- Different levels of antigen expression
 - high, moderate, low, none



2 unstained slides for each marker send to the participants

1 stained slide returned for central assessment

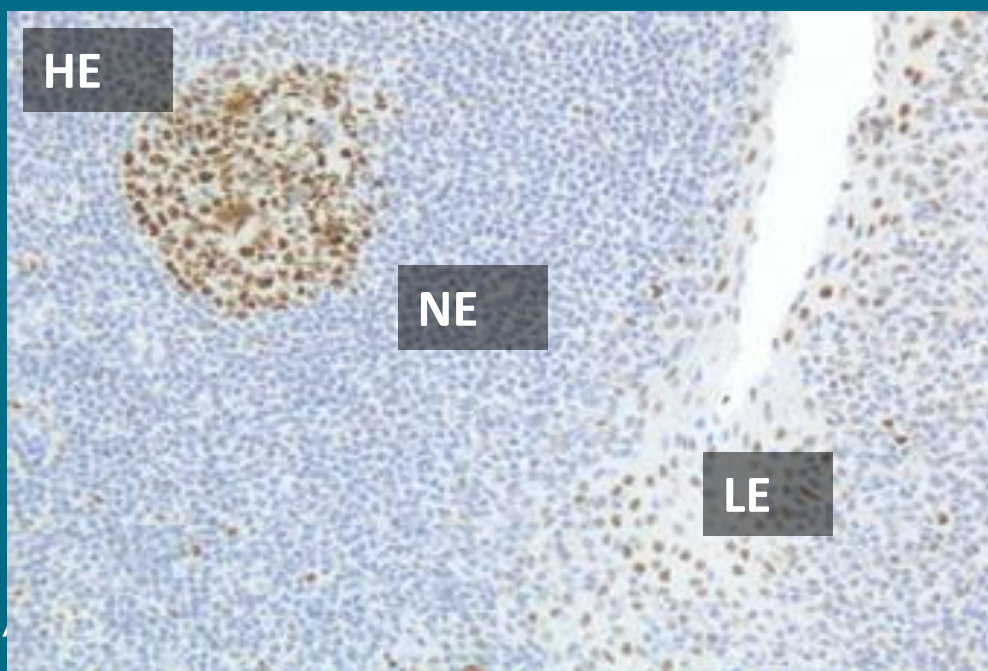
The slide to be stained for **Bcl-6** comprised:

1-2. Tonsils, 24 h/48 h

3. Follicular lymphoma, grade I

4. Follicular lymphoma, grade II

5. Diffuse large B-cell lymphoma



Tissue selection:

- **High Expressor**
 - to confirm antibody
- **Low Expressor**
 - to ensure sensitivity
- **No-Expressor**
 - to ensure specificity

Material

The slide to be stained for [Bcl-6](#) comprised:

1. Tonsil, 24h fixation, 2. Tonsil, 48h fixation*, 3. Follicular lymphoma grade I,
4. Follicular lymphoma grade II, 5. Diffuse large B-cell lymphoma, non-Germinal Centre B-cell type (DLBCL non-GCB), 6. DLBCL, GCB.

All tissues were fixed in 10% neutral buffered formalin.

Criteria for assessing a Bcl-6 staining as optimal included:

- A moderate to strong distinct nuclear staining reaction of virtually all normal germinal centre B-cells in the tonsil fixed 24h.
- An at least weak to moderate distinct nuclear staining reaction of the majority of the squamous epithelial cells in the tonsil fixed 24h.
- A moderate to strong distinct nuclear staining reaction of the neoplastic cells in the two follicular lymphomas.
- An at least weak to moderate nuclear staining reaction of the majority of the neoplastic cells in the DLBCL, GCB subtype, tissue core no. 6.
- No or only a nuclear staining reaction in dispersed neoplastic cells of the DLBCL, non-GCB subtype, tissue core no. 5

* The tonsil fixed for 48h (tissue core no 2) was excluded from the assessment due to an aberrant inconsistent staining reaction in the circulated material.

Participation

Number of laboratories registered for Bcl-6, run 42	244
Number of laboratories returning slides	228 (93%)

Results

228 laboratories participated in this assessment. Of these, 168 (74%) achieved a sufficient mark (optimal or good). Table 1 summarizes the antibodies (Abs) used and assessment marks (see page 2).

The most frequent causes of insufficient staining reactions were:

- too low concentration of the primary antibody
- less successful performance of the mAb clone PG-B6p
- use of low sensitivity detection systems

Performance history

This was the third NordiQC assessment of Bcl-6. An increased pass rate was seen compared to the two previous runs 17, 2006 and 28, 2010 (see table 2).

Table 2. Proportion of sufficient results for Bcl-6 in the three NordiQC runs performed

	Run 17 2006	Run 28 2010	Run 42 2014
Participants, n=	69	132	228
Sufficient results	42%	48%	74%

Conclusion

The mAbs clones GI191E/A8, LN22 and PG-B6p could all be used to produce optimal staining results for Bcl-6. Irrespective of the clone applied, efficient HIER in alkaline buffer, use of a high sensitive detection system and careful calibration of the primary antibody were the most important prerequisites for an optimal staining result. The mAb clone GI191E/A8 and LN22, which both had a detection sensitivity of 69% and 99% respectively, were used by 16 of the 228 participating laboratories.

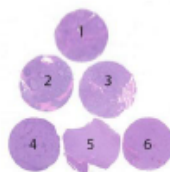


Table 1. Antibodies and assessment marks for Bcl-6, run 42

Concentrated antibodies	n	Vendor	Optimal	Good	Borderline	Poor	Suff. ¹	Suff. OPS ²
mAb clone GI191E/A8	13	Cell Marque 1 Immunologic 1 Zytomed	6	8	0	1	93%	100%
mAb clone LN22	38	Leica/Novocastra 2 DBS 1 Biocare 1 BioGenex 1 Zeta Corporation	20	16	4	3	84%	100%
mAb clone PG-B6p	43	Dako 1 DBS 1 Thermo/Neomarkers	9	22	11	3	69%	86%
Ready-To-Use antibodies								
mAb clone GI191E/A8 760-4241	59	Ventana/Cell Marque	24	25	9	1	83%	84%
mAb clone GI191E/A8 227M-9x	1	Cell Marque	0	0	1	0	-	-
mAb clone LN22 PA0204	10	Leica/Novocastra	3	7	0	0	100%	100%
mAb clone LN22 PM410	1	Biocare	1	0	0	0	-	-
mAb clone LN22 MAD-00638QD	1	Master Diagnostica	0	1	0	0	-	-
mAb clone PG-B6p IR/IS625	44	Dako	4	17	21	2	48%	75%
mAb clone PG-B6p GA625	7	Dako	2	2	3	0	57%	75%
mAb PG-B6p MAD-004023QD	2	Master Diagnostica	0	1	1	0	-	-
Total	228		69	99	50	10	-	
Proportion			30%	44%	22%	4%	74%	

1) Proportion of sufficient stains (optimal or good)

2) Proportion of sufficient stains with optimal protocol settings only, see below.

Detailed analysis of Bcl-6, Run 42

The following protocol parameters were central to obtain optimal staining:

Concentrated antibodies

mAb clone GI191E/A8: Protocols with optimal results were all based on HIER using Cell Conditioning (CC1; Ventana) (6/14)* as retrieval buffer. The mAb was typically diluted in the range of 1:50-1:100 depending on the total sensitivity of the protocol employed. Using these protocol settings 9 of 9 (100%) laboratories produced a sufficient staining result (optimal or good).

* (number of optimal results/number of laboratories using this HIER buffer)

mAb clone LN22: Protocols with optimal results were all based on HIER using Target Retrieval Solution (TRS) pH 9 (3-in-1) (Dako) (2/2), CC1 (Ventana) (9/18) or Epitope Retrieval Solution 2 (BERS2; Ventana) (9/11) as retrieval buffer. The mAb was typically diluted in the range of 1:25-1:200 depending on the sensitivity of the protocol employed. Using these protocol settings 27 of 27 (100%) laboratories produced a sufficient staining result.

PDF file e-mailed to participants with assessment marks and – when needed – explanations and recommendations



Assessment of ER, B24 - individual results
Aalborg Sygehus (101)

Epitope ER
Assessment Optimal

NordIQC has assessed the submitted slides. In general, the assessment is based on staining intensity and distribution in cells expected to be demonstrated, background staining, cross-reactivity, quality of counter-staining and preservation of tissue morphology. Specific criteria for each epitope are described on <http://www.nordiqc.org/epitope.php>.

Each slide was marked as optimal, good, borderline or poor based on the following criteria:

Optimal: The staining reaction is considered perfect or close to perfect in all of the included tissues.

Good: The staining reaction is considered acceptable in all of the included tissues. However, the protocol settings may be optimized to ensure improved sensitivity or higher signal-to-noise ratio.

Borderline: The staining reaction is considered insufficient because of a generally too weak staining reaction, false negative or false positive staining reaction of one of the included tissues. The protocol should be optimized.

Poor: The staining reaction is considered insufficient because of, e.g., false negative or false positive staining reactions of several of the included tissues. An optimization of the protocol is urgently needed.

Moderate or strong cross reaction (due to the character of the primary antibody) or other false positive staining reaction (e.g. due to endogenous biotin) is not compatible with an optimal result and will usually cause downgrading.

For stains assessed as borderline or poor, comments and recommendations are given to the protocols. Good stains may also be accompanied by comments if specific problems are identified.

Recommended protocols from each staining platform are available at the NordIQC homepage (<http://www.nordiqc.org/recommended.php>) for comparison. Implementation of NordIQC recommended protocols as well as changes suggested in this letter must be tested carefully in your own laboratory before implementation into diagnostic work. NordIQC do not take any responsibility for consequences of changes in protocols or methods in your laboratory.

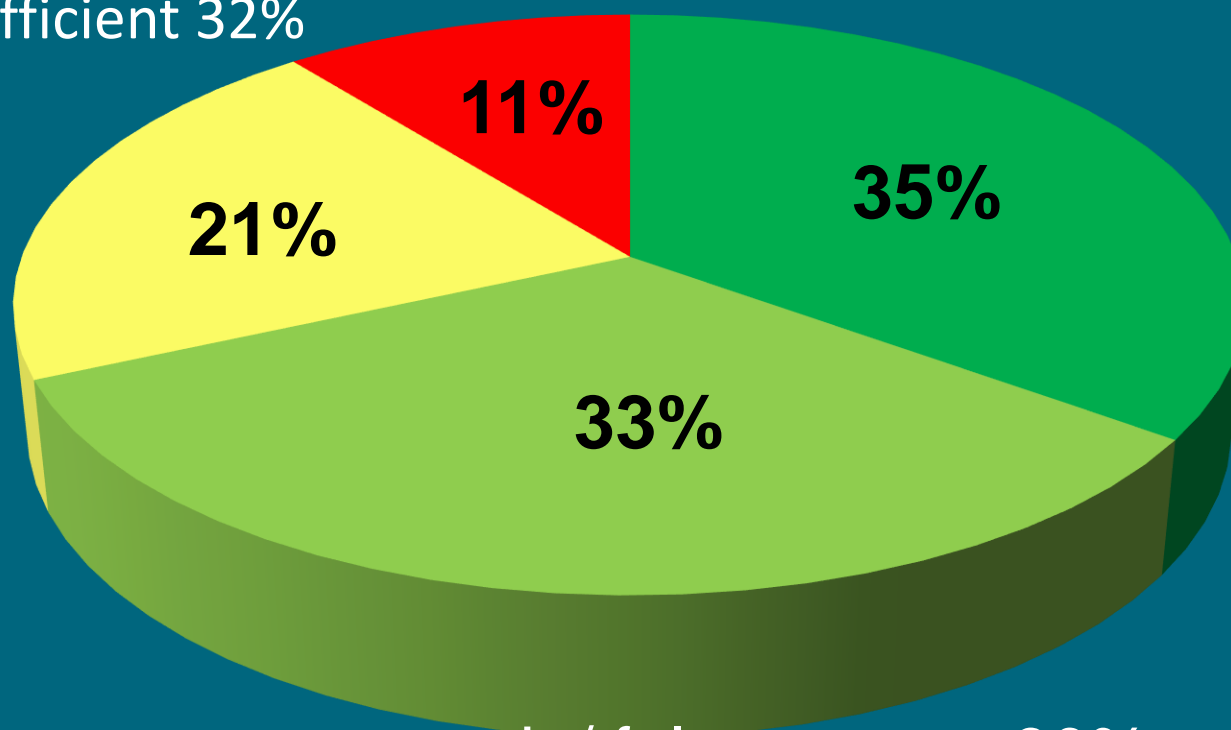
Marker	CD23	CR	CyD1	Ki67	Podop	TTF1
Assessment:	Poor	Optimal	Optimal	Good	Good	Borderline
Comments to the protocol:	False negative	-	-	Excessive counterstain	Weak	Weak
Suggestions for improvement:	Consider change of primary Ab and recalibrate	-	-	-	-	Increase primary Ab conc. and/or prolong HIER

Original stain

* Please read the epitope description and assessment summary carefully, as the choice of the Ab clone will influence the sensitivity and specificity.

General module ~ 20,000 slides (~100.000 core sections)

Insufficient 32%

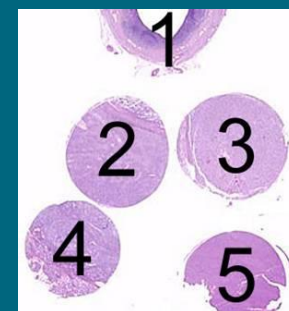
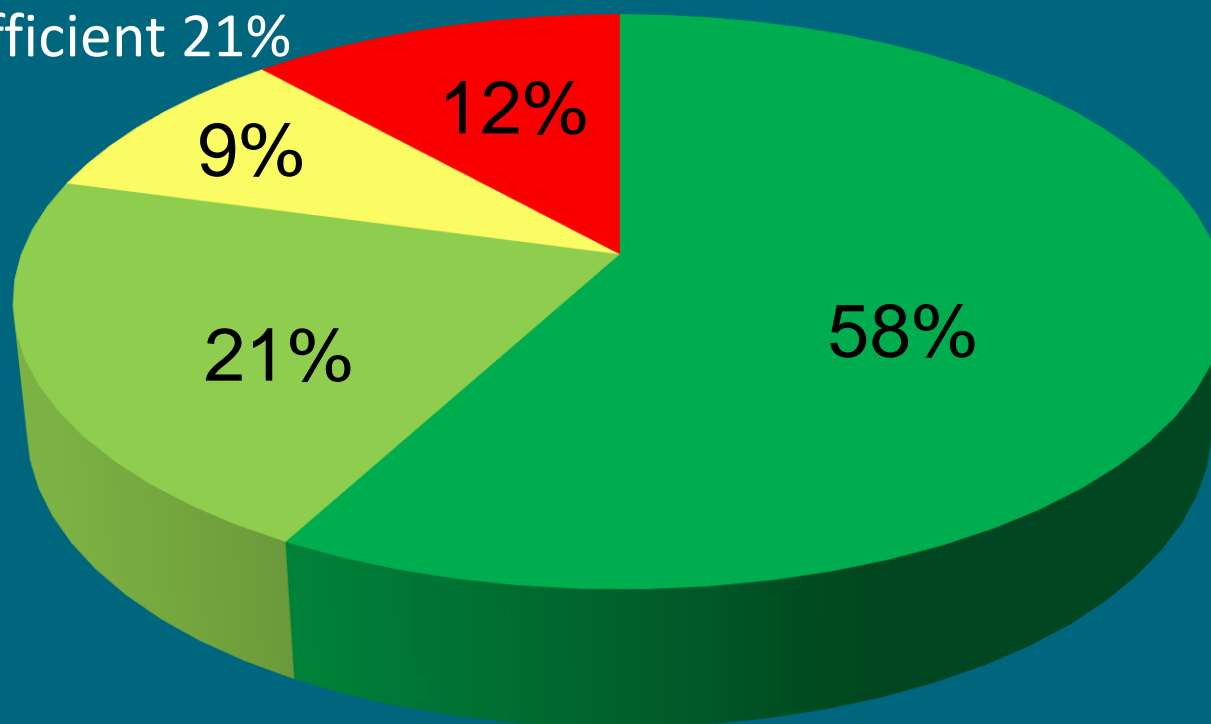


- Optimal
- Good
- Borderline
- Poor

Insuff. { too weak / false neg.: ~ 90%
over-stained / false pos.: ~ 10%

Breast cancer module ~ 9,000 slides (~35,000 core sections)

Insufficient 21%



- Optimal
- Good
- Borderline
- Poor

Insuff. { too weak / false neg.: ~ 90%
over-stained / false pos.: ~ 10%

Major causes of **insufficient** stains in ~ 9,000 slides

Less successful antibodies/RTUs	17 %
---------------------------------	------

Inappropriate antibody dilution	20 %
---------------------------------	------

Inappropriate epitope retrieval	27 %
---------------------------------	------

Inappropriate detection kit	19 %
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Other inappropriate lab. performance	17 %
--------------------------------------	------

- Endogenous biotin reaction

- Section drying-out after HIER

- Technical platform error

-

- Unexplained

Standardization of Negative Controls in Diagnostic Immunohistochemistry: Recommendations From the International Ad Hoc Expert Panel

Emina E. Torlakovic, MD, PhD,†‡ Glenn Francis, MBBS, FRCPA, MBA, FFSc (RCPA),§¶
 John Garratt, RT,†‡# Blake Gilks, MD, FRCPC,†‡** Elizabeth Hyjek, MD, PhD,*
 Merdol Ibrahim, PhD,†† Rodney Miller, MD,‡‡ Søren Nielsen, HT, CT,§§¶¶
 Eugen B. Petcu, MD, PhD,§ Paul E. Swanson, MD,¶¶ Clive R. Taylor, MD, PhD,##
 and Mogens Vyberg, MD§§¶¶* **AIMM 2014, 22:241**

Standardization of Positive Controls in Diagnostic Immunohistochemistry: Recommendations From the International Ad Hoc Expert Committee

Emina E. Torlakovic, MD, PhD,† Søren Nielsen, HT, CT,‡§ Glenn Francis, MBBS, FRCPA,
 MBA, FFSc (RCPA),¶¶# John Garratt, RT,†** Blake Gilks, MD, FRCPC,†††
 Jeffrey D. Goldsmith, MD,‡‡ Jason L. Hornick, MD, PhD,*§§ Elizabeth Hyjek, MD, PhD,*
 Merdol Ibrahim, PhD,¶¶ Keith Miller, FIBMS,¶¶ Eugen Petcu, MD, PhD,||
 Paul E. Swanson, MD,¶¶## Xiaoge Zhou, MD,***††† Clive R. Taylor, MD, PhD,‡‡‡
 and Mogens Vyberg, MD‡§* **AIMM 2015, 23:1**

Evolution of Quality Assurance for Clinical Immunohistochemistry in the Era of Precision Medicine:

Part 1: Fit-for-Purpose Approach to Classification of Clinical Immunohistochemistry Biomarkers

AIMM 2016-17

Carol C. Cheung, MD, PhD, JD,† Corrado D'Arrigo, MB, ChB, PhD, FRCPath,‡§||
 Manfred Dietel, MD, PhD,¶ Glenn D. Francis, MBBS, FRCPA, MBA, FFSc (RCPA),#**††
 C. Blake Gilks, MD,‡‡ Jacqueline A. Hall, PhD,§§||| Jason L. Hornick, MD, PhD,¶¶
 Merdol Ibrahim, PhD,### Antonio Marchetti, MD, PhD,*** Keith Miller, FIBMS,##
 J. Han van Krieken, MD, PhD,††† Soren Nielsen, BMS,‡‡‡§§§ Paul E. Swanson, MD,||| ||
 Clive R. Taylor, MD,¶¶¶ Mogens Vyberg, MD,‡‡‡§§§ Xiaoge Zhou, MD,####****
 and Emina E. Torlakovic, MD, PhD,*††††‡‡‡‡*

*From the International Society for Immunohistochemistry and Molecular Morphology (ISIMM)
 and International Quality Network for Pathology (IQN Path)*

Evolution of Quality Assurance for Clinical Immunohistochemistry in the Era of Precision Medicine – Part 2: Immunohistochemistry Test Performance Characteristics

Evolution of Quality Assurance for Clinical Immunohistochemistry in the Era of Precision Medicine.

Part 3: Technical Validation of Immunohistochemistry (IHC) Assays in Clinical IHC Laboratories

Evolution of Quality Assurance for Clinical Immunohistochemistry in the Era of Precision Medicine:

Part 4: Tissue Tools for Quality Assurance in Immunohistochemistry

Go for Low antigen expressors ~

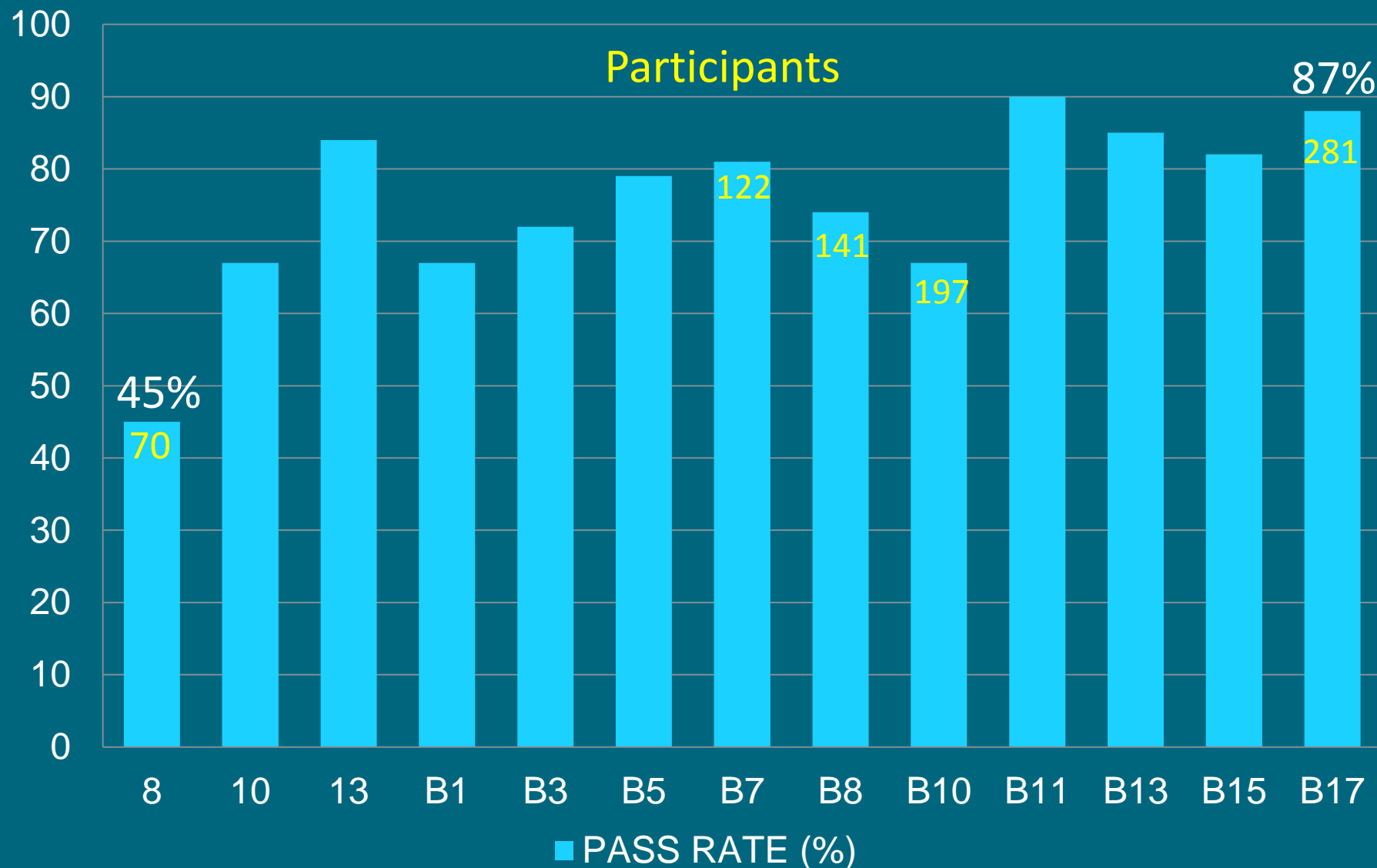
Critical Assay Performance Controls (CAPCs)

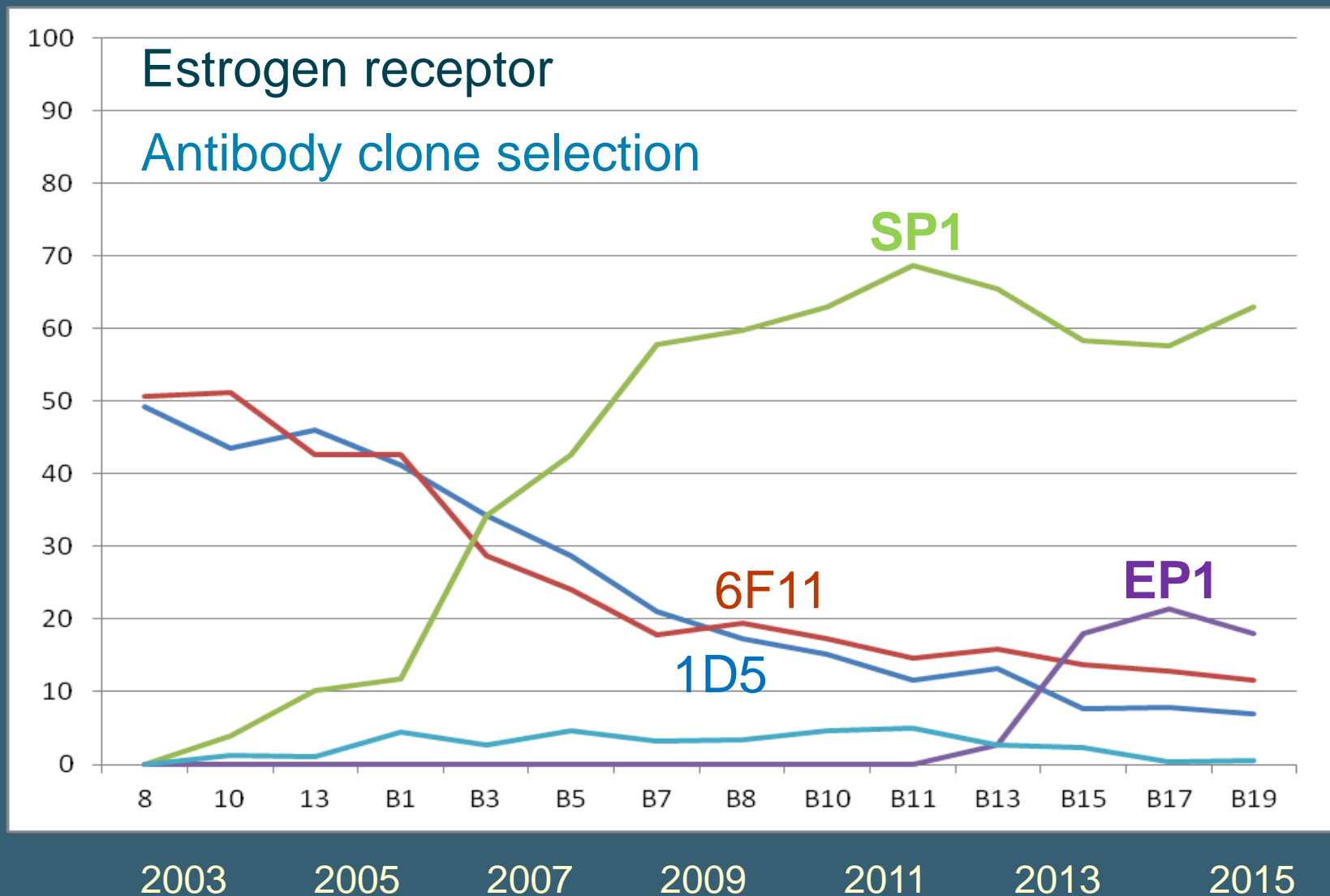
- essential to evaluate sensitivity
- essential to assure consistency

Normal tissues - easier to ensure the quality

- 90 % of insufficient staining results in EQA are caused by weak/false negative results
- often related to the use of inappropriate positive tissue controls.....

NordiQC EQA: Estrogen Receptor in 13 runs

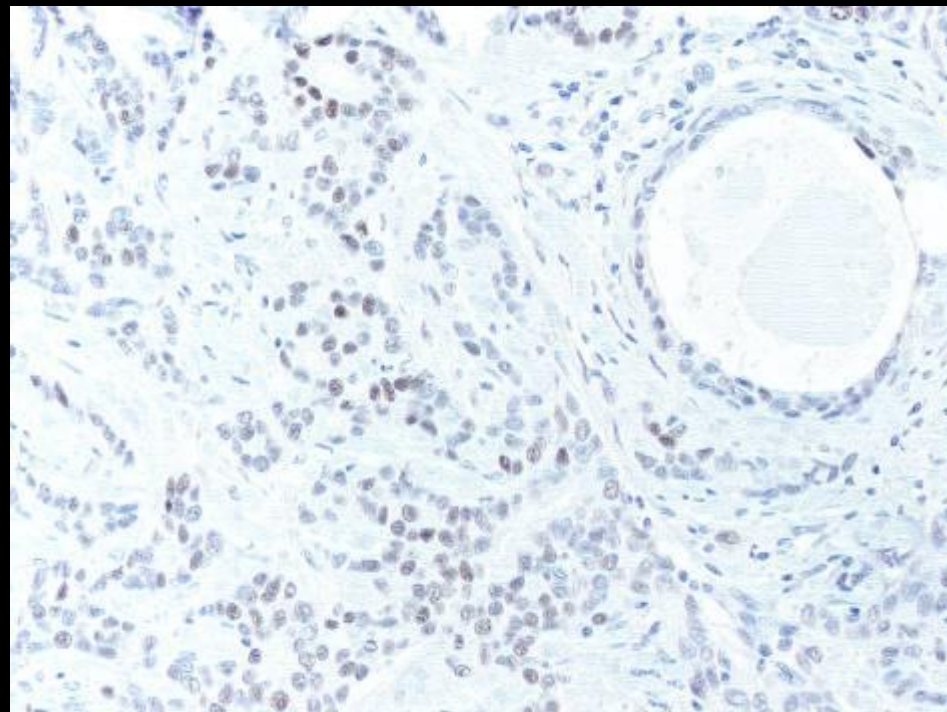




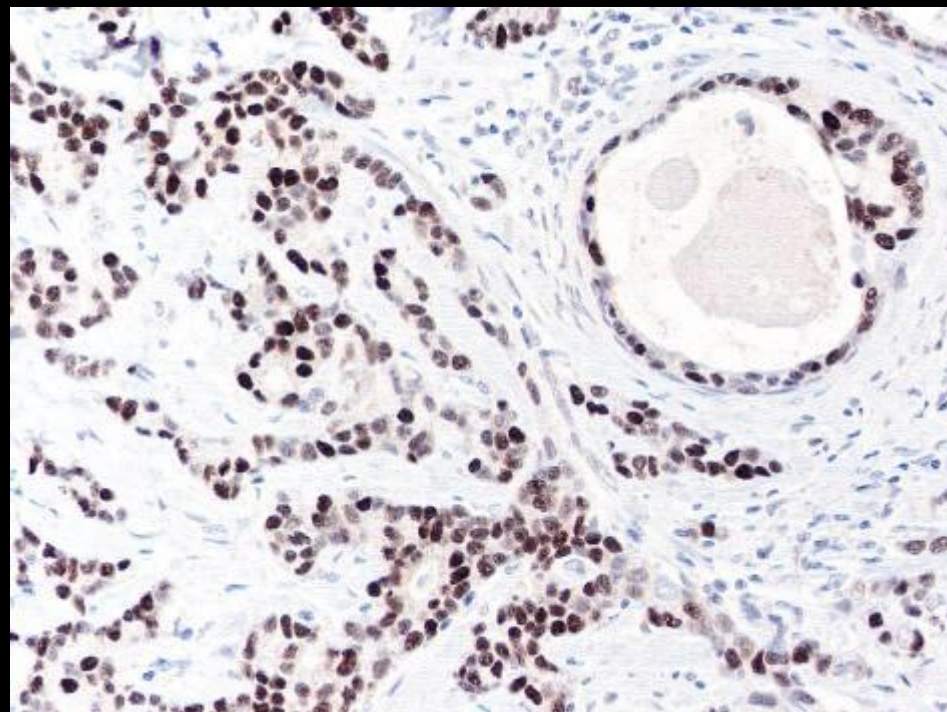
IHC – Optimal performance

ER 1D5 1:100

HIER Ci pH 6



2-step polymer

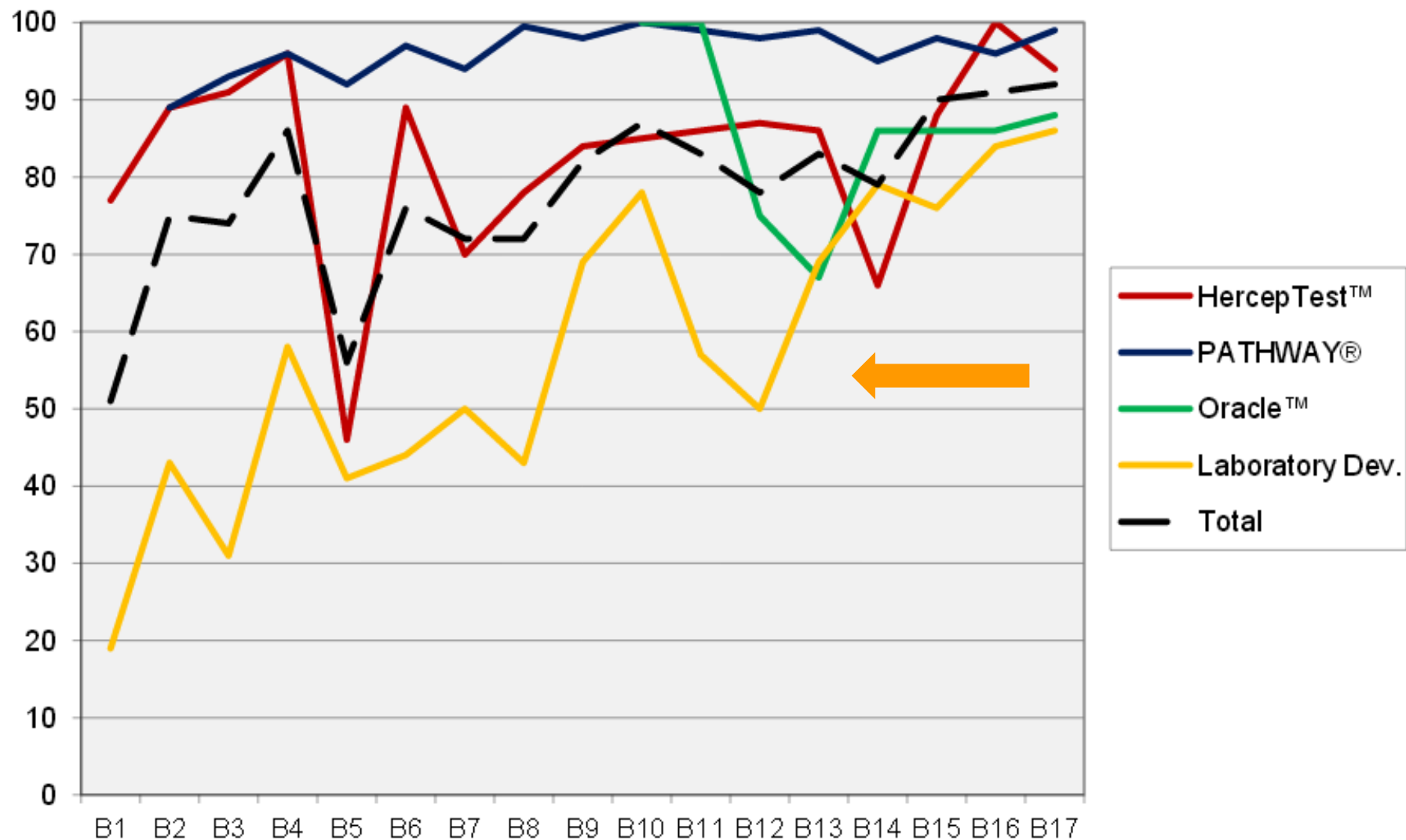


3-step polymer

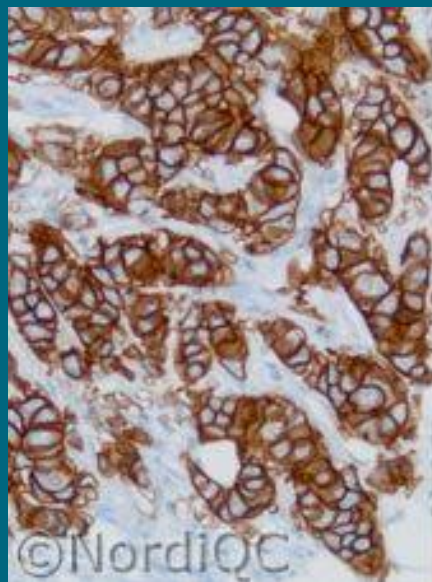
Pass rate (optimal + good) by participant status

Estrogen receptor	New participants	'Old' participants
Run 10, 2004	57%	71%
Run B15, 2010	70%	86%
Run B19, 2015	51%	73%
Average	59%	77%

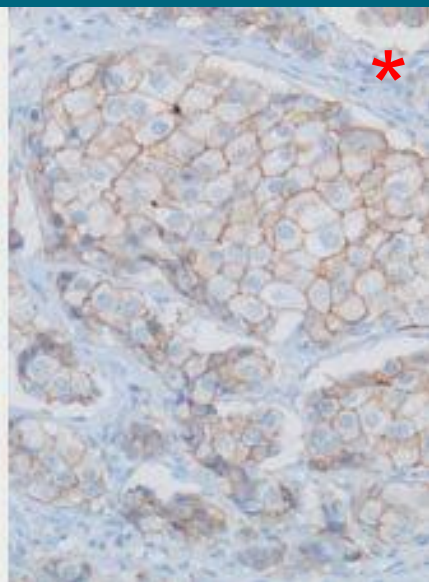
HER-2 staining results in 17 runs



NordiQC runs for HER2 IHC



Ampl. 3+

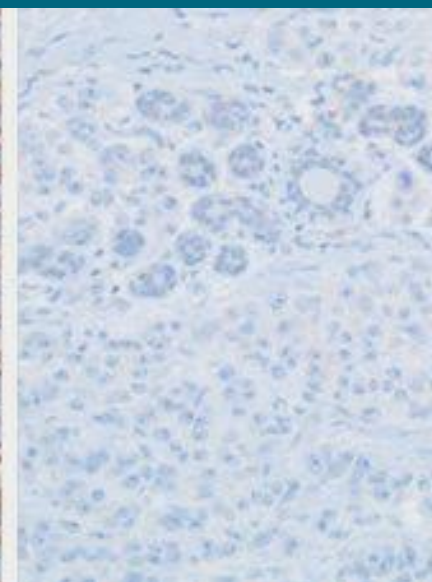


Ampl. 2+

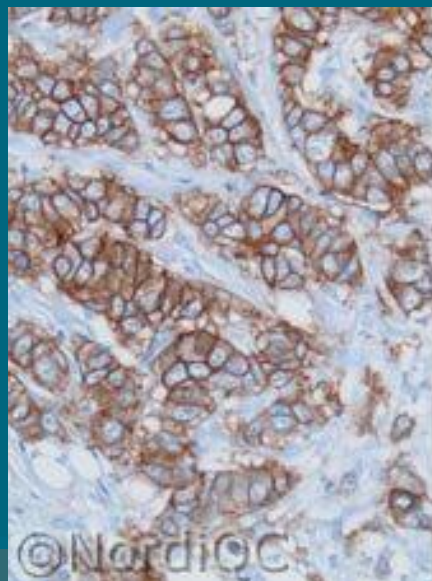
Optimal



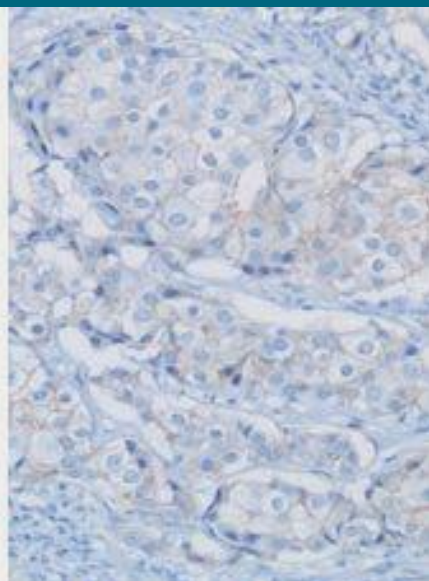
Unampl. 2+



Unampl. 0

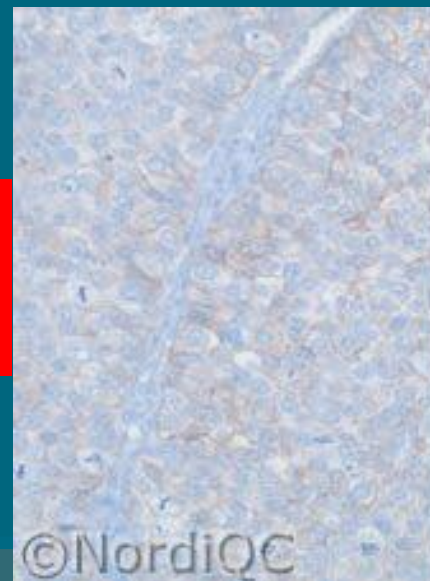


Ampl. 3+

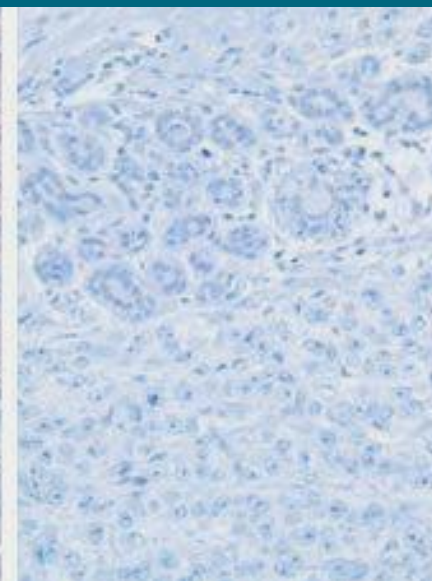


Ampl. 1+

Poor

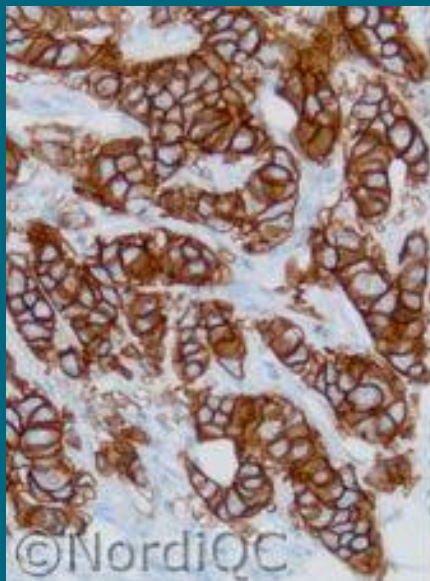


Unampl. 1+

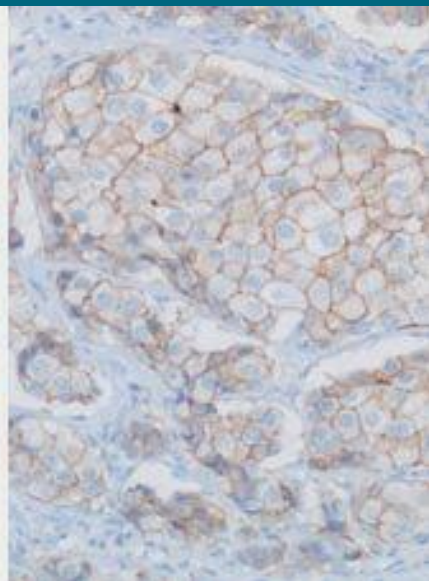


Unampl. 0

NordiQC runs for HER2 IHC



Ampl. 3+

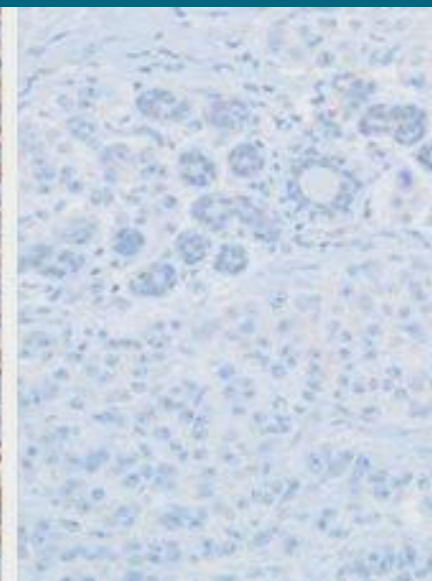


Ampl. 2+

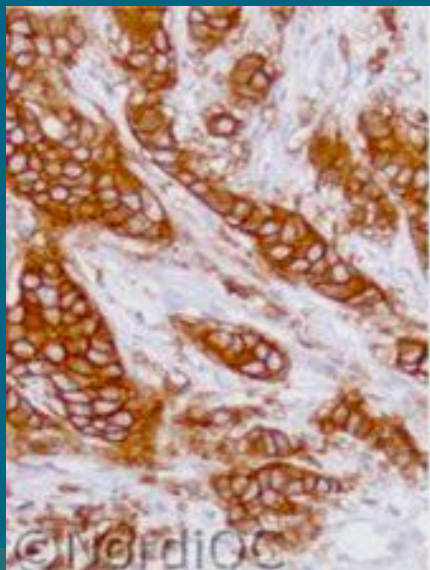
Optimal



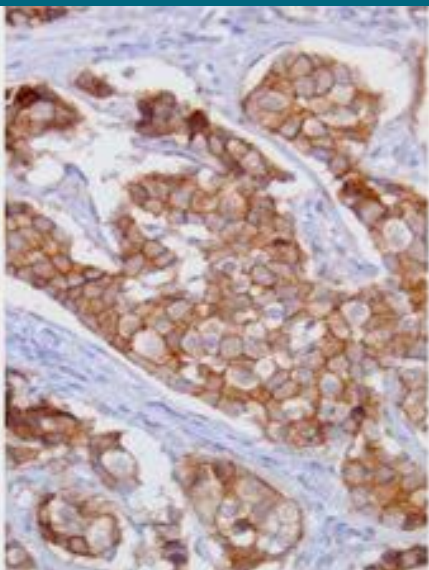
Unampl. 2+



Unampl. 0

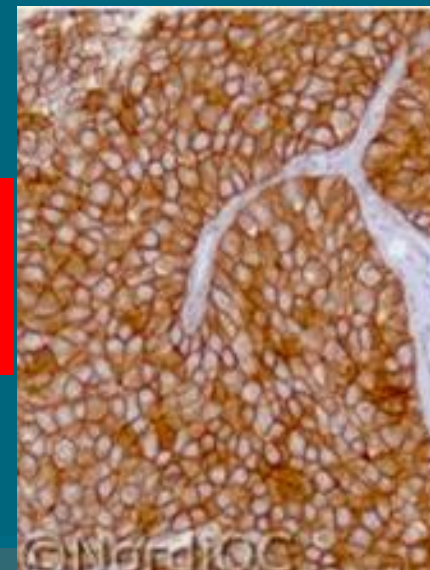


Ampl. 3+

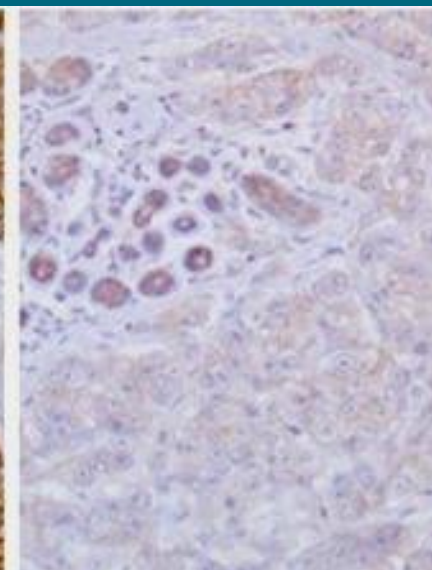


Ampl. 2+

Poor



Unampl. 3+



Unampl. 1

Vyberg et al. *BMC Health Services Research* (2015) 15:352
DOI 10.1186/s12913-015-1018-6



RESEARCH ARTICLE

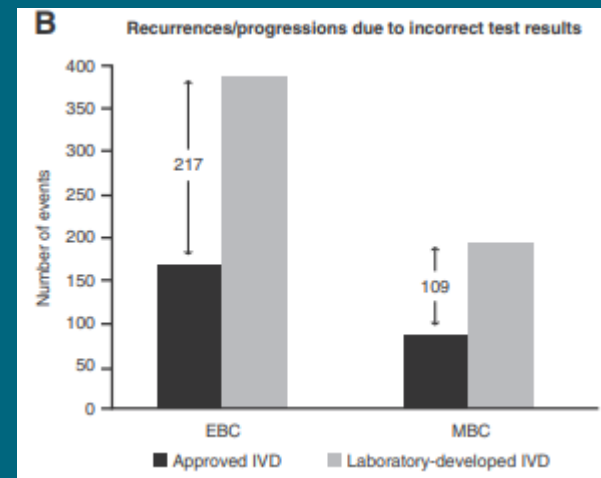
Open Access



Immunohistochemical expression of HER2 in breast cancer: socioeconomic impact of inaccurate tests

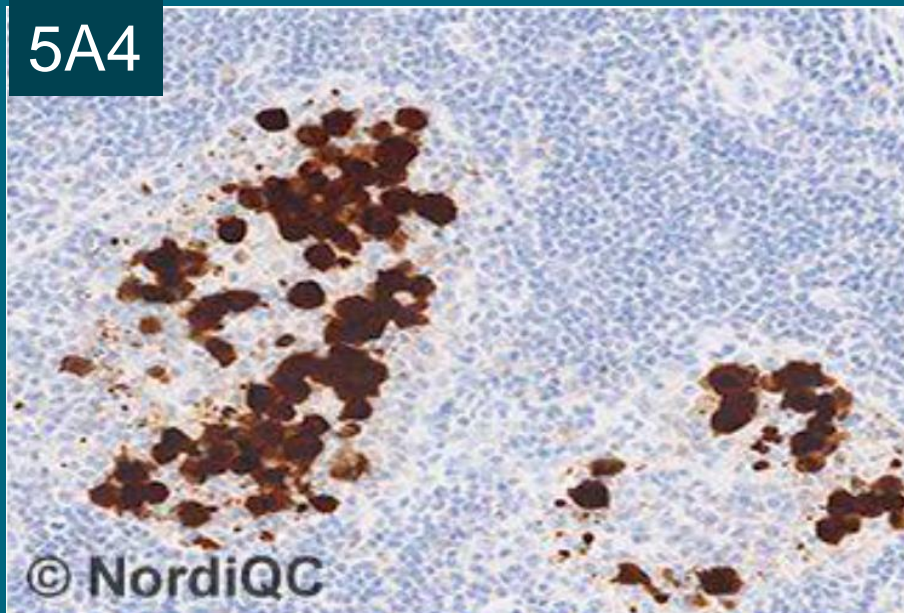
Mogens Vyberg^{1*}, Søren Nielsen¹, Rasmus Røge¹, Beth Sheppard², Jim Ranger-Moore², Eric Walk², Juliane Gartemann³, Ulrich-Peter Rohr³ and Volker Teichgräber³

Every \$1 saved by laboratories by using cheaper reagents could potentially result in approximately \$6 additional costs to the healthcare system.

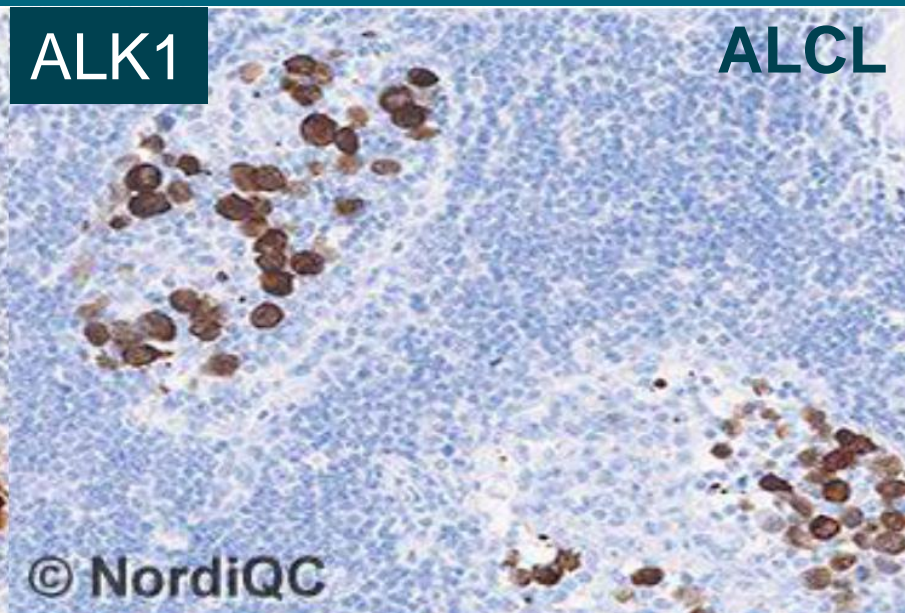


Lung ALK

5A4

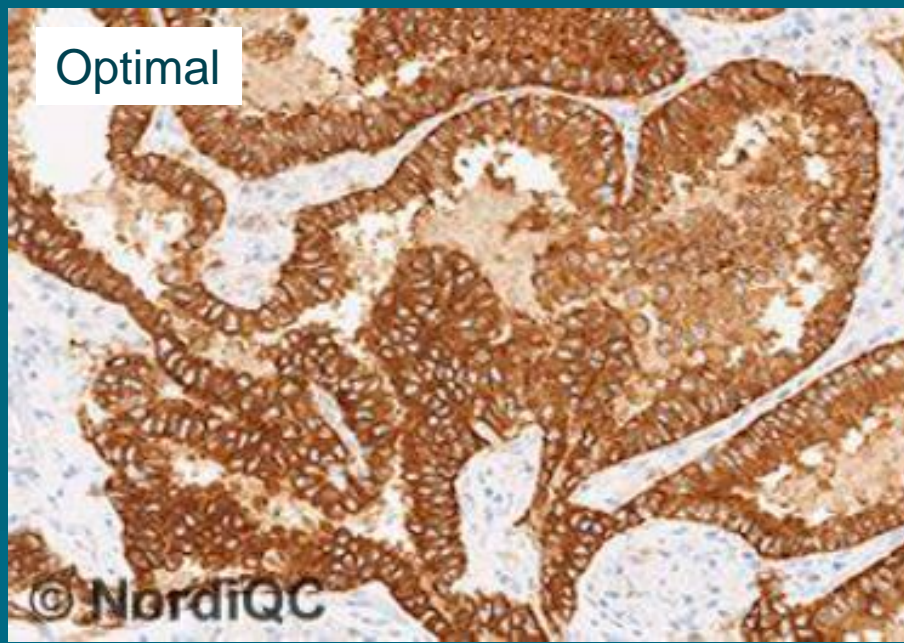


ALK1

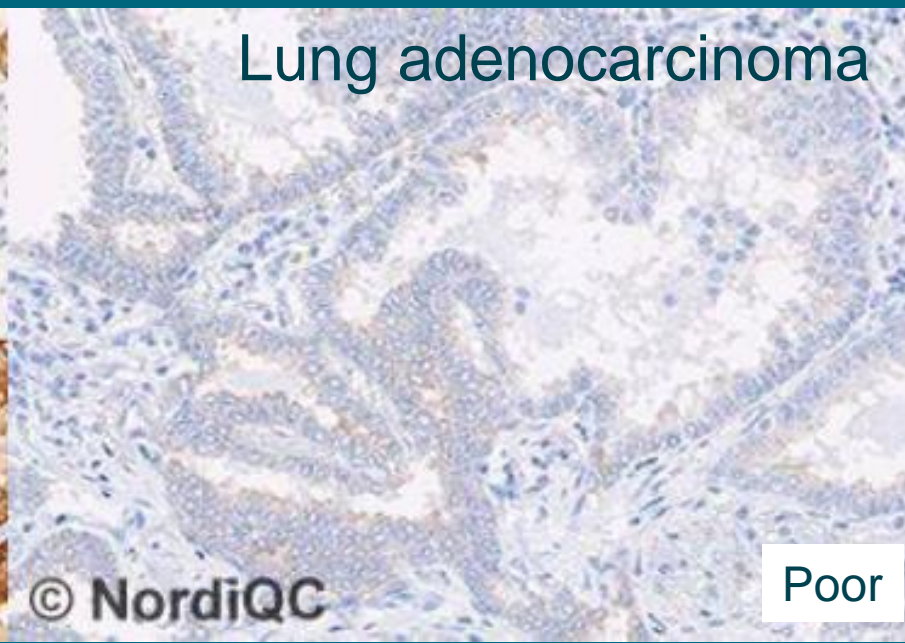


ALCL

Optimal



Lung adenocarcinoma



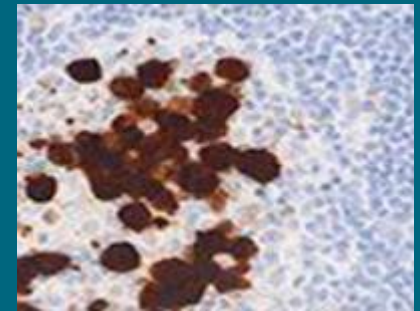
Poor

The immunoassay must fit for the purpose:

- Identify the antibody useful for the specific task

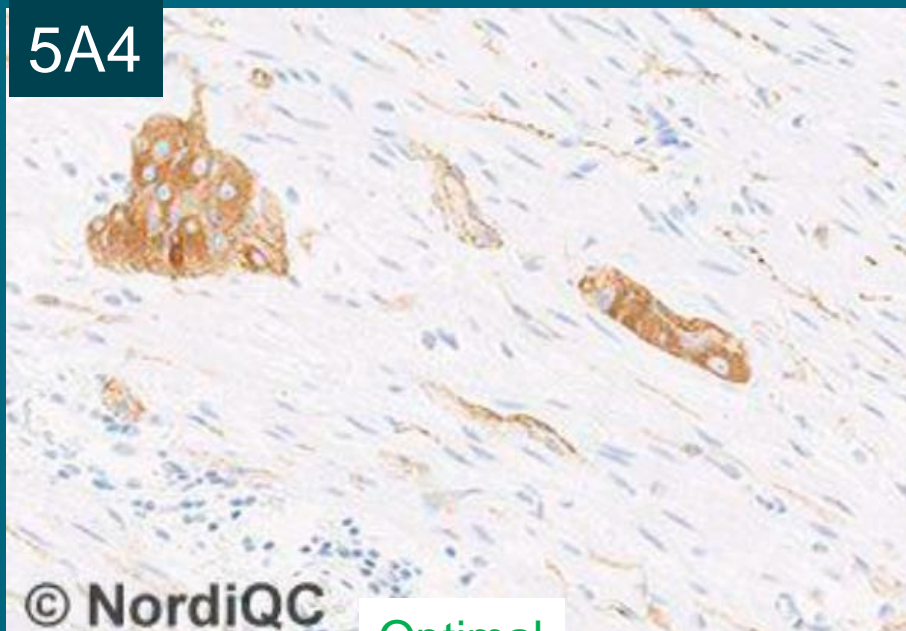
The right external controls must be used:

- Tissue with high epitope expression to identify the right antibody
 - **Anaplastic large cell lymphoma**
- Normal and neoplastic tissue with moderate/low epitope expression to assure the sensitivity:
 - **Appendix**
 - **ALK-positive lung adenocarc.**
- Tissue with no epitope expression to assure the specificity
 - e.g., liver



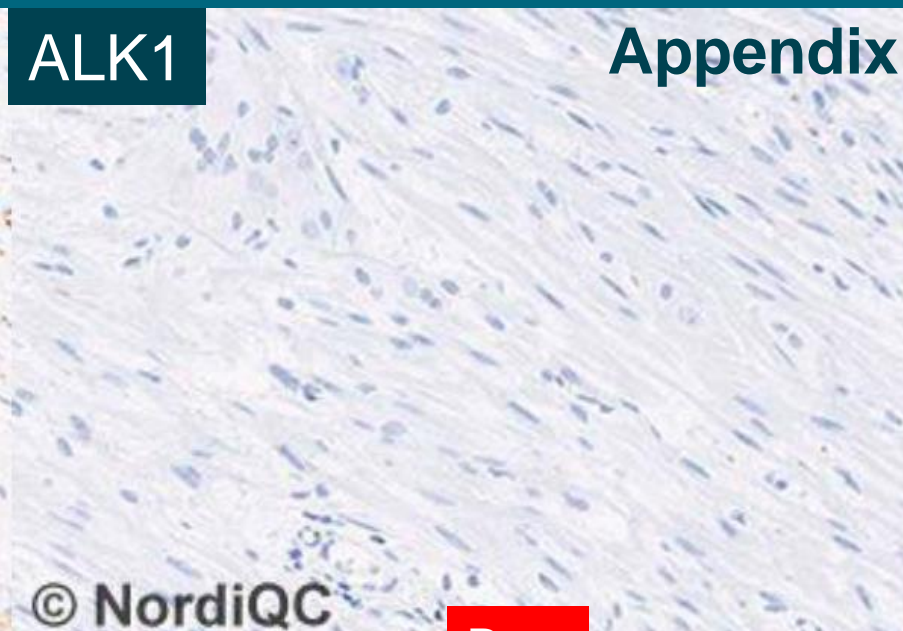
Lung ALK – run 45, 176 labs

5A4

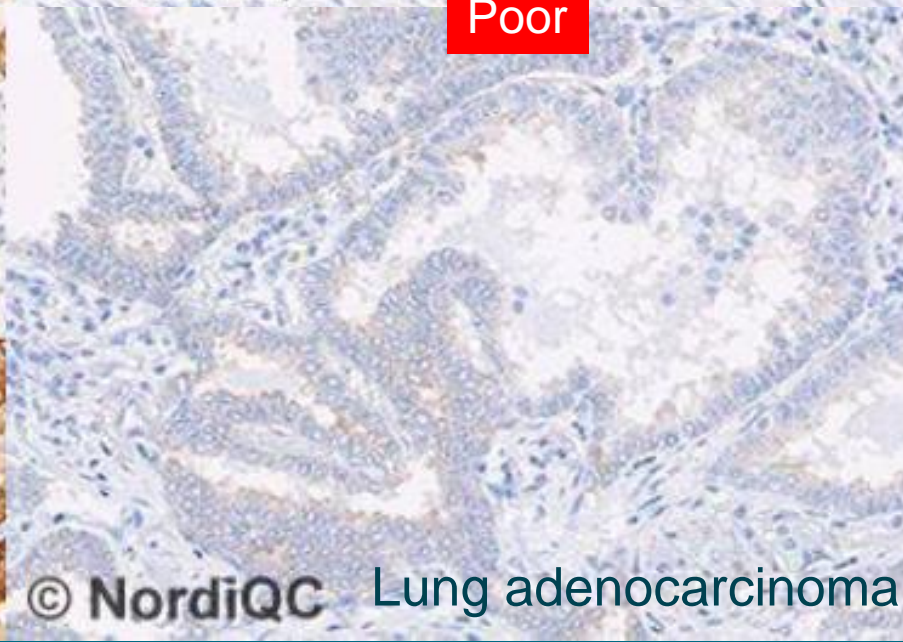
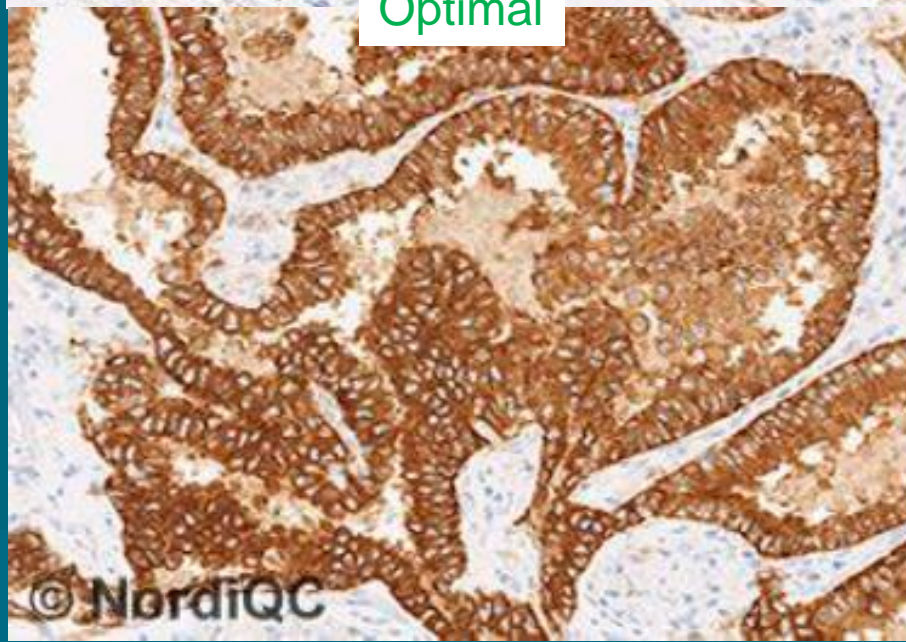


Optimal

ALK1



Poor



Appendix

Lung adenocarcinoma

419 advices for 11 markers

	<u>No.</u>	<u>Improved</u>	<u>%</u>
Positive	268	195	73
Negative	151	21	14

- Almost 1/3 of all IHC stains produced by NordiQC participants are still insufficient !
 - New labs
 - New antibodies, techniques, platforms
 - Increasing demands
- How many IHC stains produced by labs not participating in an EQA scheme are insufficient ?
- How many scientific publications are based on insufficient IHC stains ?
- What are the consequences for the patients ?

"Whatever can go wrong, will go wrong."

A HISTORY OF MURPHY'S LA

by Nick T. Spark



When you believe in automation and stop thinking

NordiQC External Quality Assurance in Immunohistochemistry

Mogens Vyberg
Professor of Clinical Pathology
Director of NordiQC
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Aalborg, Denmark