BEST PRACTICES IN THE APPLICATION OF IMMUNOHISTOCHEMISTRY TO DIAGNOSTIC UROLOGIC PATHOLOGY:

LESSONS FROM USES & ABUSES

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Toward Best Practice IHC use in routine practice

- **When IHC stains exceed H&E stain**

  - Complex case *OR*

  - Lack of best practice approach

Toward Best Practice IHC use in routine practice

Surgical Pathology

- Foundation is the integration of clinical history, gross examination & microscopy
- Cornerstone is still the H&E with appropriate and judicious IHC support – ***IHC guides; does not dictate the diagnosis***
- Practice made considerably more objective by ancillary techniques e.g. IHC

Toward Best Practice IHC use in routine practice

- Serious misdiagnoses are made by inappropriate use of IHC or incomplete knowledge of antibody/ies
  - *More is not necessarily better*
- IHC adjunctive method, histology key
  - *If you have no idea, don't mark it*
- Start with a question based on morphology
- Apply a judiciously constructed panel based on the differential diagnosis generated by the case

TABLE 1. Tissues and Neoplasms With GATA3 Expression

Commonly expressed (expected)
Urothelial cells and neoplasms
Breast carcinoma (particularly lobular and low grade ductal)
Paraganglioma
Subset of T lymphocytes
Trophoblasts (particularly intermediate)
Skin adnexal tumors
Cutaneous basal cell carcinoma
Parathyroid
Yolk sac tumor (particularly reticular-microcystic and embryoid patterns)
Often positive
Mesothelioma
Skin squamous cell carcinoma
Chromophobe RCC
Clear cell-papillary RCC
Pancreatic ductal carcinoma
Salivary gland neoplasms
Less frequently positive
Renal oncocytoma
Lung carcinoma
Gastric carcinoma
Colorectal carcinoma
Endometrial carcinoma
Ovarian carcinoma
Squamous cell carcinoma (cervix, larynx, lung)
Synovial sarcoma (epithelial component)

TABLE 2. Tissues and Neoplasms With PAX-8 Expression

Commonly expressed (expected)
Thyroid tissue and neoplasms (including anaplastic)
Renal tubules and renal epithelial neoplasms
Nephroblastoma (Wilms tumor)
Parathyroid tissue and neoplasms
Gynecologic tract carcinomas (ovary, endometrial, endocervical)
Testicular adnexa epithelium
Medulloblastoma
Pancreatic neuroendocrine tumors (with polyclonal antibody)
Thymic epithelium and neoplasms
Merkel cell carcinoma
Clear cell carcinoma of urinary tract
Nephrogenic adenoma
Yolk sac tumor
B cells and subset of B-cell lymphomas (with polyclonal antibody)
Less frequently expressed
Seminoma
Urothelial carcinoma (mostly upper ureter and renal pelvis)

TABLE 3. Tissues and Neoplasms With SALL4 Expression

Commonly expressed
Most germ cell tumors (less in trophoblastic and "mature" teratoma elements)
Serous carcinoma of the gynecologic tract
Malignant rhabdoid tumor
Gastric adenocarcinomas (particularly those with "fetal-gut" differentiation)
Urothelial carcinoma (particularly poorly differentiated)
Less frequently positive
B-cell lymphoma
Leukemia
Melanoma
Prostatic carcinoma
Colorectal carcinoma
Mammary carcinoma
Hepatocellular carcinoma
Melanoma
Epithelioid sarcoma
Desmoplastic small round cell tumor
Rhabdomyosarcoma

Toward Best Practice IHC use in routine practice

- Panel should include expected positive and expected negatives
- There are no absolutely specific or sensitive antibodies
  - *Anomalous stuff happens*
  - *Sensitivity and specificity is not inherent to the antibody, but to the antibody applied in a given setting*
- Evaluate the stain paying attention to pattern *(nuclear, cytoplasmic, membranous, etc.)*
- ALWAYS evaluate the controls *(positive and negative)*
- Diagnose the case after review of IHC only in the context of the morphology and the clinical situation

GOWN'S LAWS OF IMMUNOCYTOCHEMISTRY

- There is no perfect marker of any tumor
- There is no perfect fixative for all antibodies
- If everything in the tissue section appears positive, nothing is actually positive
- All that turns brown (or black, or red, etc.) on the slide is not positive
- Under inappropriate conditions, any antibody can be made to appear positive on any tissue
- In any given immunocytochemical run involving multiple slides, tissue will fall off the slide corresponding to the most critical antibody
- The diagnostic power of any immunocytochemical preparation is no greater than the knowledge and wisdom of the pathologist interpreting it

Best "Special Studies" in Surgical Pathology

- Good thin section and well stained H&E slides
- Additional sections, recuts and levels
- A phone call to the clinician (or reviewing the electronic medical records)
- Another trust-worthy pair of eyes (colleague)
- Placing the diagnostic dilemma in context of the clinical situation and management considerations
- Having a best practice approach immunohistochemistry

SELECT BEST PRACTICE IHC APPLICATIONS IN UROLOGIC PATHOLOGY

- **Bladder:**
  - Proving origin/differentiation in unusual primary or at a metastatic site
  - IHC in flat intraepithelial lesions
- **Prostate:**
  - Proving origin at a metastatic site
  - Issues related to triple cocktail use in prostate biopsies
- **Kidney:**
  - Proving renal origin at a metastatic site
- **Testis:**
  - Screening panels for tumors involving testis – primary or metastatic sites
  - Characterizing the various germ cell components

PROVING UROTHELIAL DIFFERENTIATION

Carcinoma of unknown origin or patient with history of bladder/renal cancer:

- Lymph node
- Lung
- Liver
- Bone
- Prostate

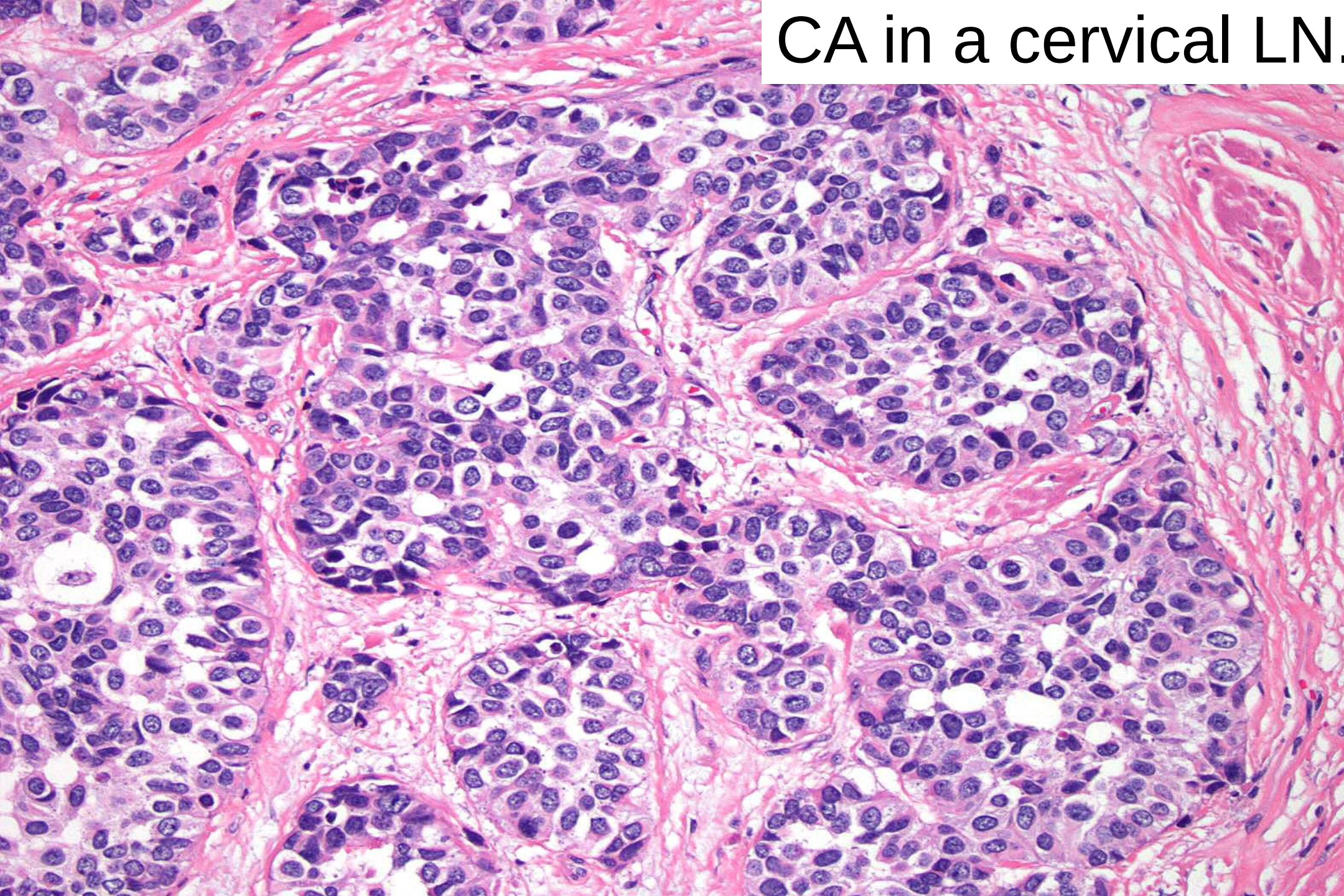
"Unusual carcinoma" in the bladder

Metastatic tumors to the bladder:

- Melanoma
- Prostate
- Colorectal
- Cervix
- Ovary
- Renal

Primary urothelial carcinoma:

- UCa with small tubules
- Plasmacytoid
- Micropapillary
- Etc


CA in a cervical LN

UROTHELIAL CARCINOMA (Prim. or Metastatic site)

Challenges:

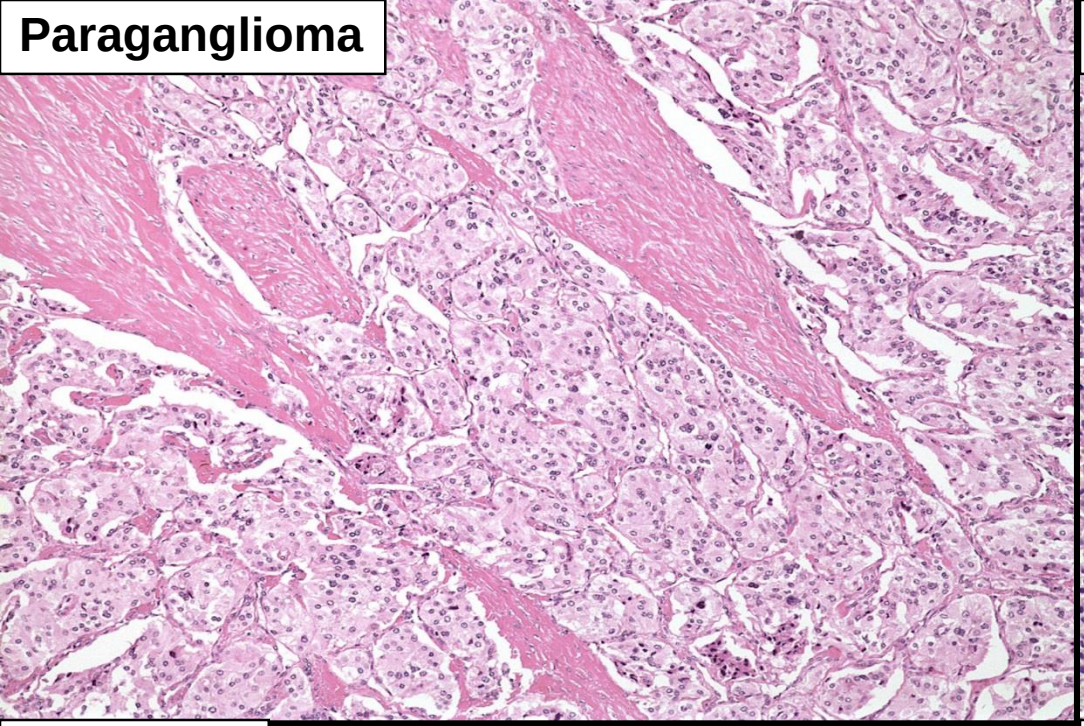
- Poorly differentiated carcinoma
- "Characterless": solid, nested & trabecular architecture

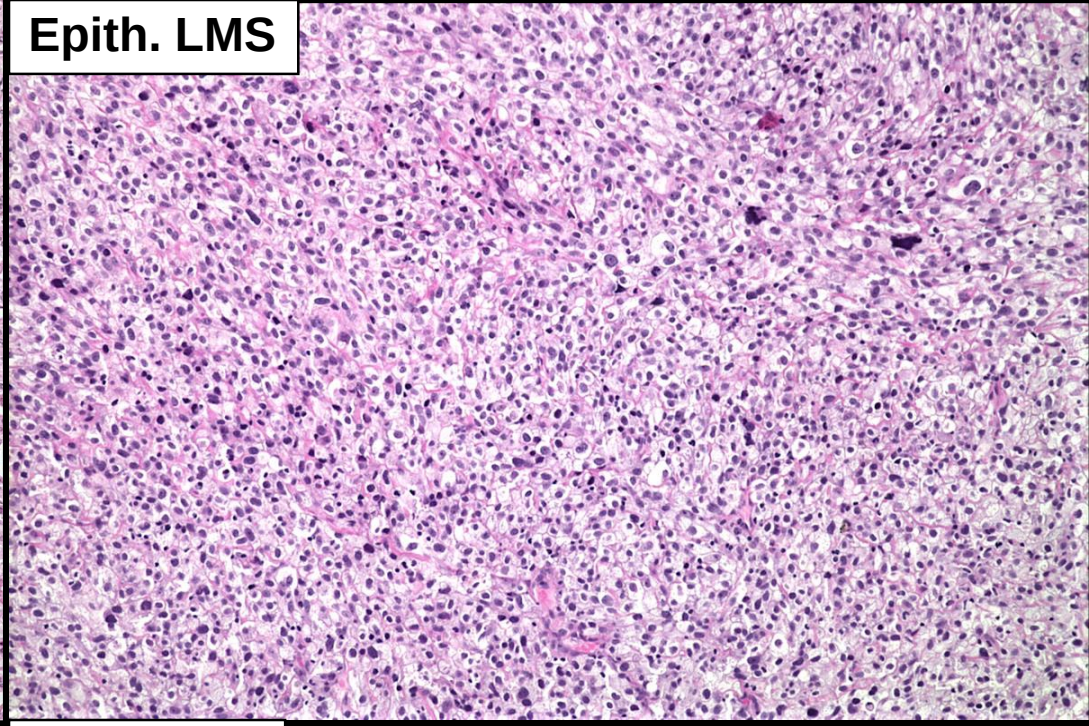
Hallmarks:

- *Frequent squamous and / or glandular diff.*
- *Cells with nuclear grooves*
- *Nuclear atypia obvious +/- anaplasia*

Approach

- *Clinical history (invasive, usually high stage carcinoma)*
- *Compare with primary*
- *Judicious IHC: ? Best markers*


Paraganglioma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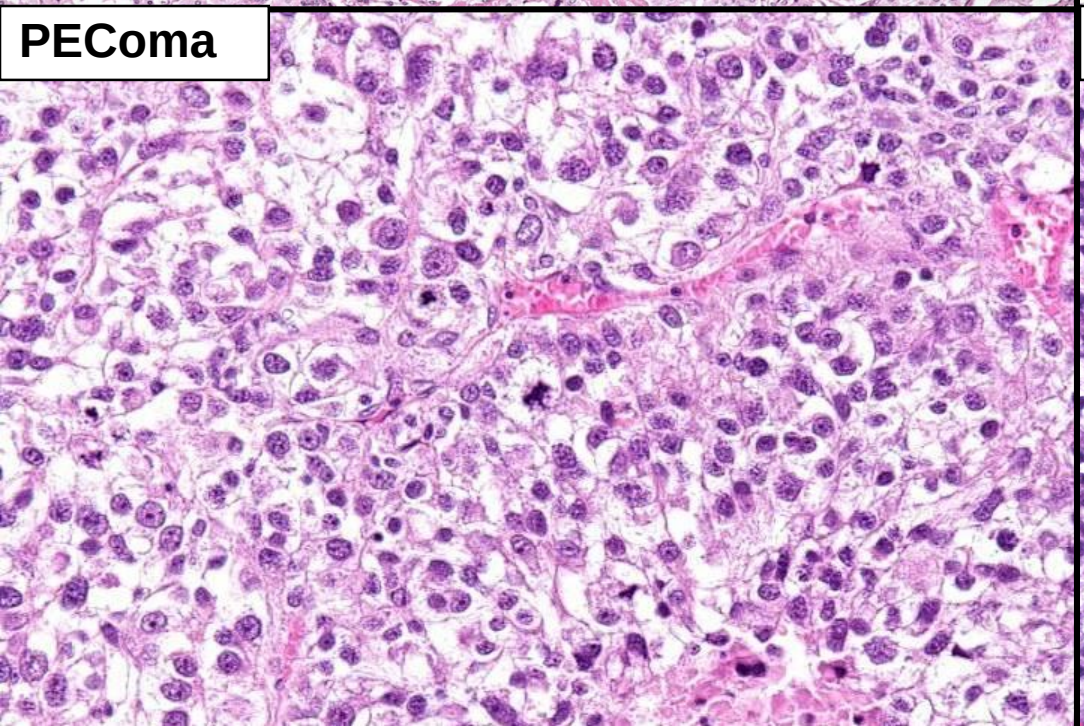
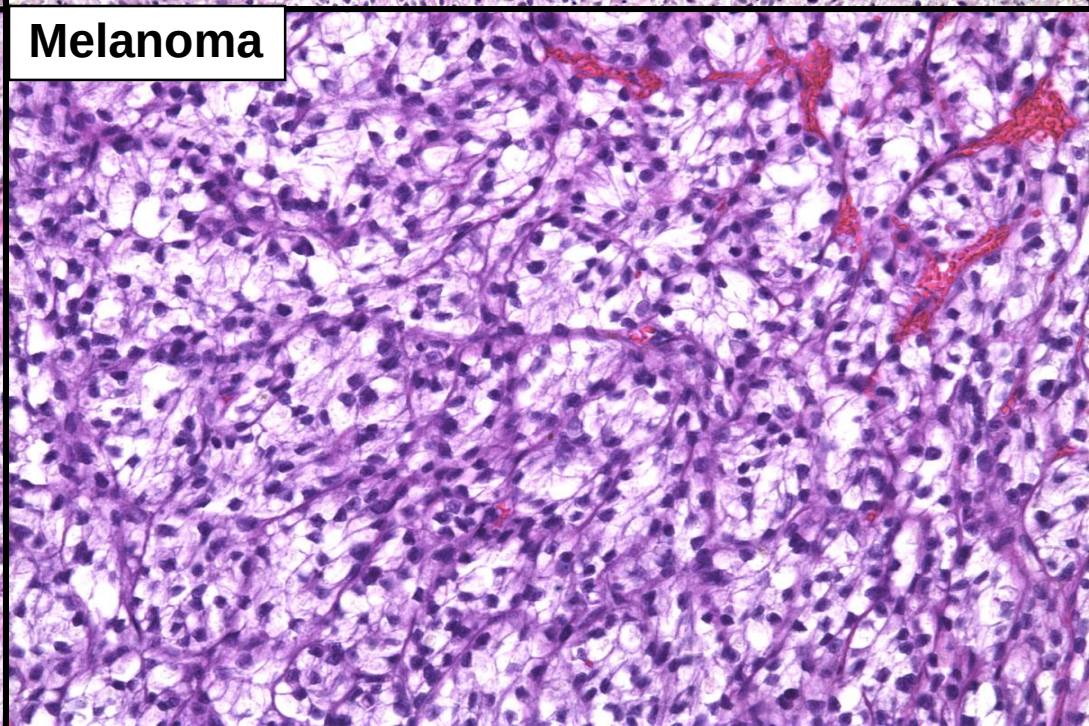

PEComa


Melanoma

URINARY BLADDER - IHC

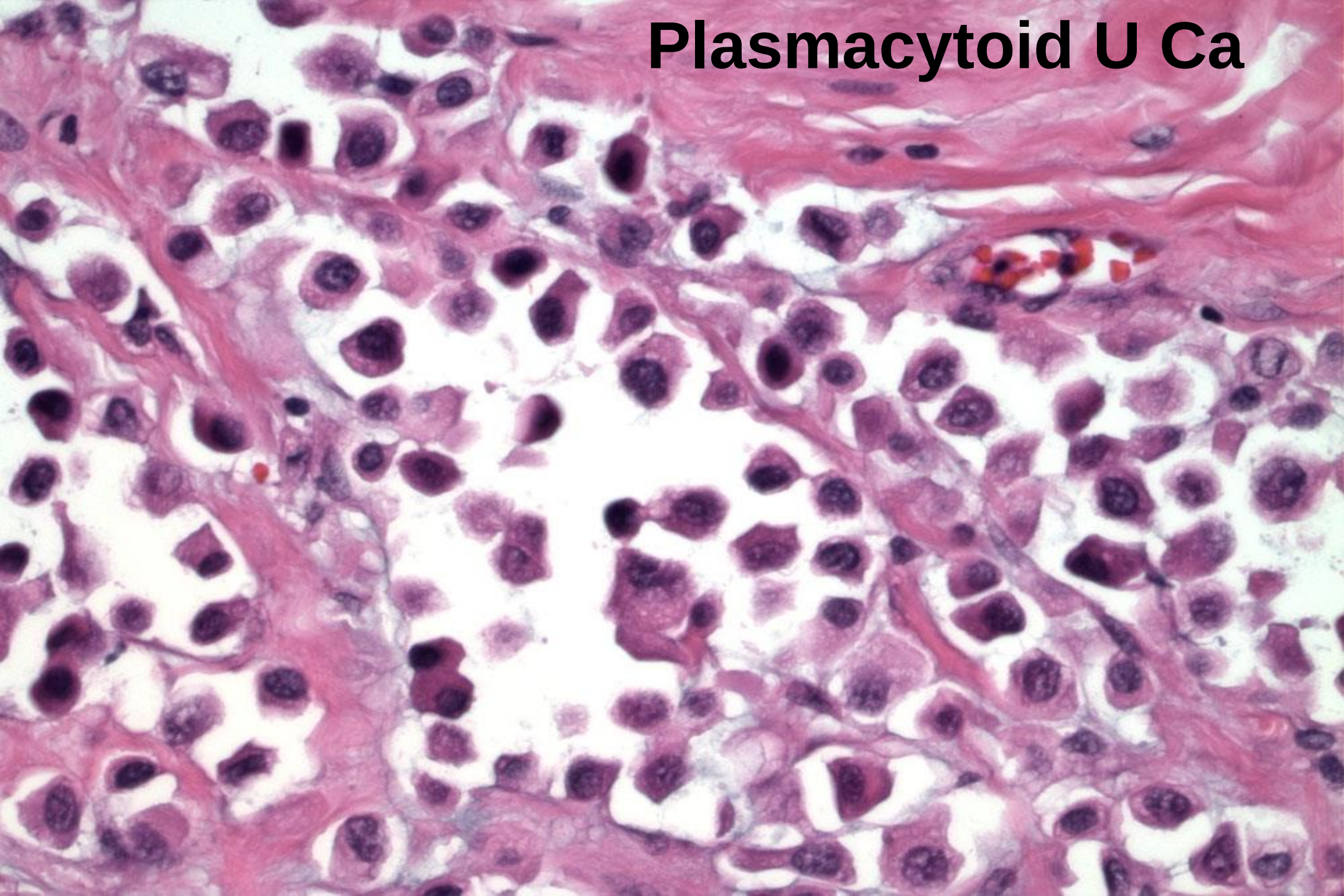
- **Diagnosis of metastatic urothelial cancer**
  - **CK7 (+) (>90%)**
  - **CK20 (+) (40-70%)**
  - **p63 (+) (60-90%)**
  - **High molecular weight cytokeratin 34ßE12 (+) (60-90%)**

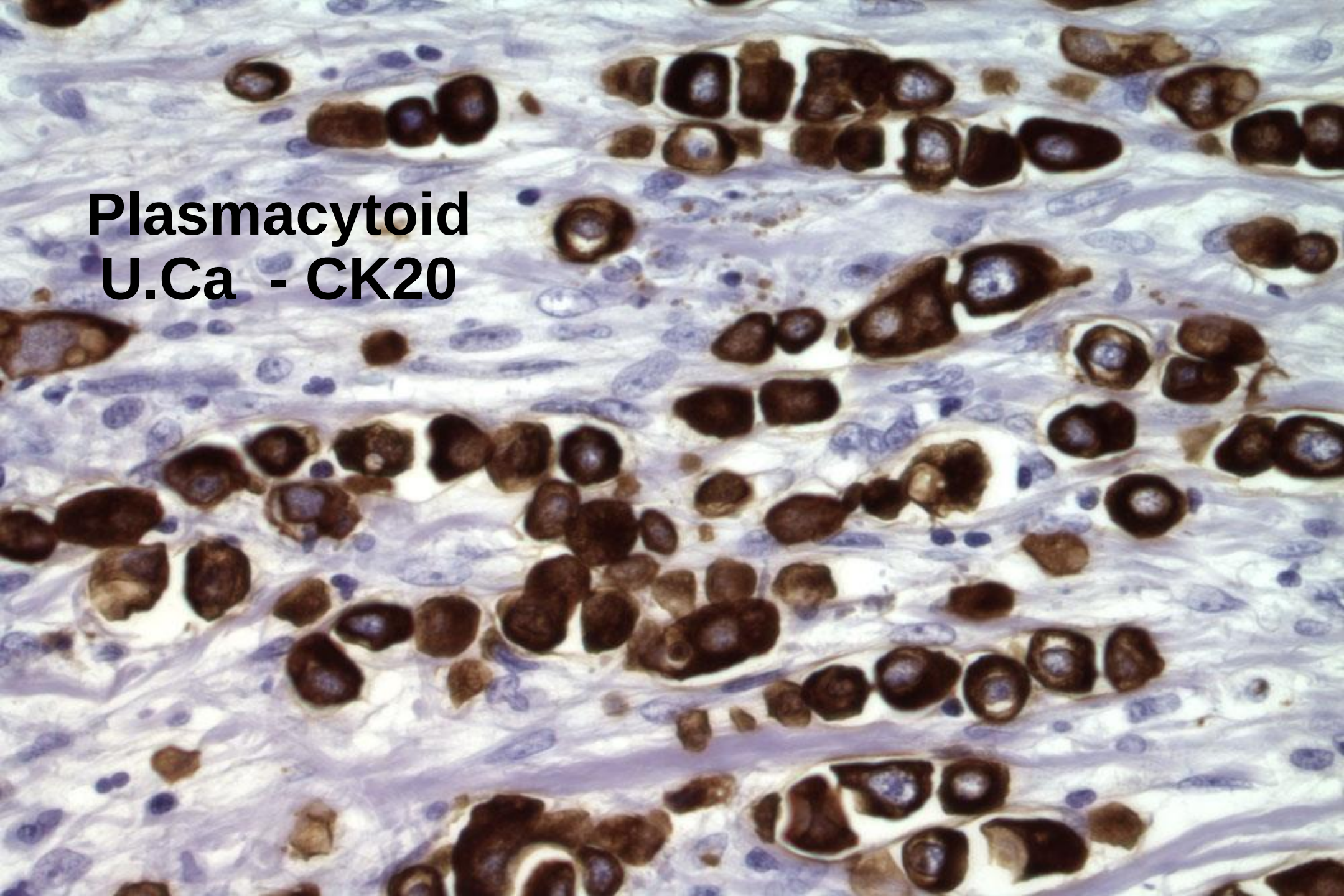
Traditional, Broad Markers

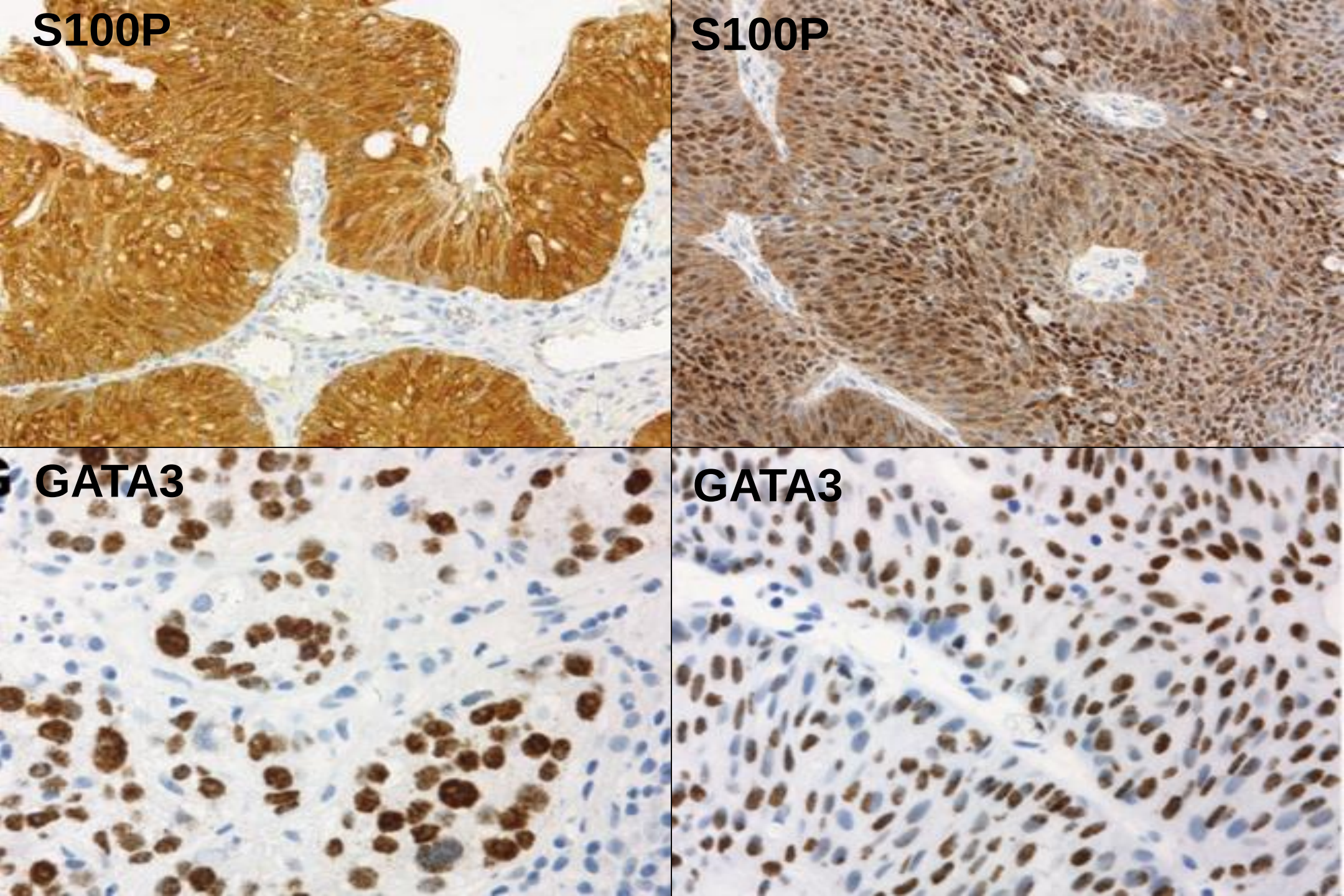
  - **GATA3 (60-70%)**
  - **Uroplakin II (+) (50-80%)**
  - **S100P (70- 80%)**

Histogenesis-associated markers

- ***Uroplakin III (+) (20-50%)***
  - ***Thrombomodulin (+) (60-75%)***
  - ***CEA, Leu-M1 (±) (minimal value)***

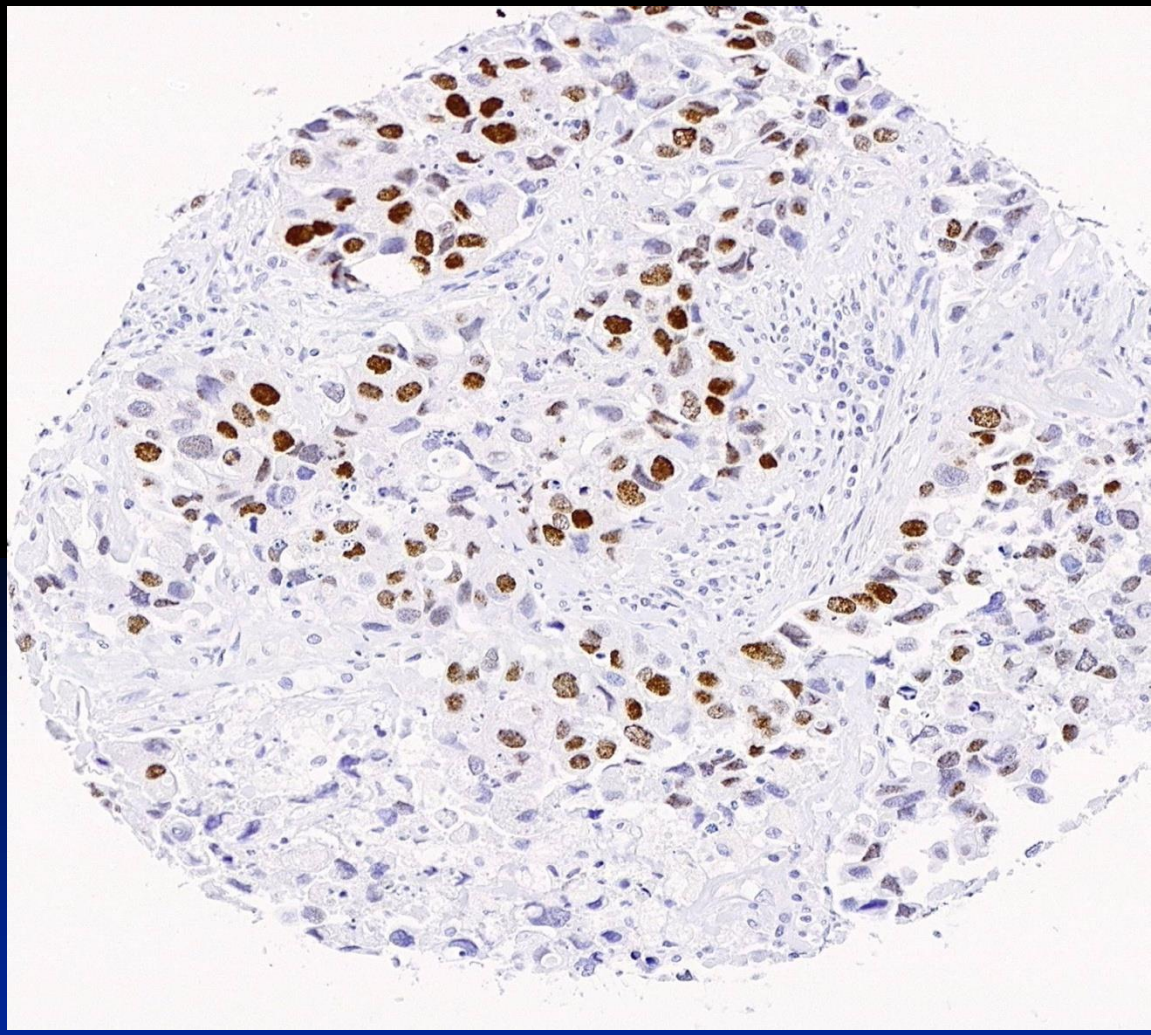

Plasmacytoid U Ca


Plasmacytoid
U.Ca - CK20


S100P
S100P
GATA3
GATA3

GATA3

- Nuclear staining
- lower sensitivity but higher specificity than S100P for urothelium



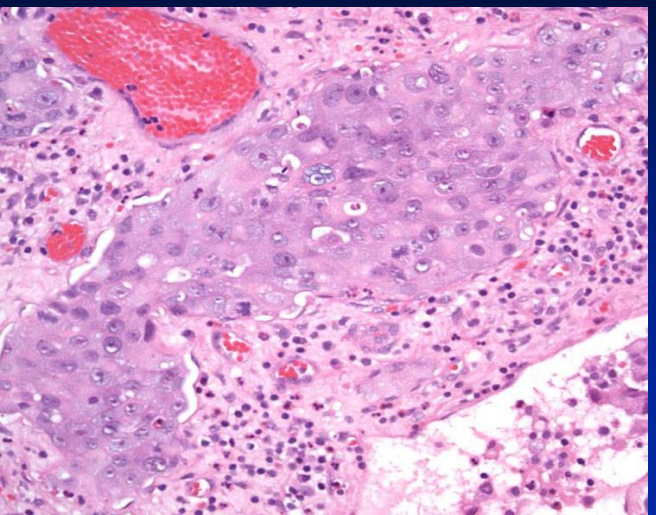
GATA3 – Wide Range of Expression

- **Positive in**
  - **Breast, trophoblastic tumors, paragangliomas, salivary gland neoplasms, squamous carcinomas, basal cell carcinomas, yolk sac tumors, pancreatic ductal adenocarcinomas**

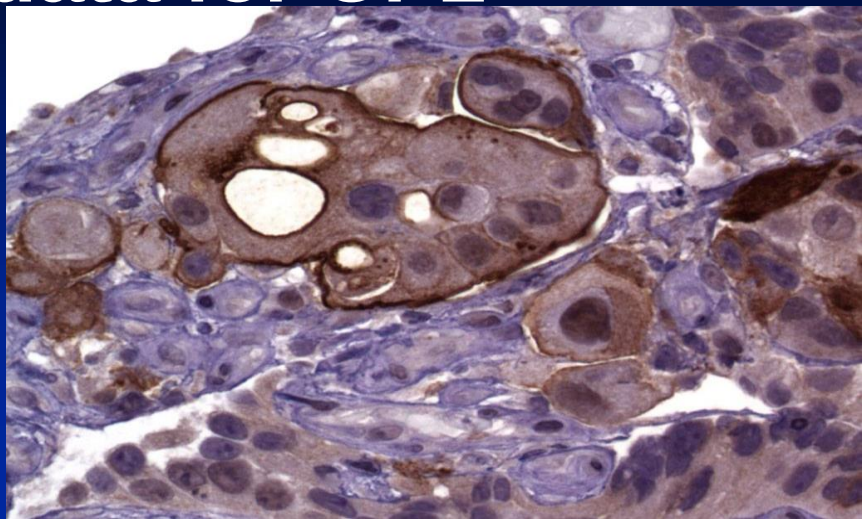
- ***Mietinnen et al. Am J Surg Pathol 2013***

Uroplakins – II and III

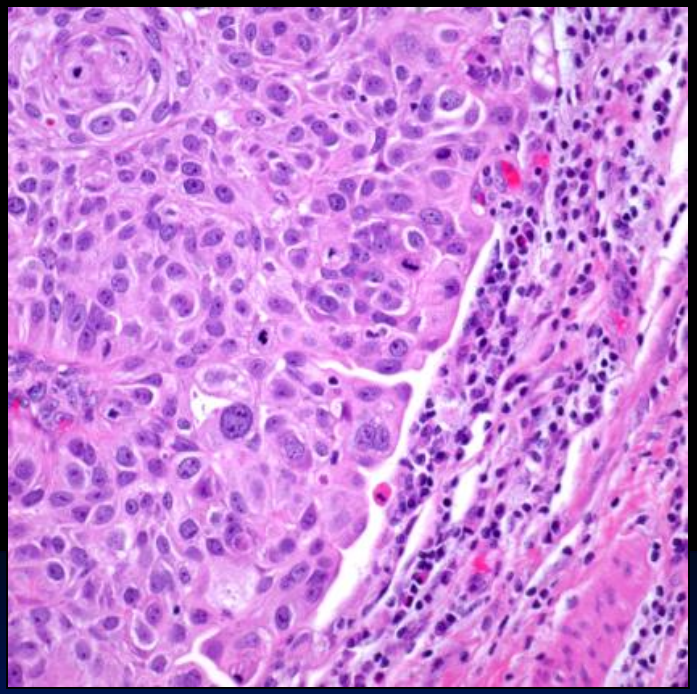
- Protein constituents of the urothelial plaques in vesicles of urothelium
- Vital role in expansion and contraction through vesicle cycling
- Subunits uroplakins Ia, Ib, II, and IIIa
- Unique and characteristic feature of urothelium
- Previous data for UP3, new data for UP2

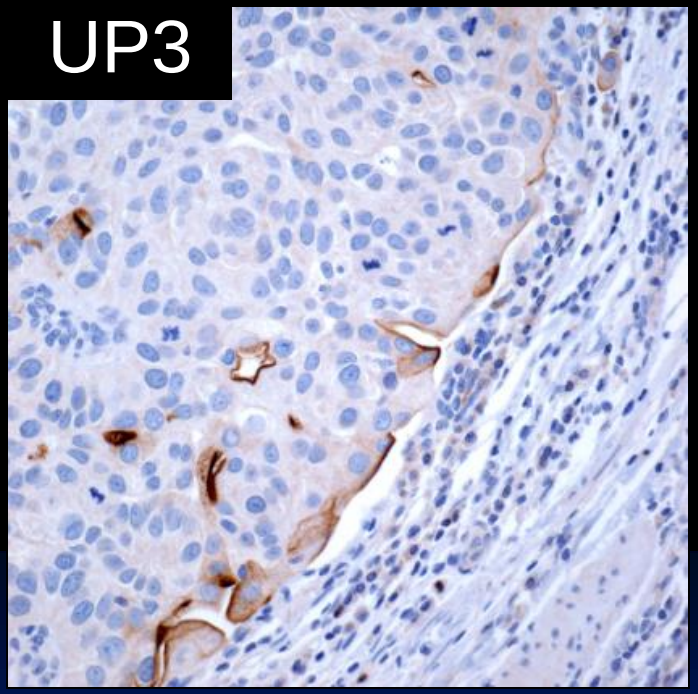


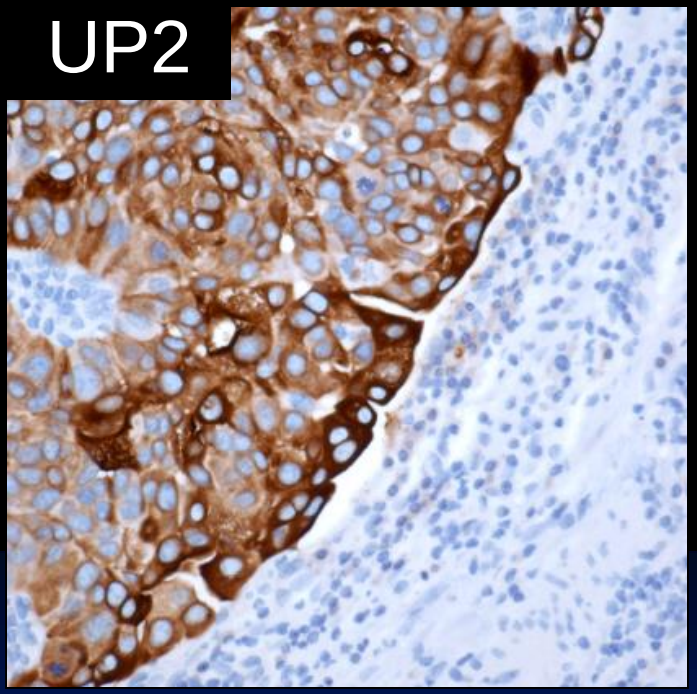
Uroplakin 3



Uroplakin 2 versus Uroplakin 3



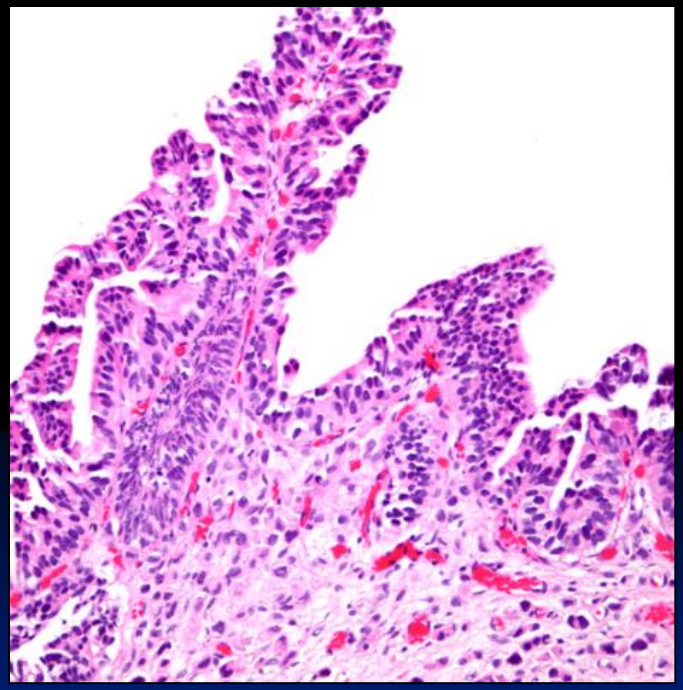


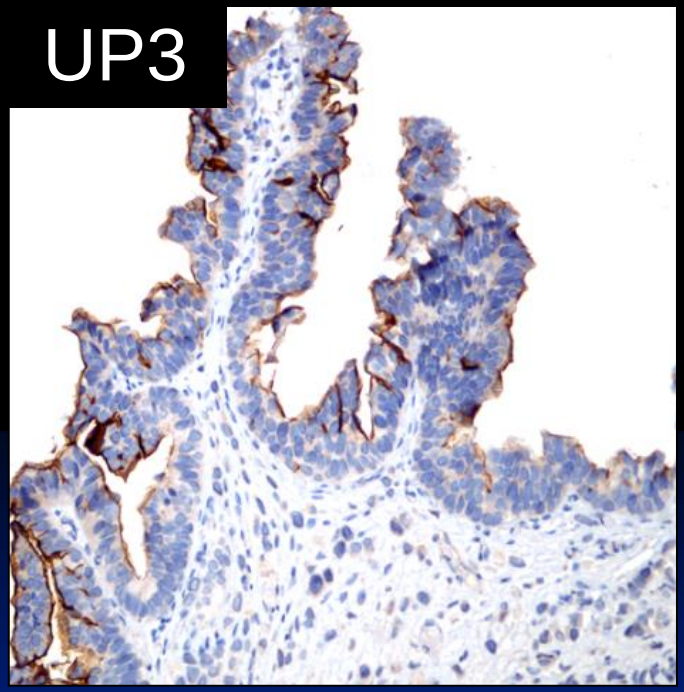


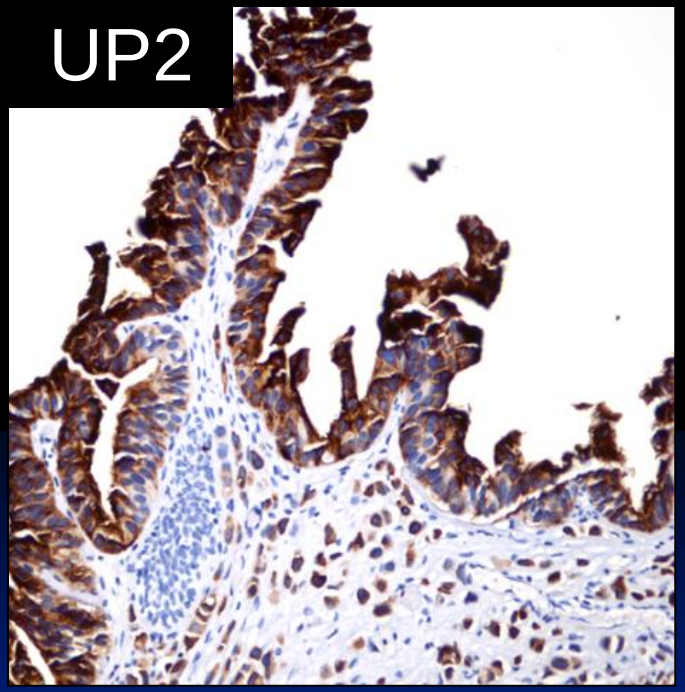
. Among UC metastases, UP2 showed greater intensity and proportion, (both $p<0.001$), with higher sensitivity (73% vs 37%, respectively, $p=0.001$).

Smith et al. Histopathology. In press

Uroplakin 2 versus Uroplakin 3

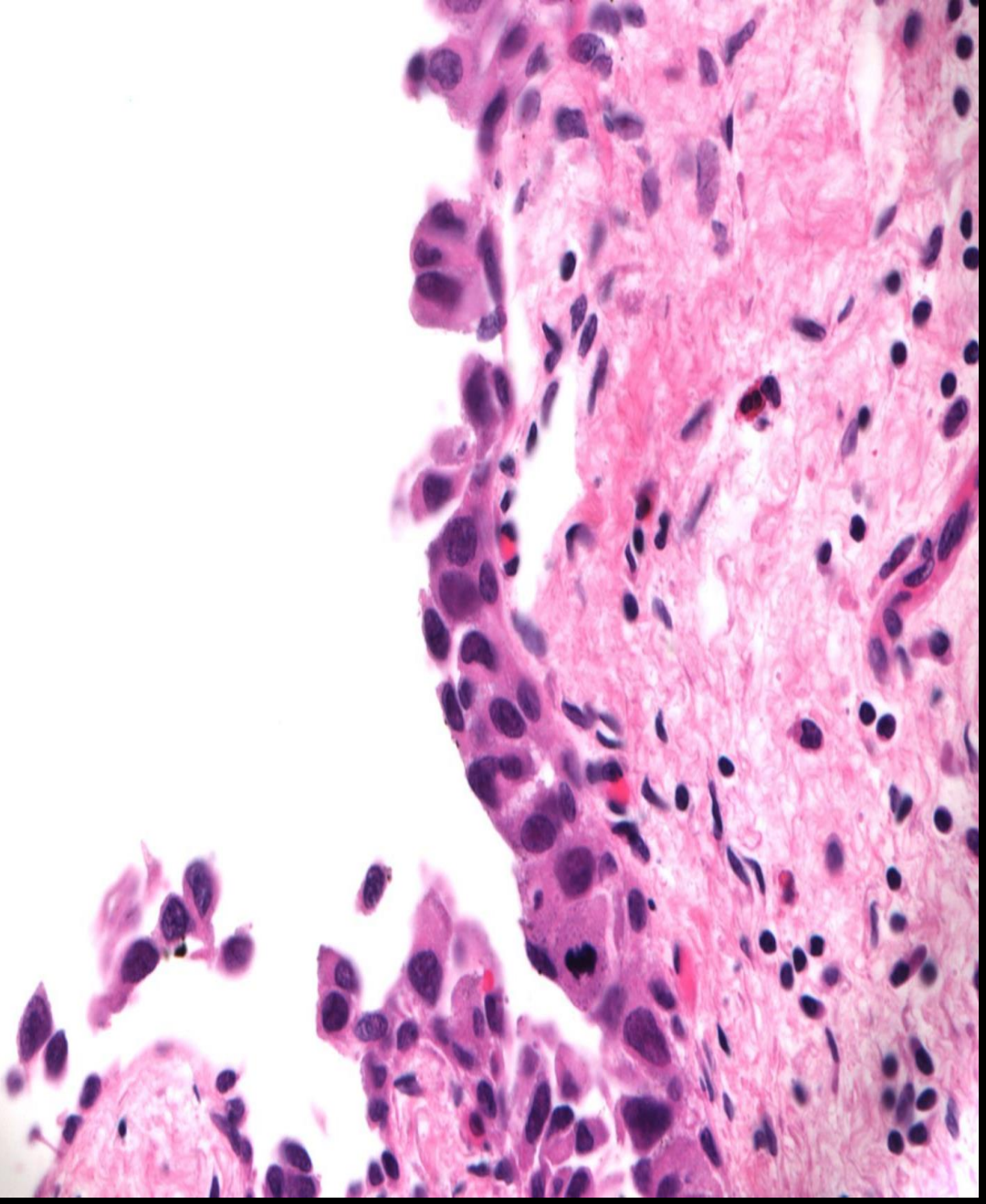




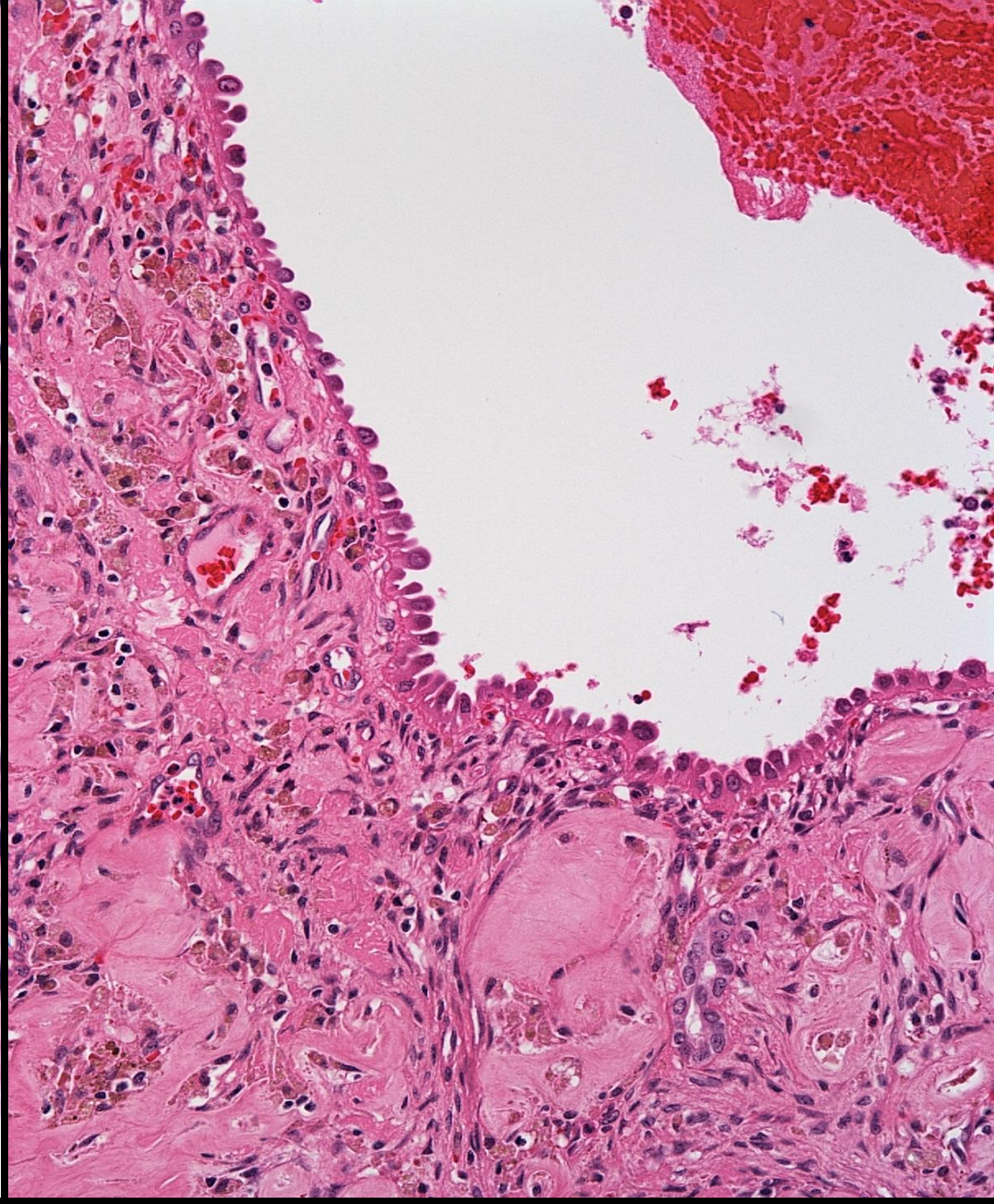


Villoglandular variant simulates colorectal carcinoma

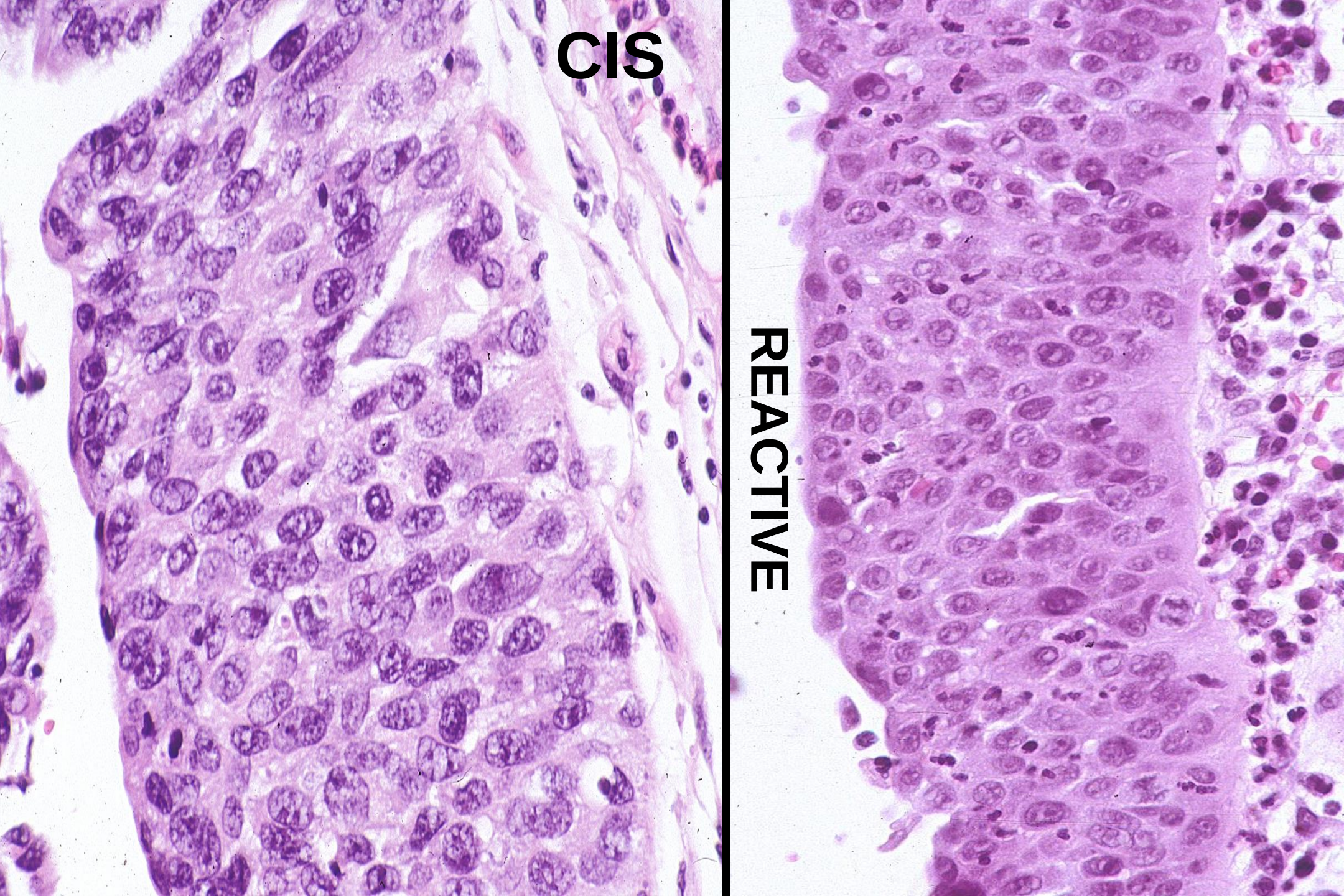
Smith et al. Histopathology. In press



CIS



REACTIVE ATYPIA


CIS
REACTIVE

IMMUNOHISTOCHEMISTRY IN FLAT LESIONS OF THE BLADDER

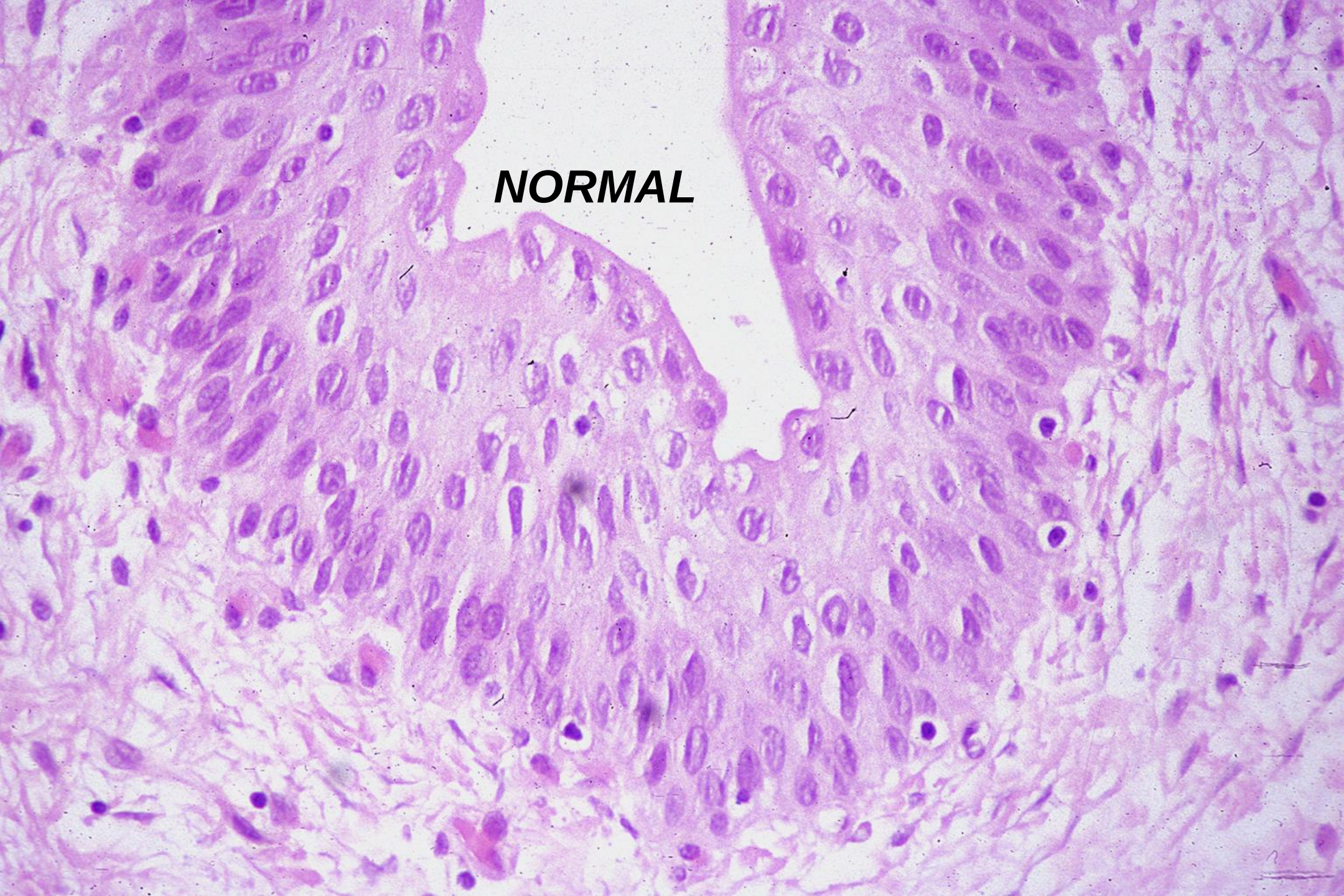
Panel: p53, CD44 (standard isoform), CK20

Indications:

- Marked denudation – residual basal cells vs "clinging" CIS
- Distinction between reactive atypia and CIS (large cell non-pleomorphic or "small" cell)
- Pathologist favors CIS but has reservations making diagnosis
- CIS with unusual morphology – Pagetoid, undermining, etc.

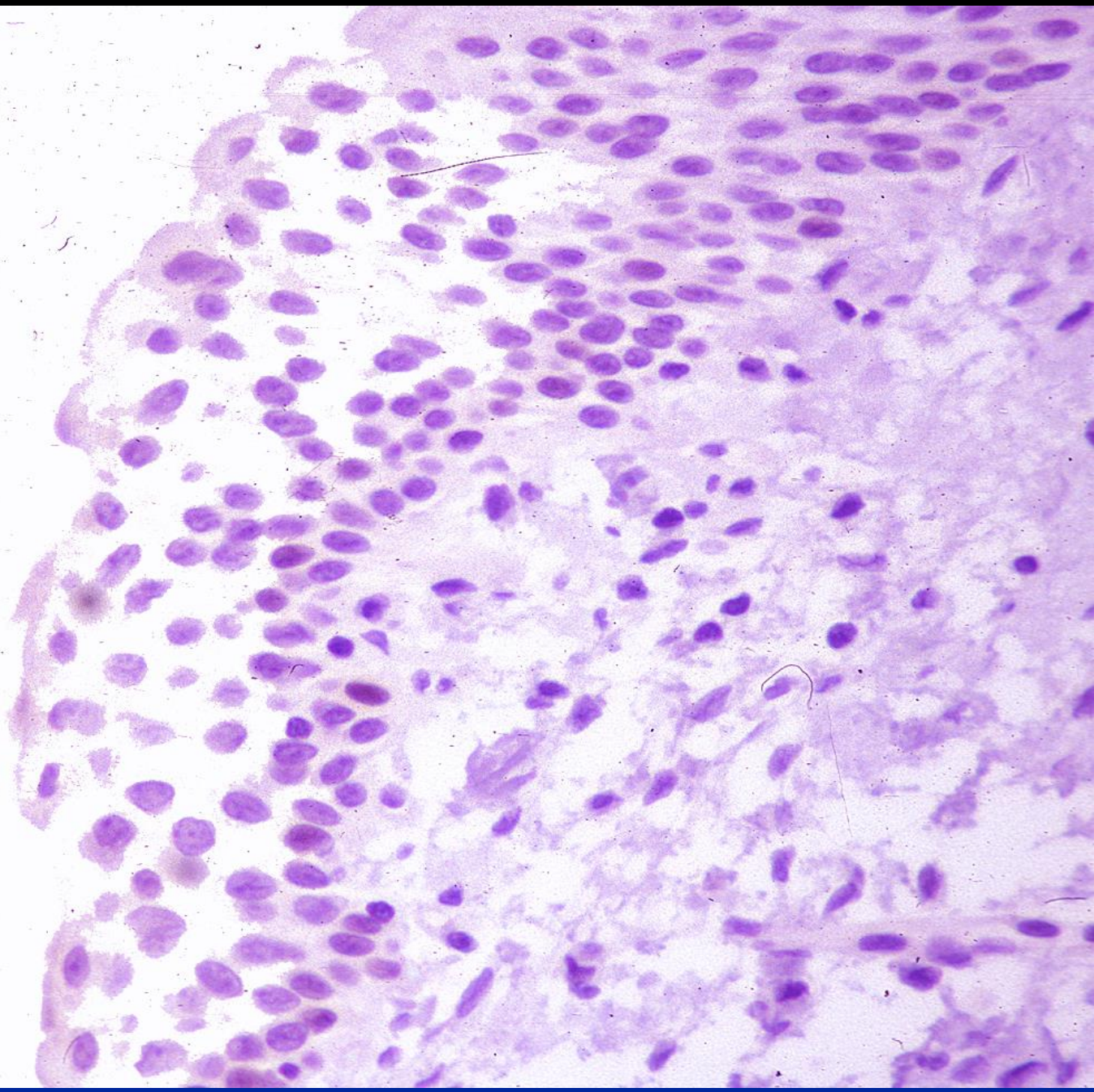
Caveats:

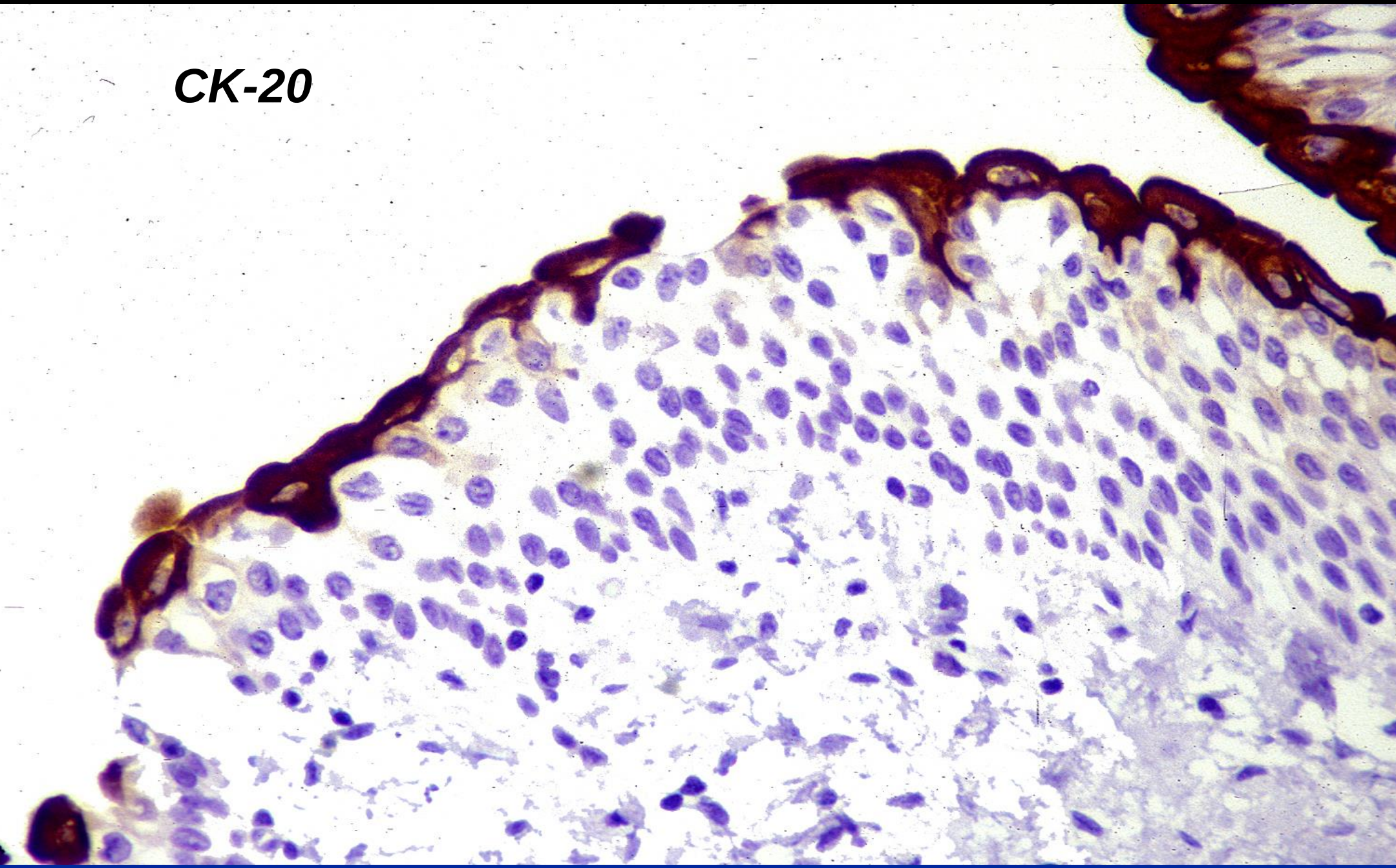
- Not applicable for dysplasia vs CIS
- Greater caution while evaluaiting post-treatment biopsies


NORMAL

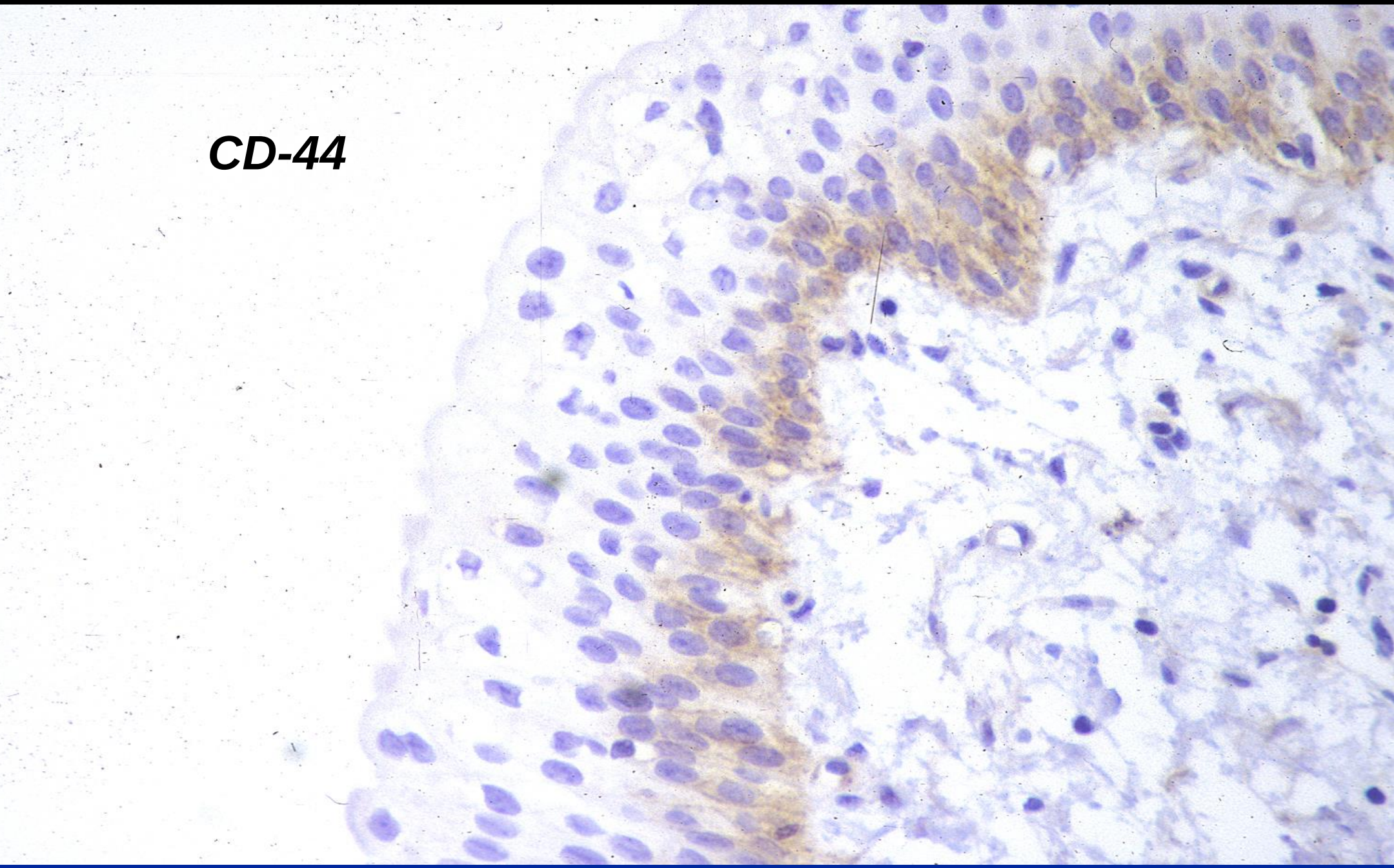
NORMAL

p53

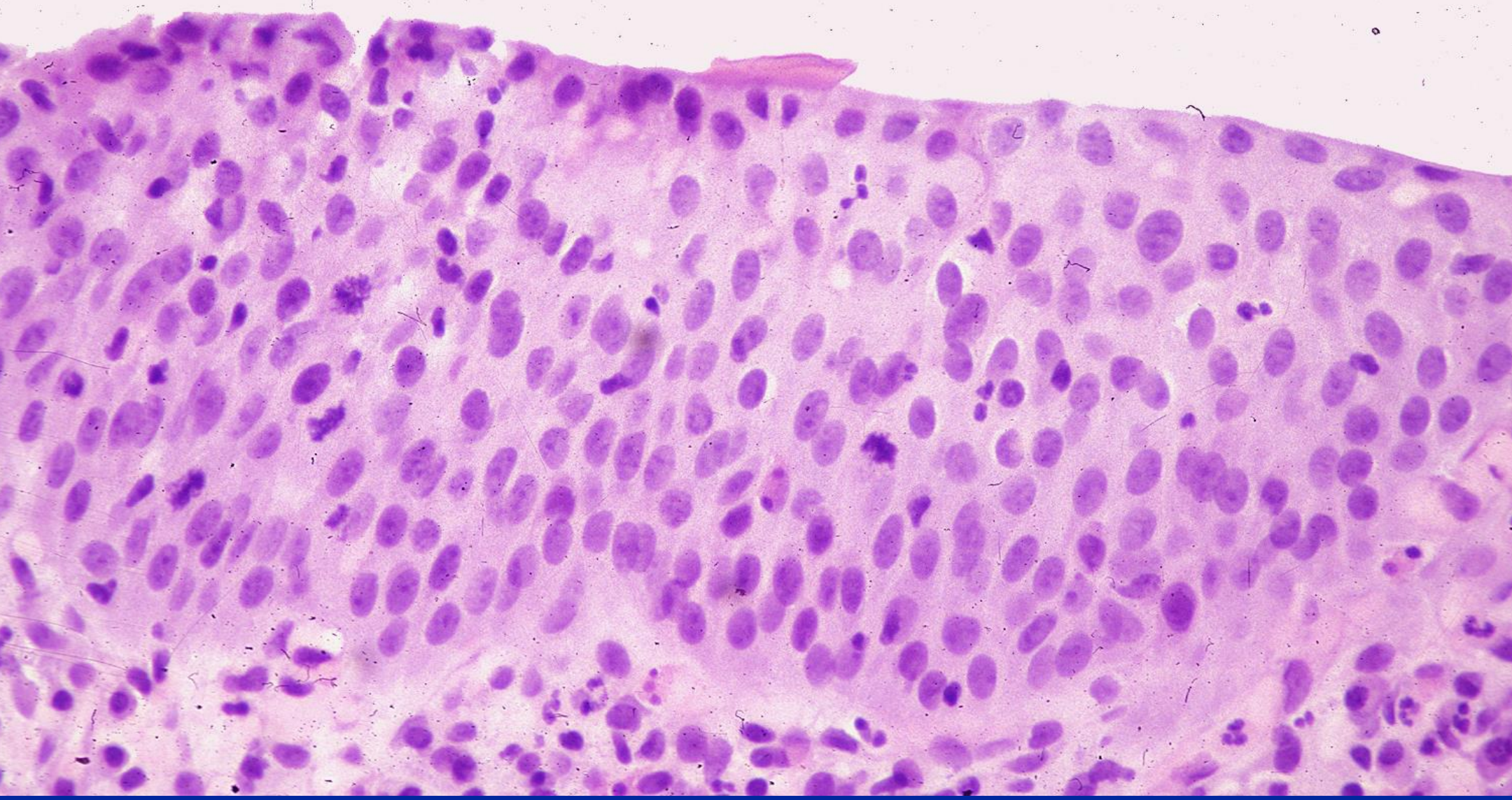


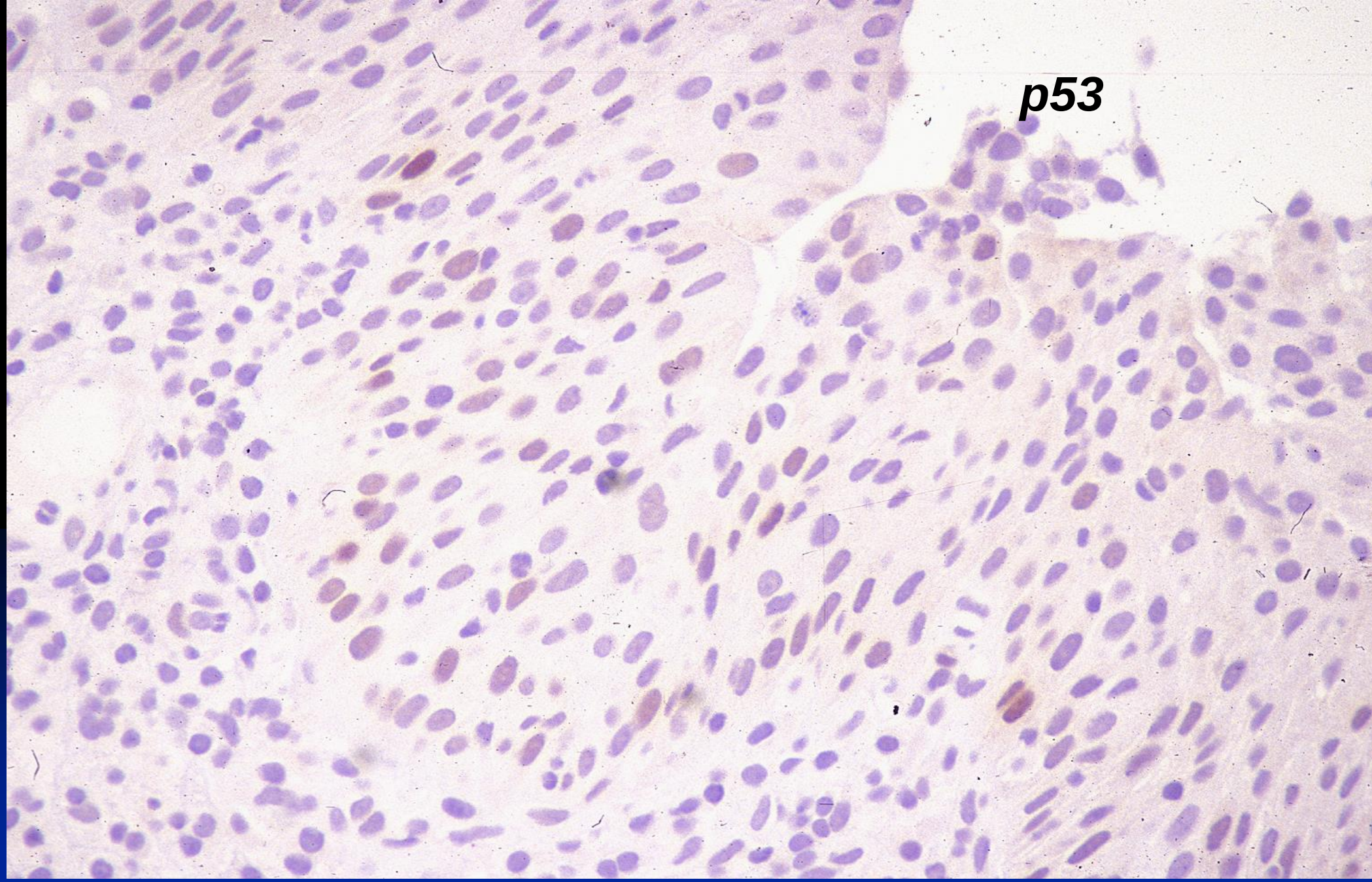

CK-20

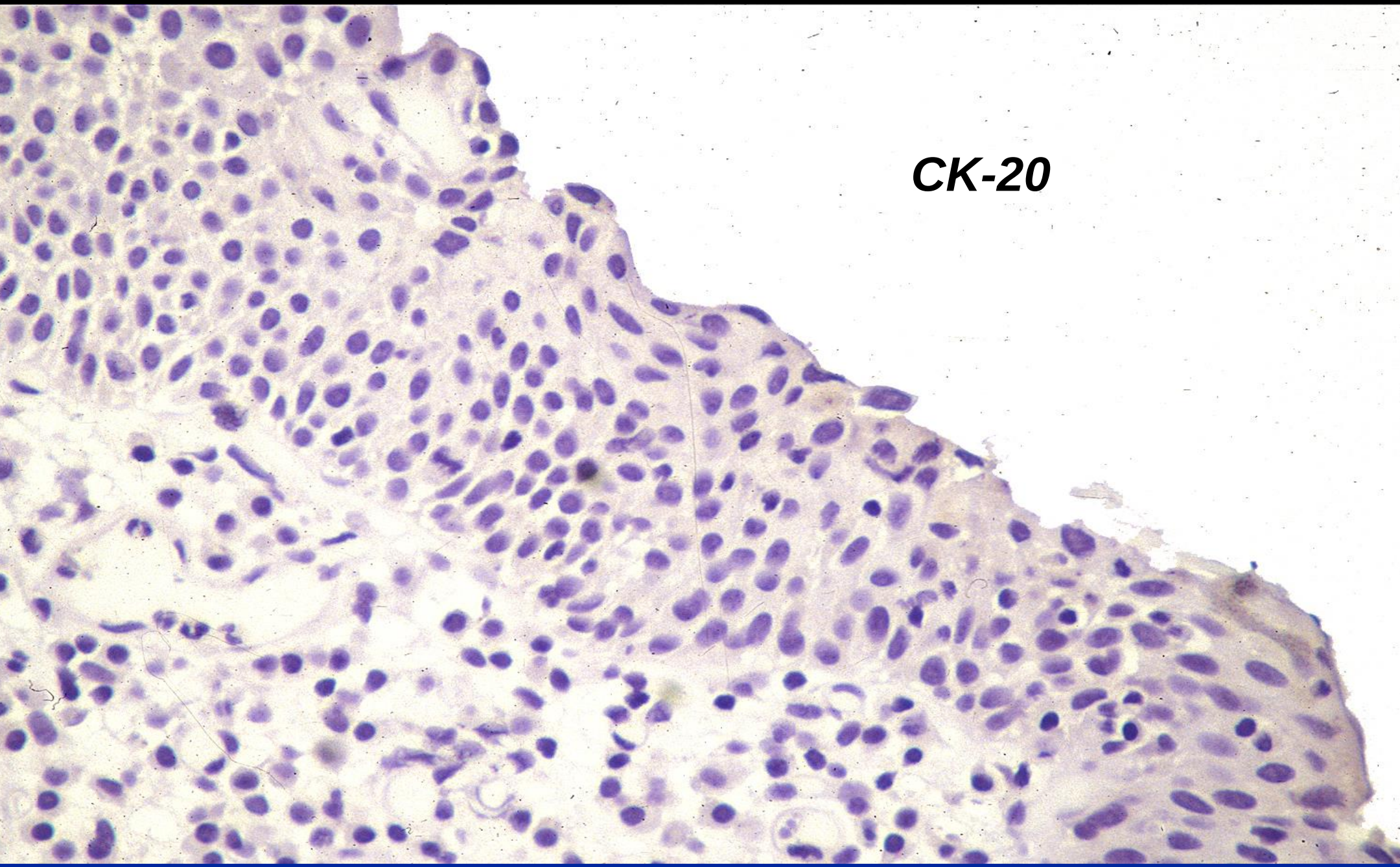
CD-44

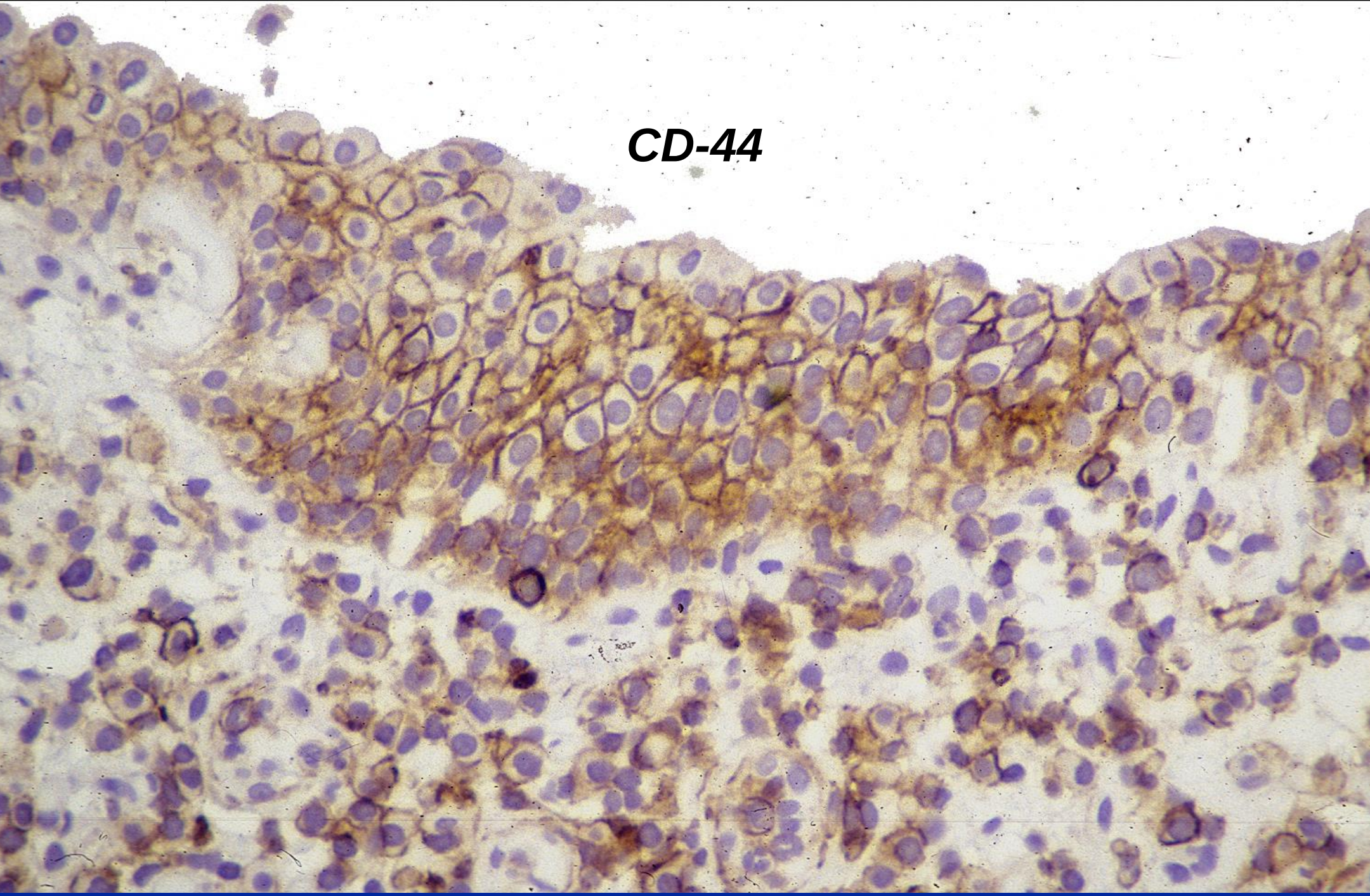


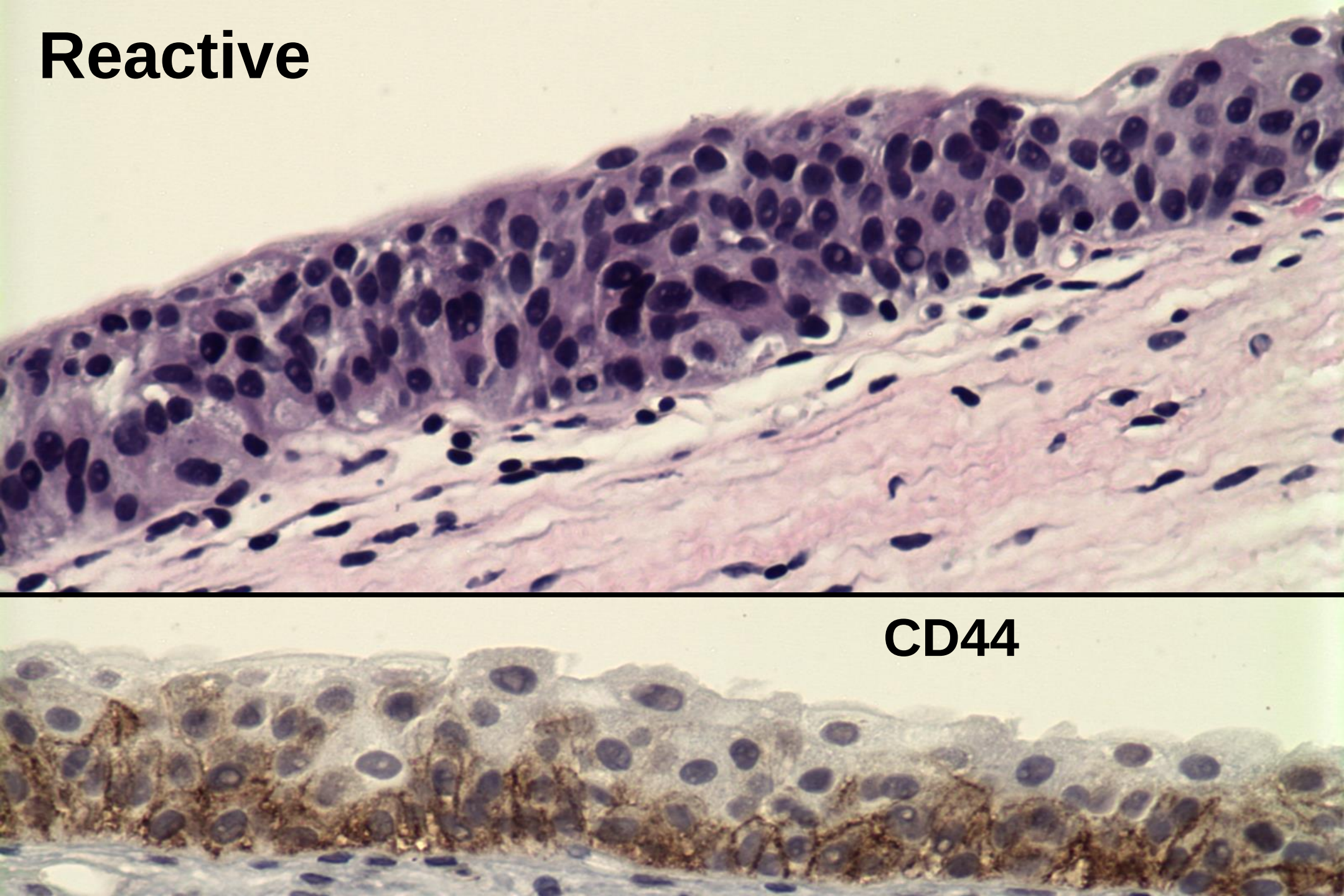
REACTIVE UROTHELIUM

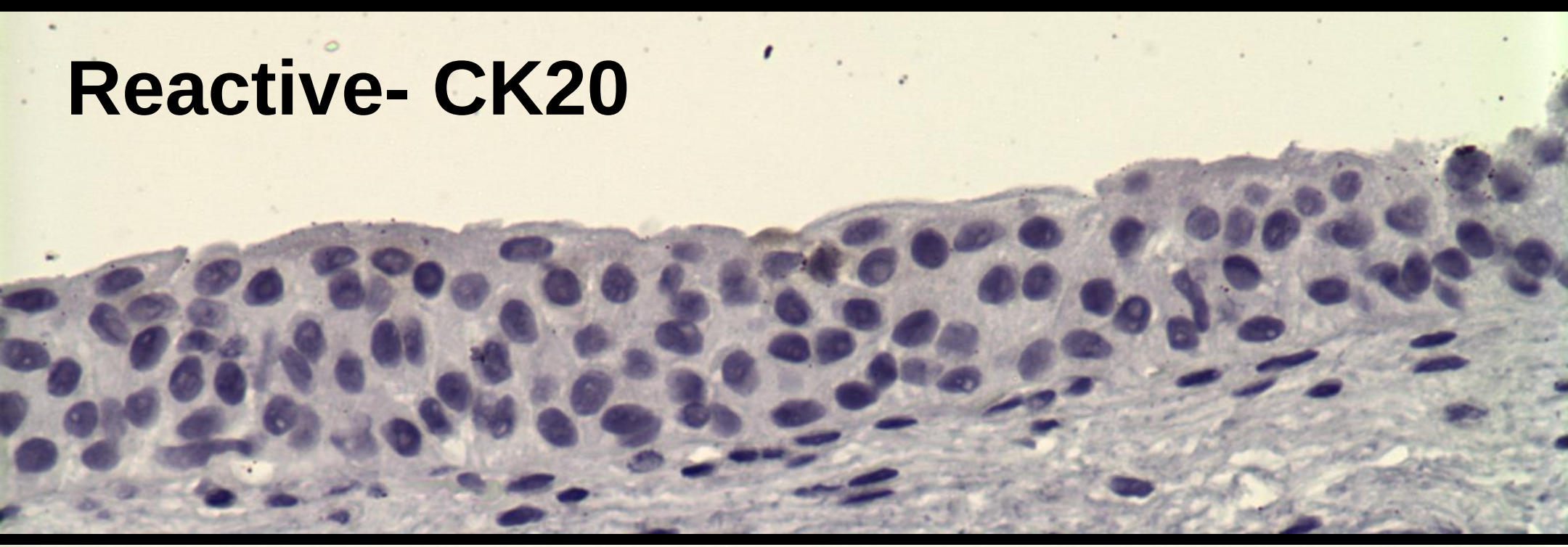


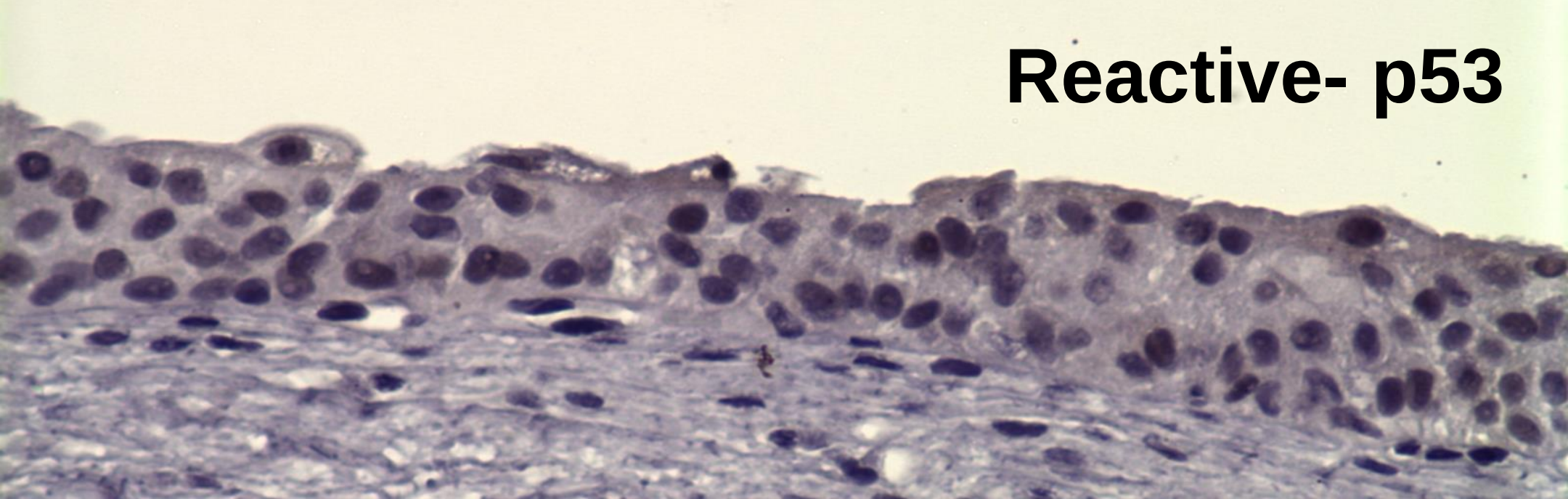

p53

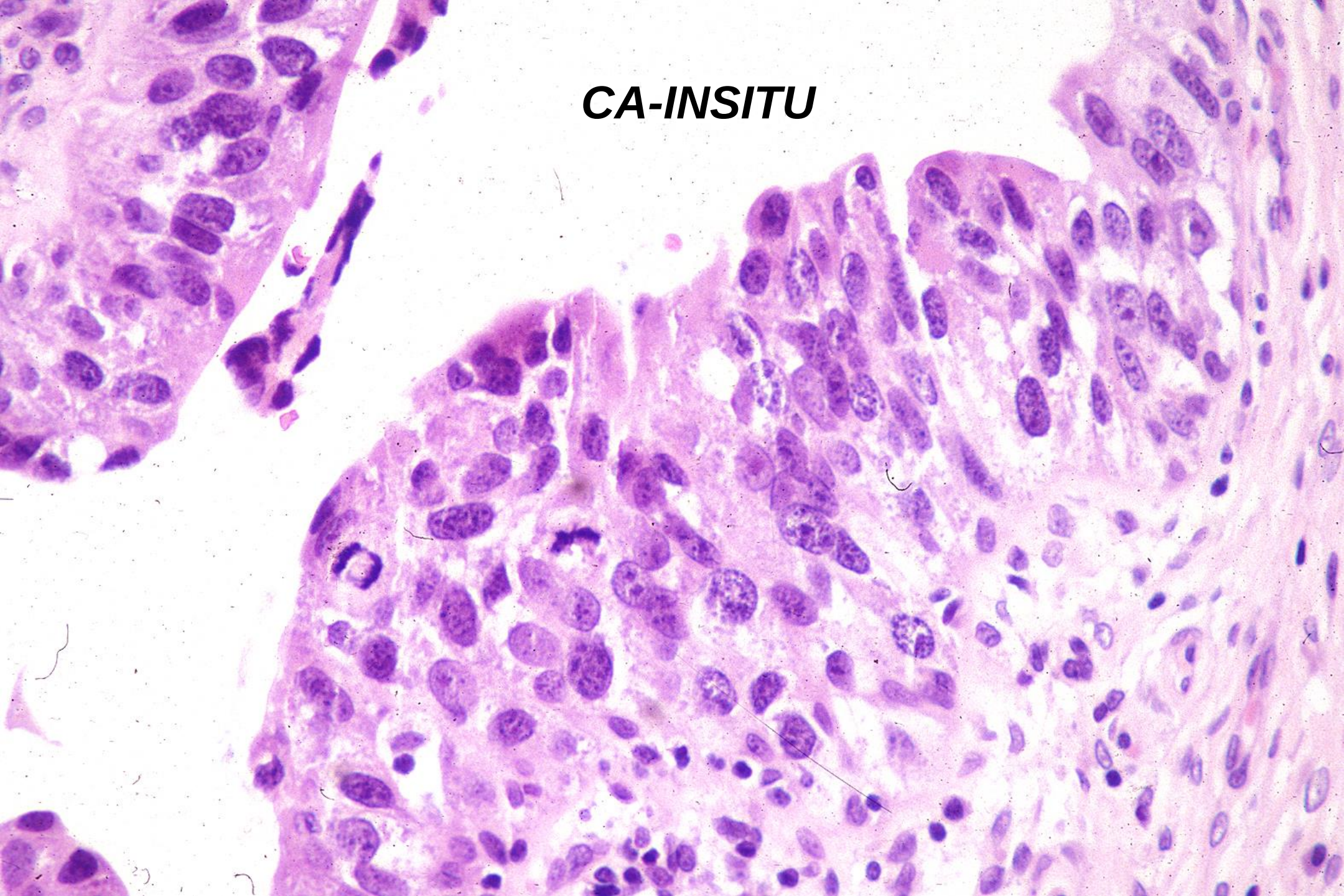

CK-20


CD-44

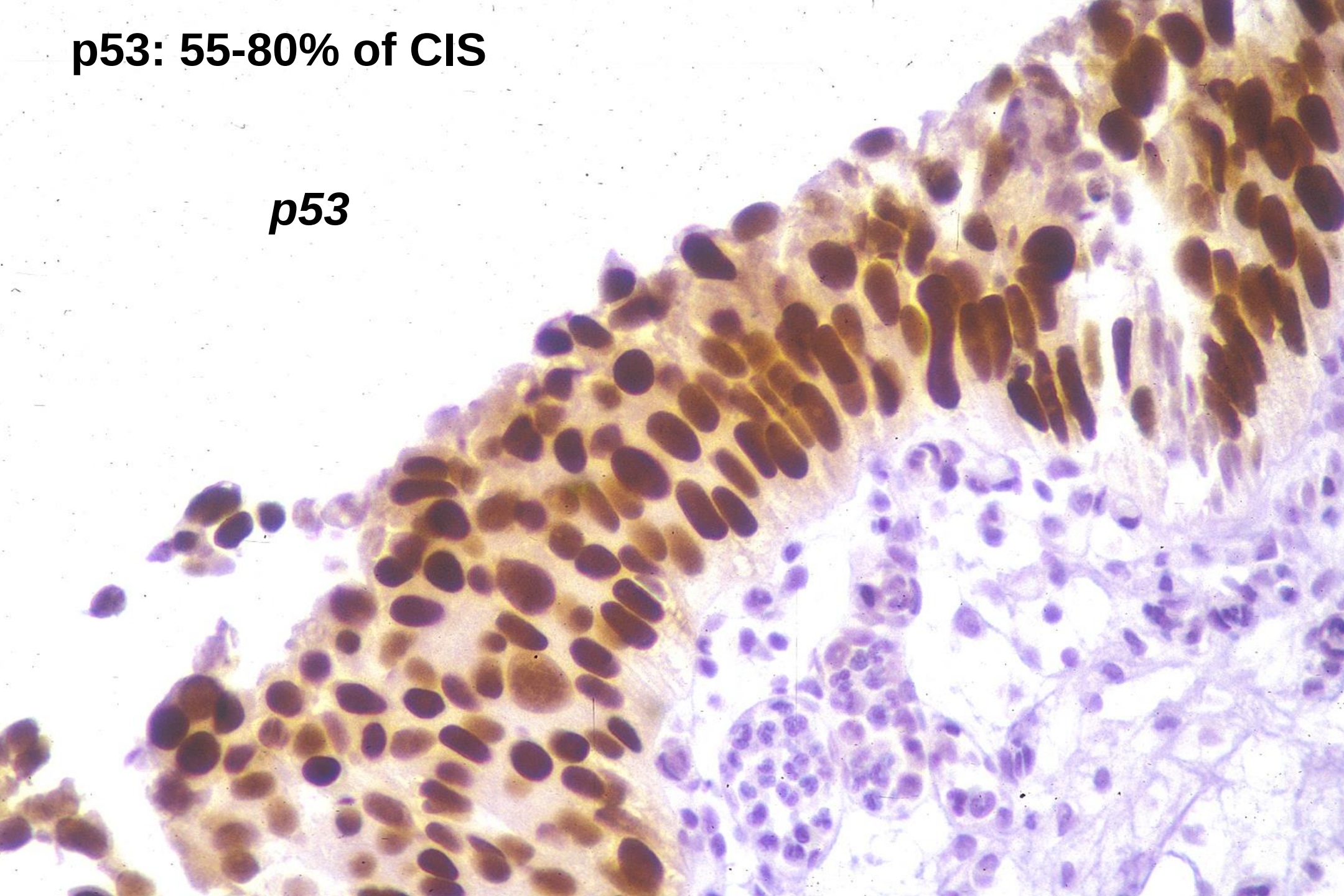

Reactive
CD44

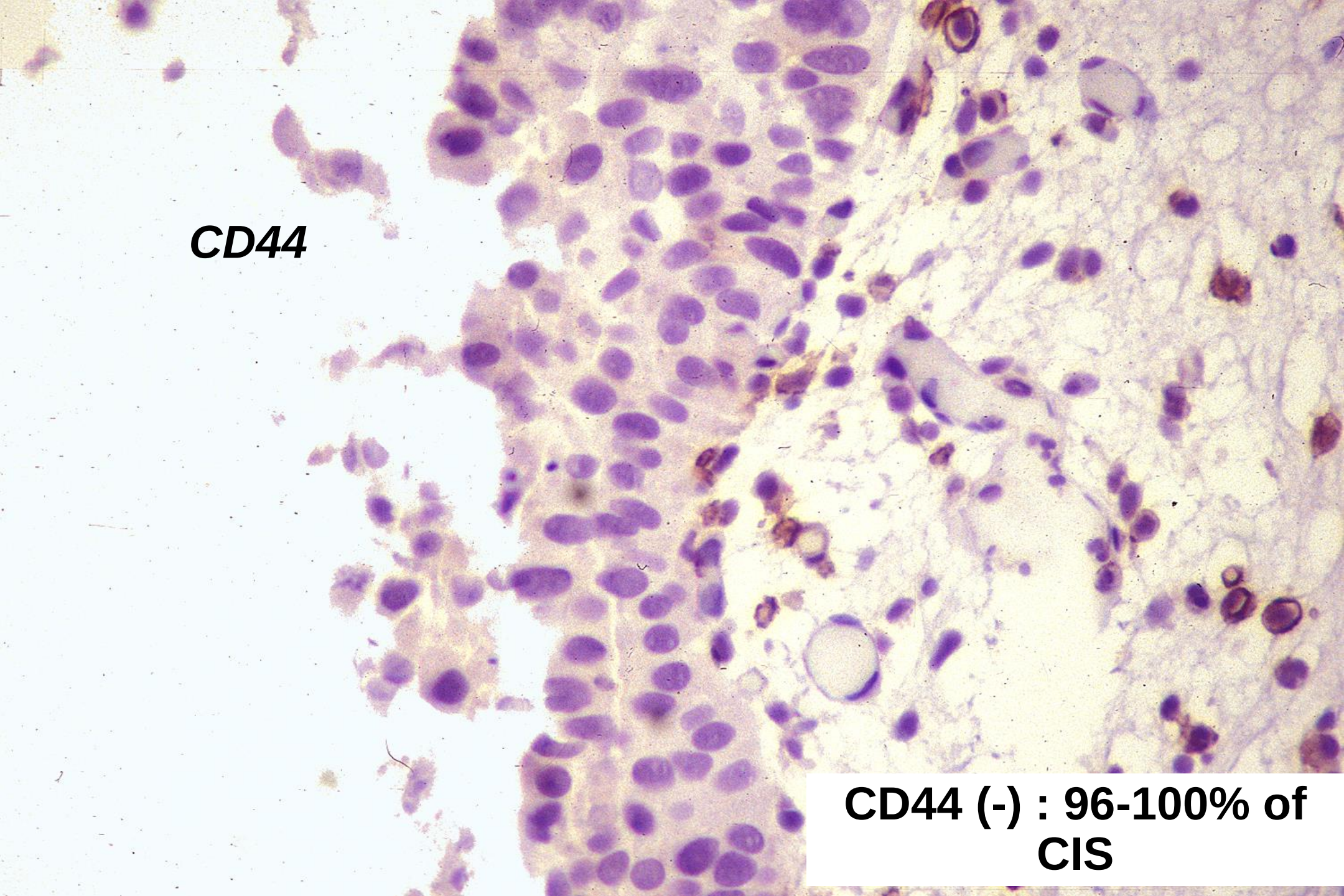

Reactive- CK20

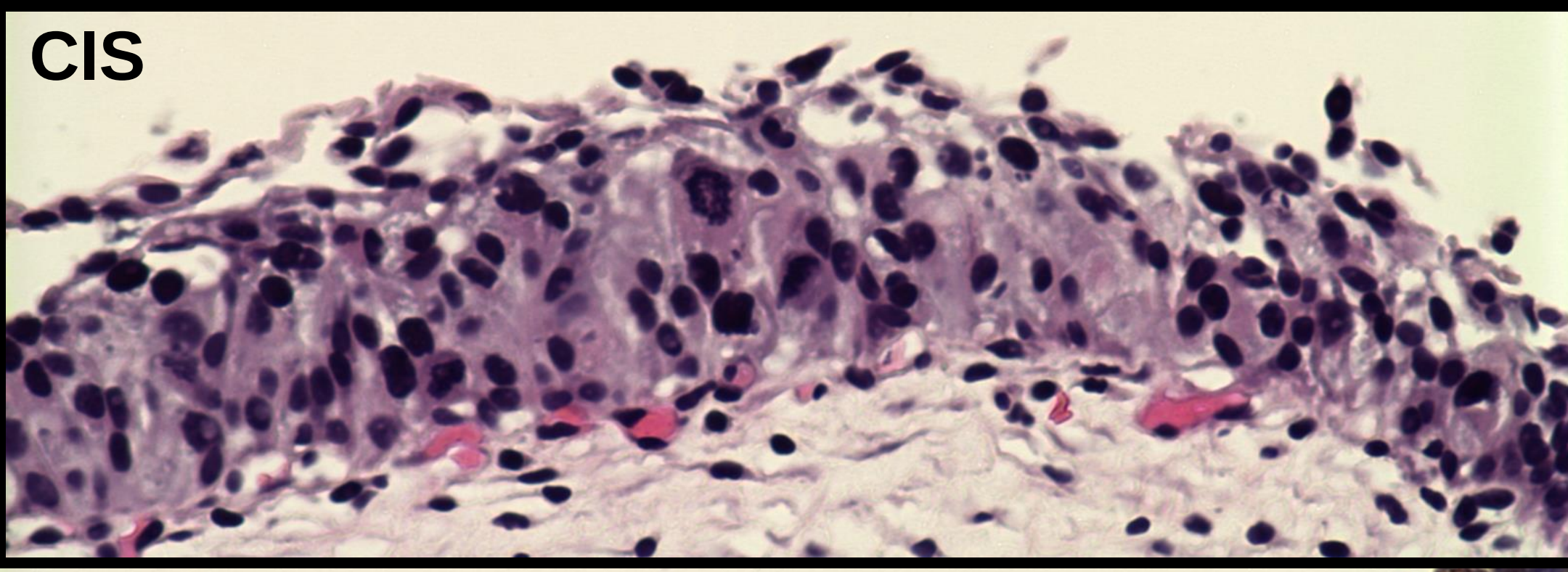

Reactive- p53

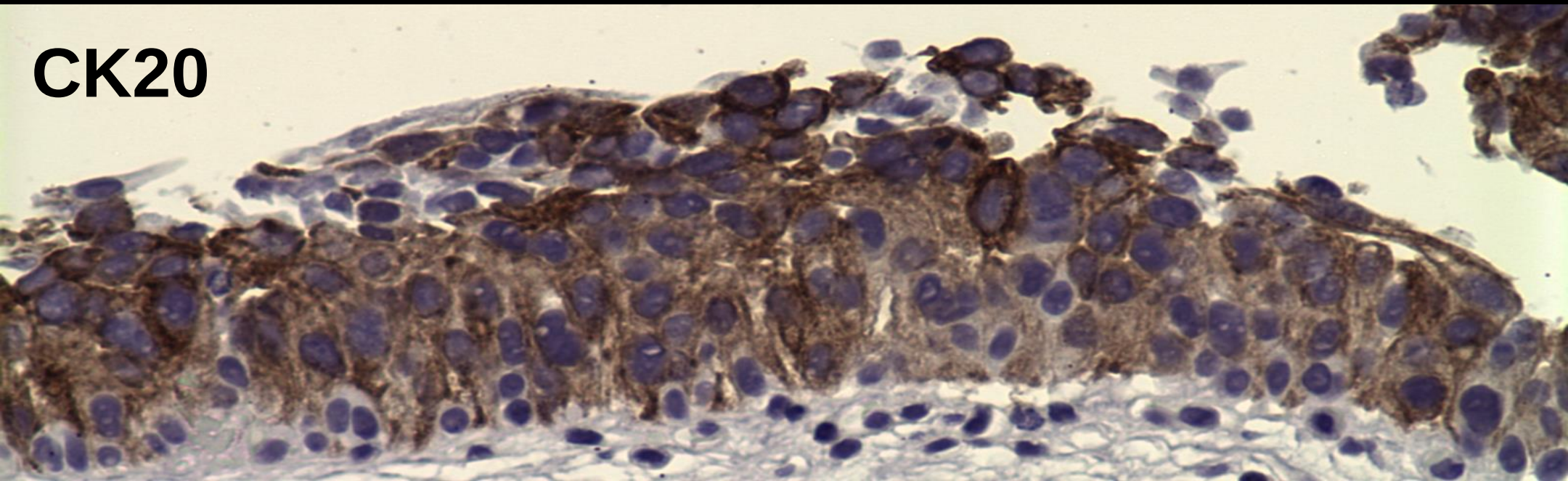

CA-INSITU

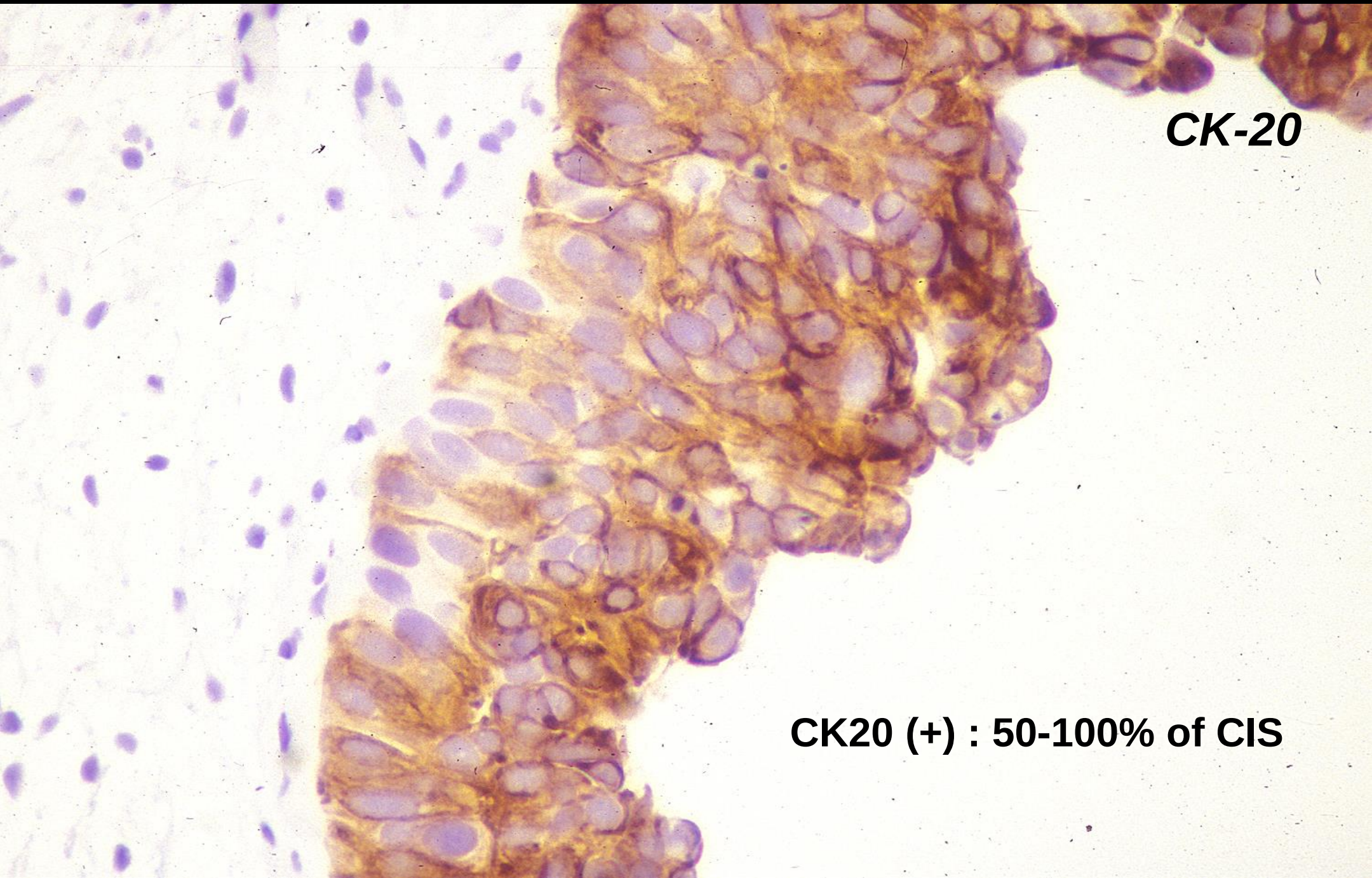
p53: 55-80% of CIS

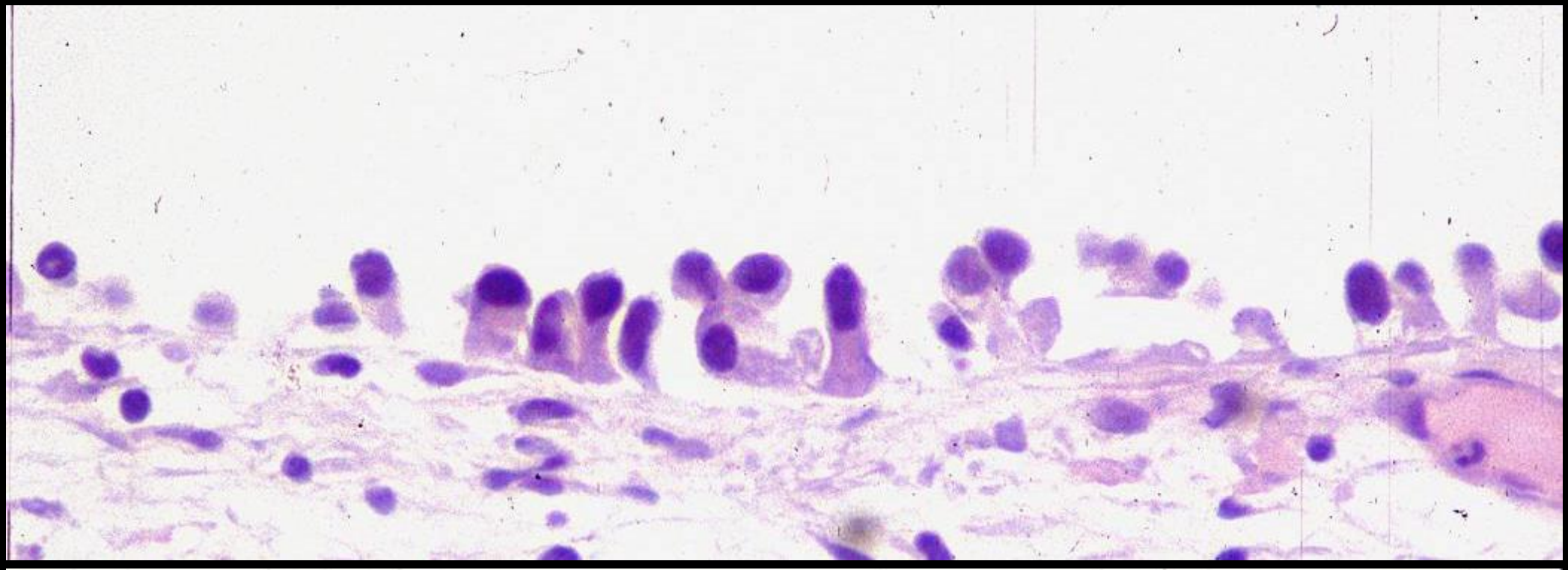


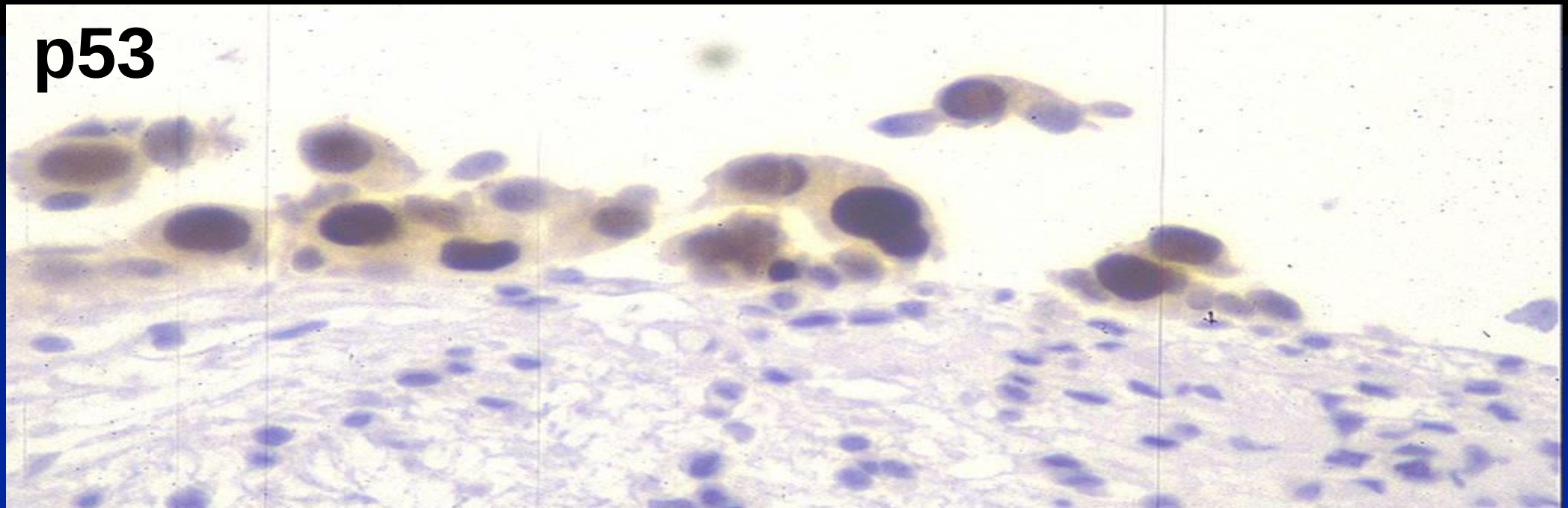

CD44
CD44 (-) : 96-100% of CIS

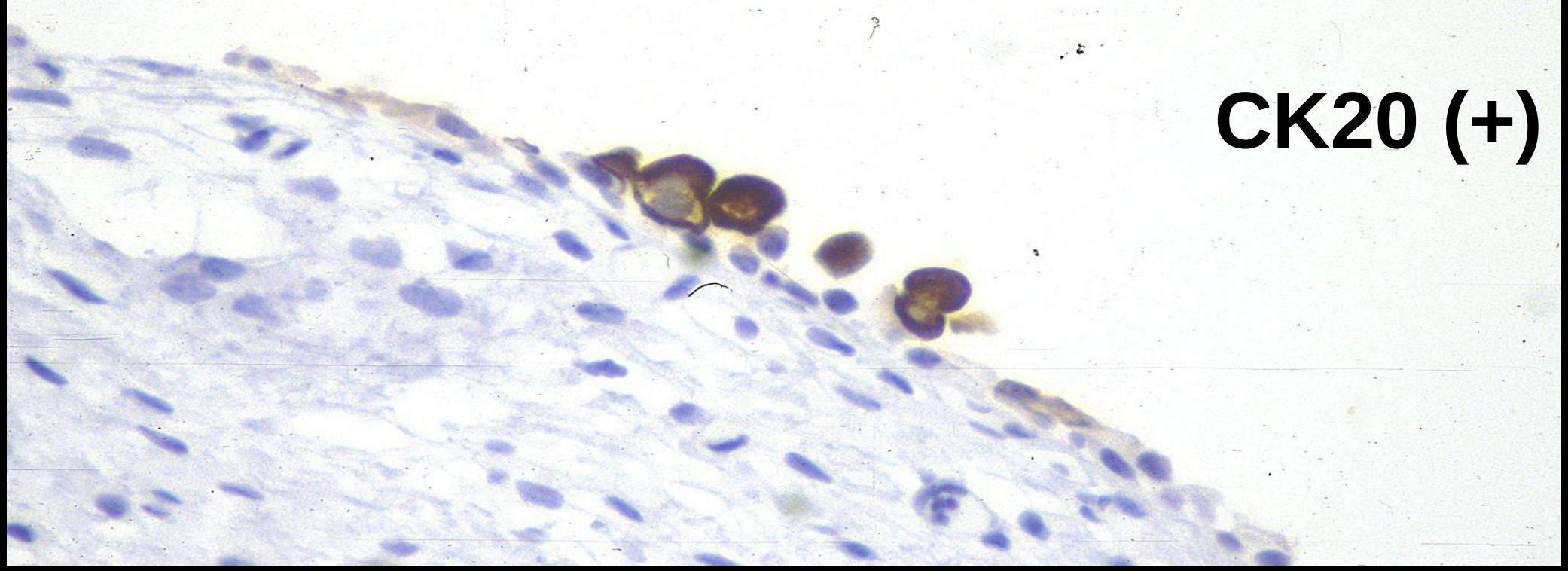

CIS

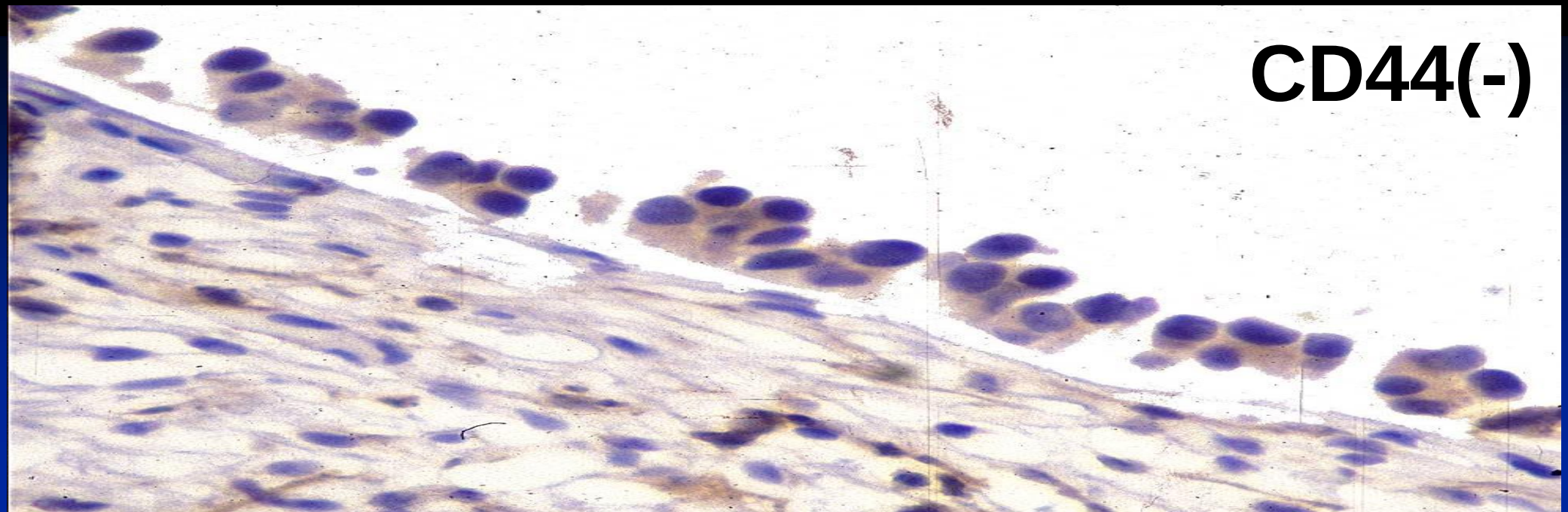

CK20

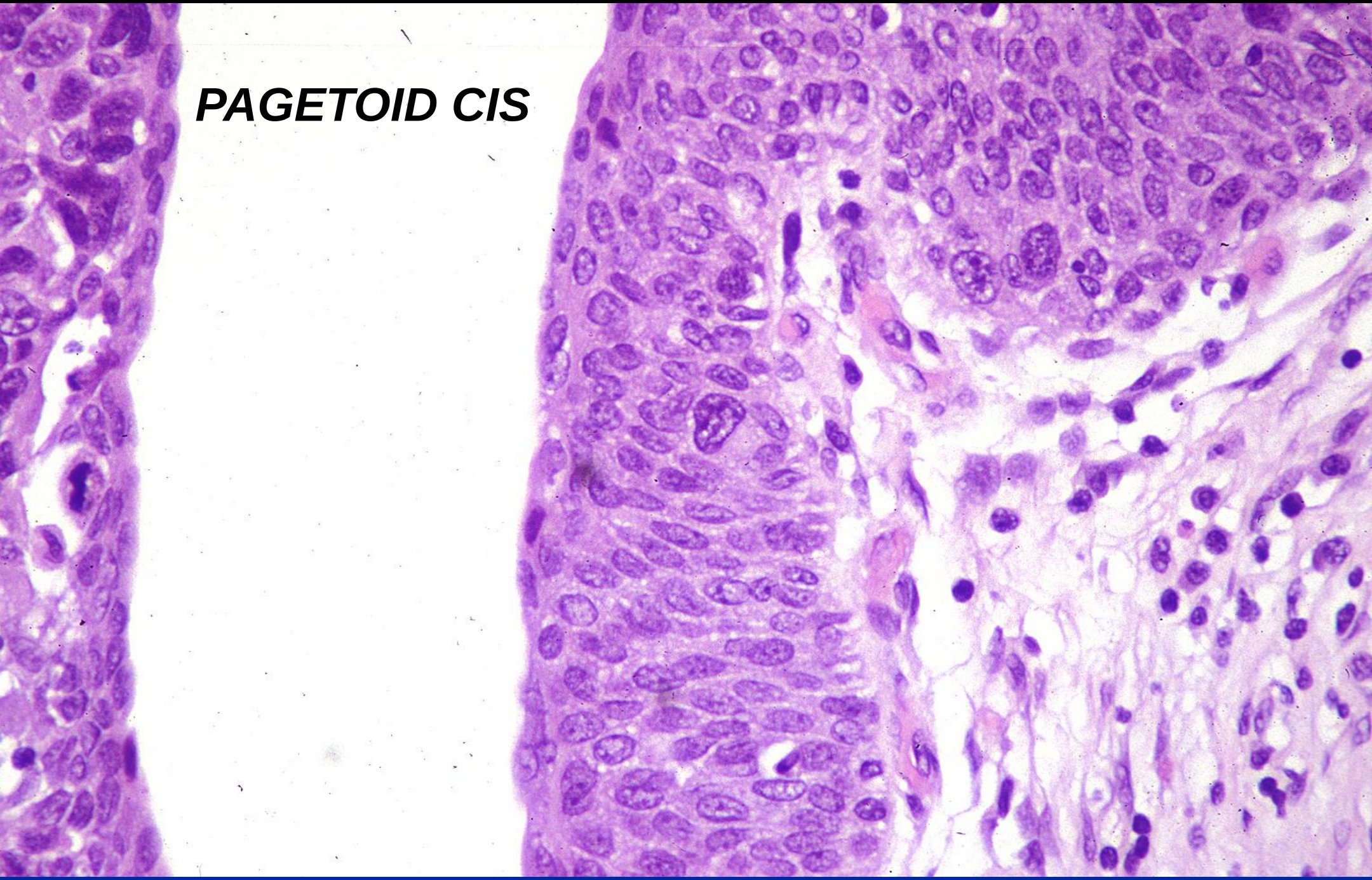

CK-20
CK20 (+) : 50-100% of CIS

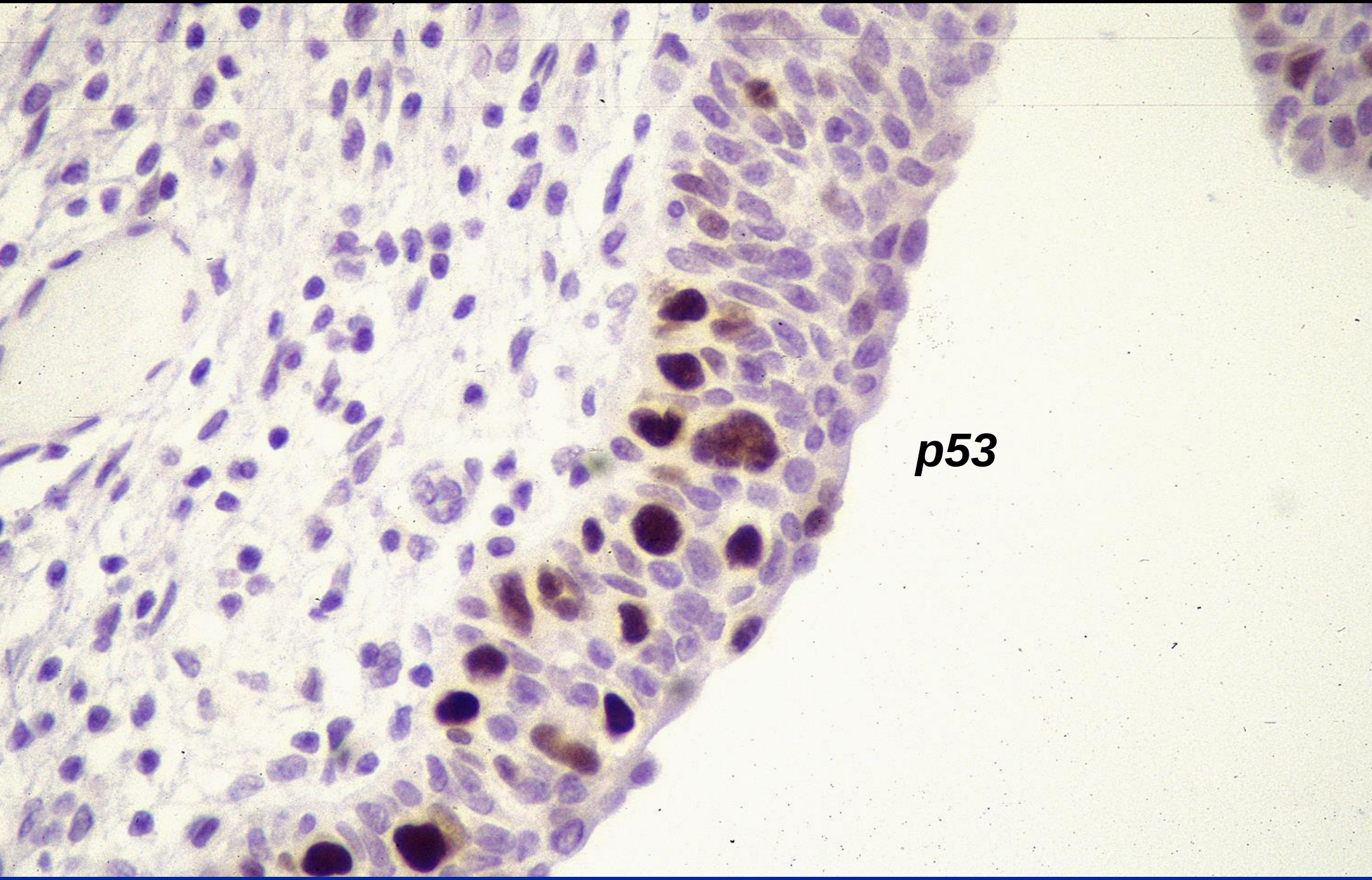



p53


CK20 (+)


CD44(-)


PAGETOID CIS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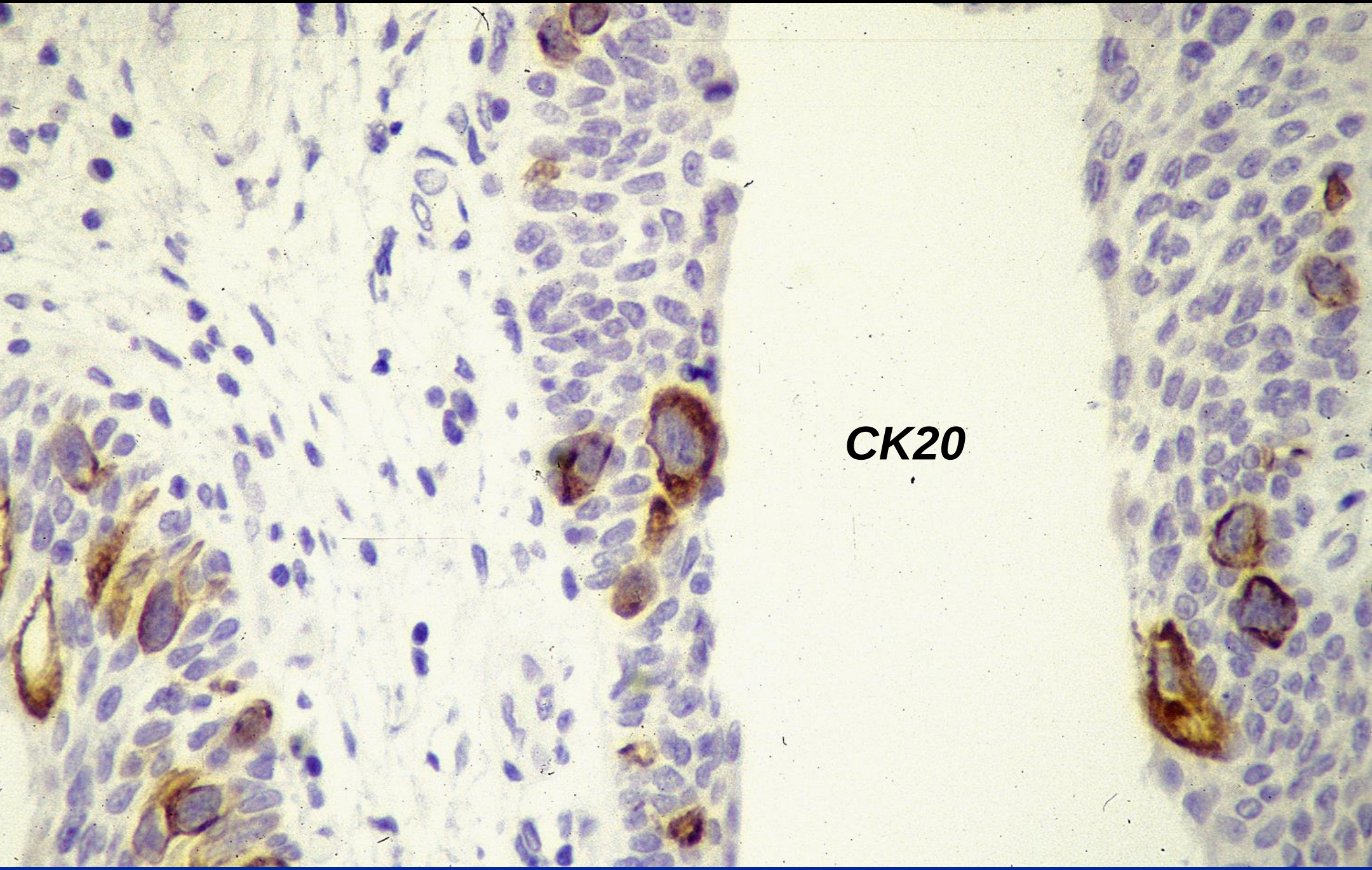
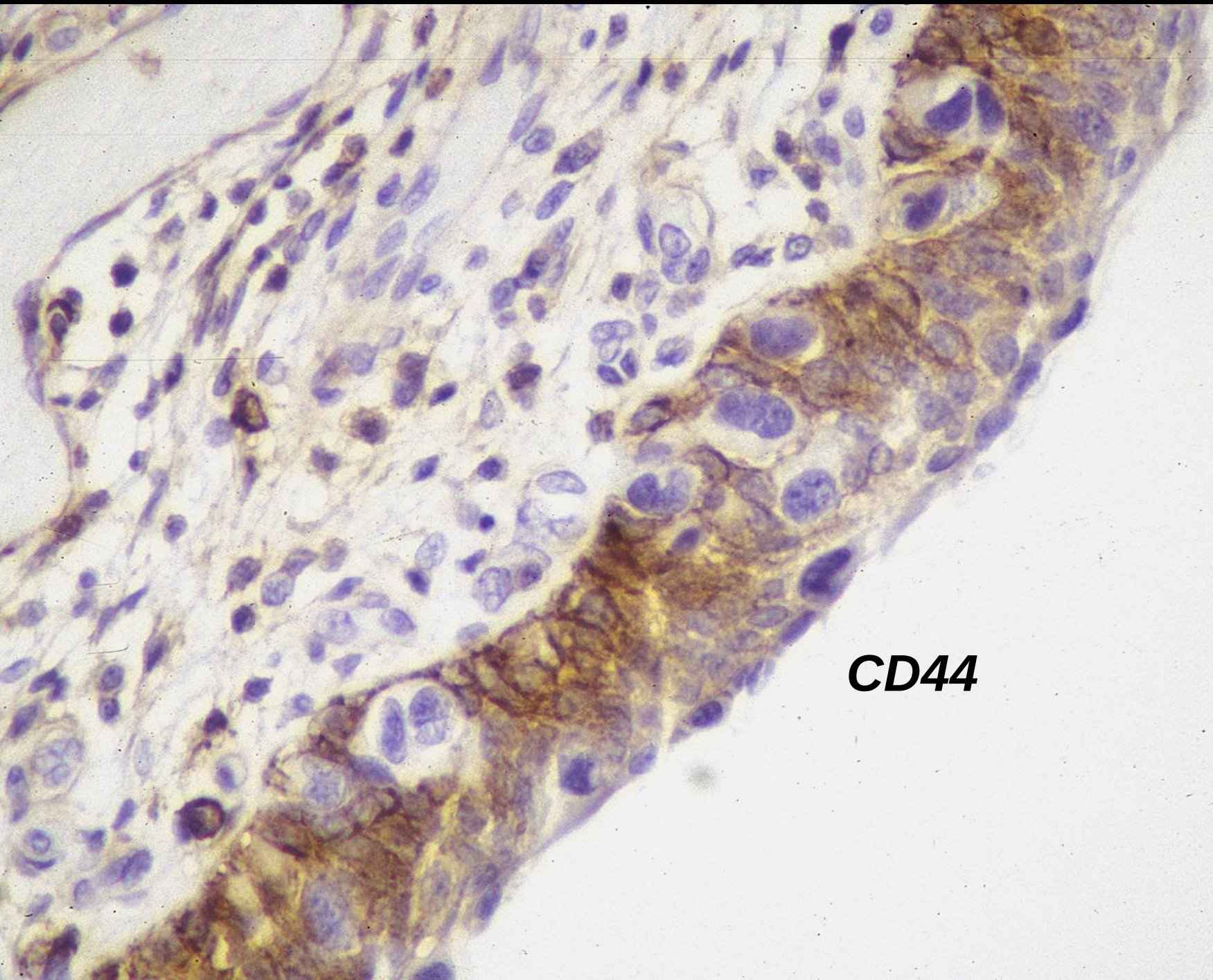

CK20


CD44

UROTHELIAL ASSOCIATED-MARKERS

Prostate vs. Urothelial Carcinoma

- Often in bladder neck specimens

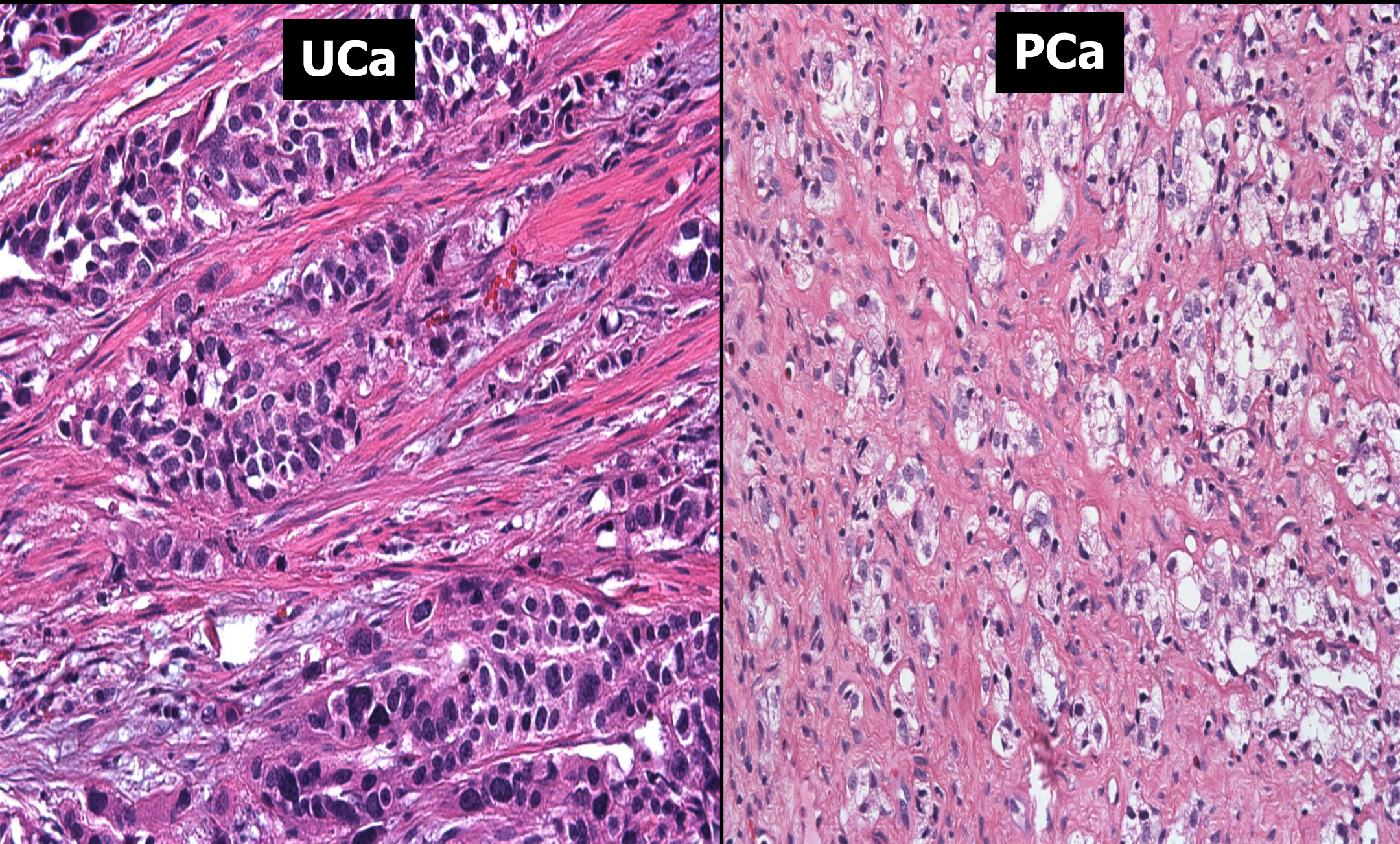
- Therapeutically critical differential

- ***PSA***
- ***PSAP***
- ***NKX3.1***
- ***Prostein (P501S)***
- ***ERG-TMPRSS2***
- ***PSMA***

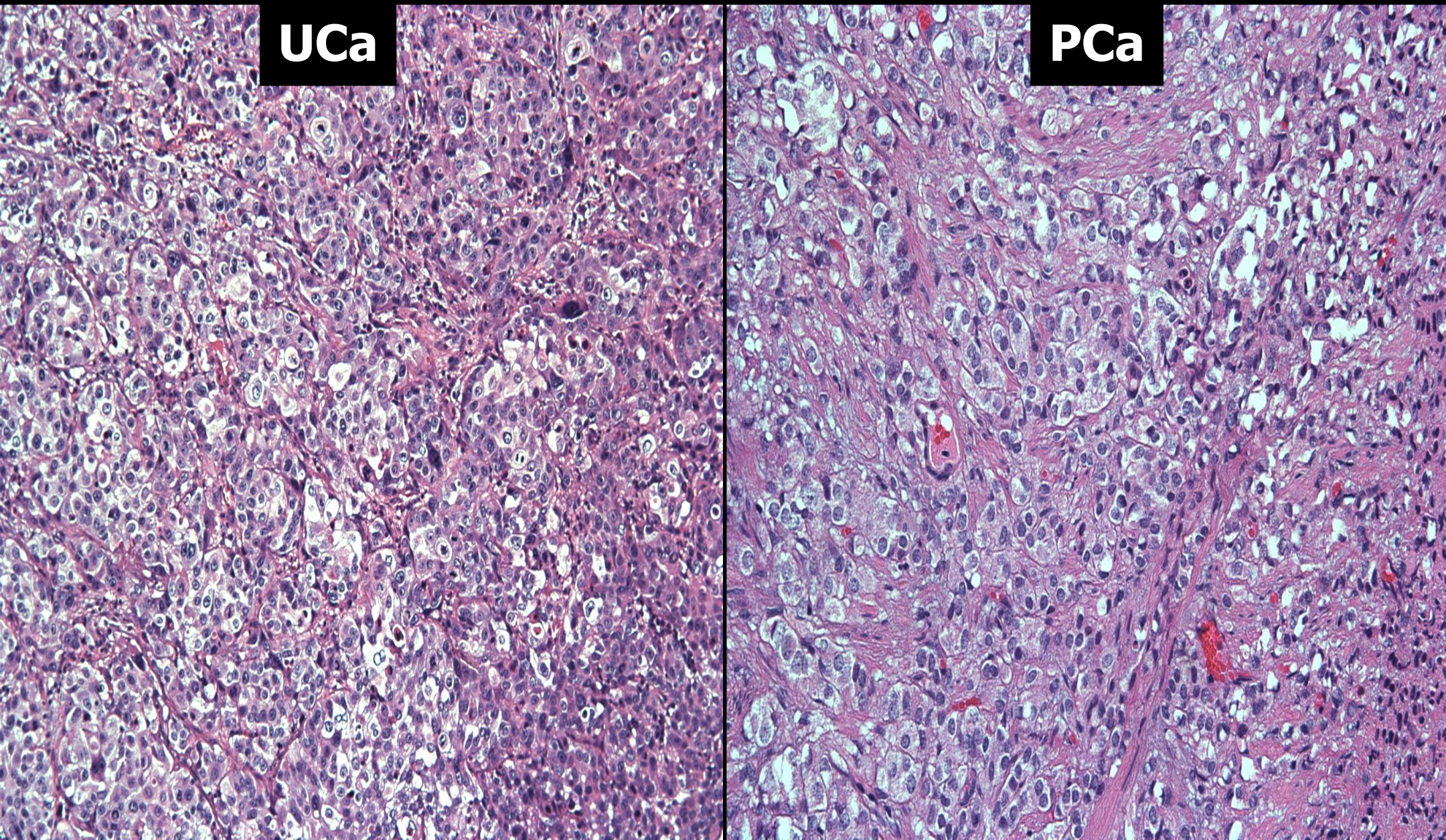
- **CK20**
- **P63 or MWCK**
- ***GATA3***
- ***Uroplakin 2***
- ***S100p***
- ***Uroplakin 3***

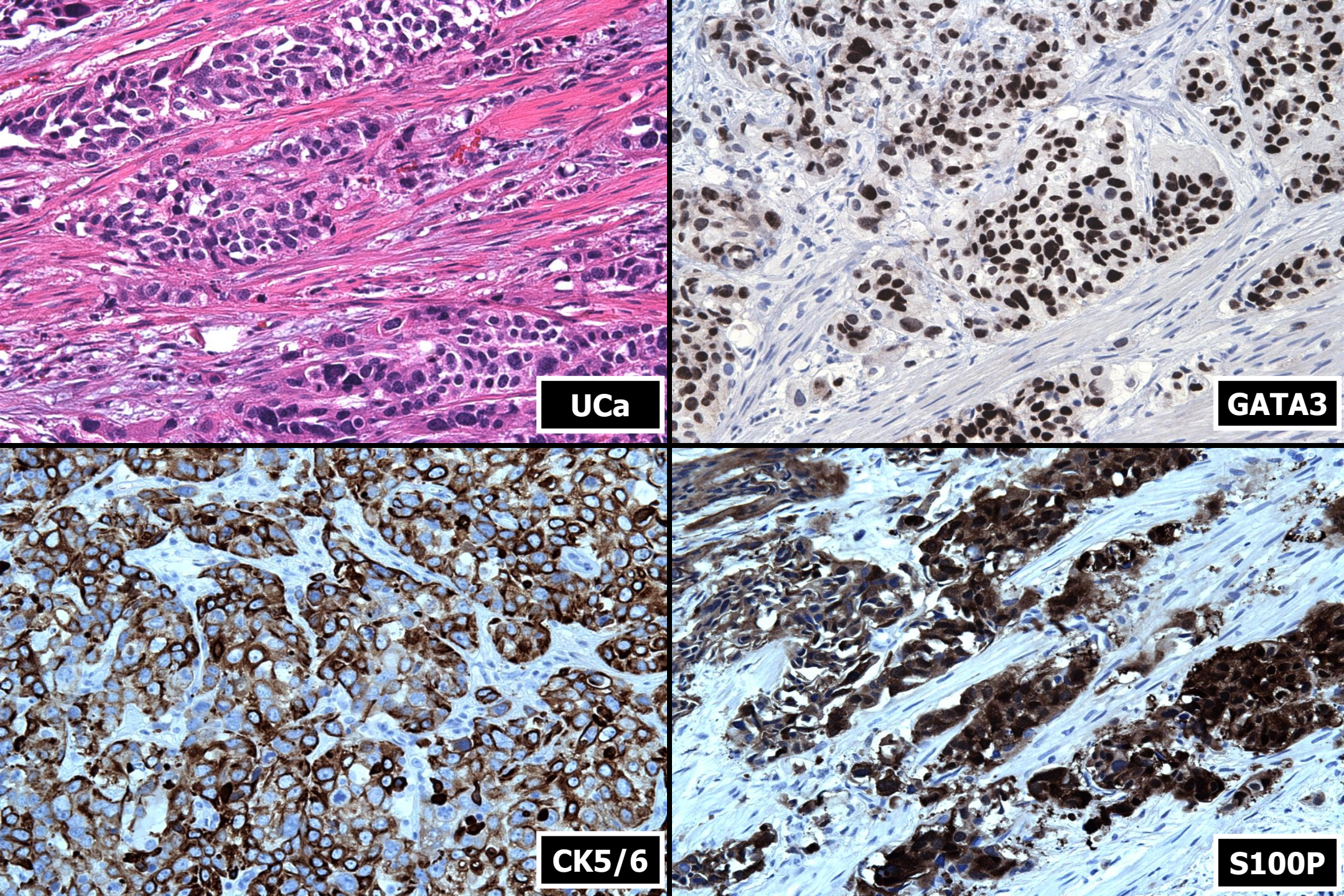
CAUTION: Both may coexist!

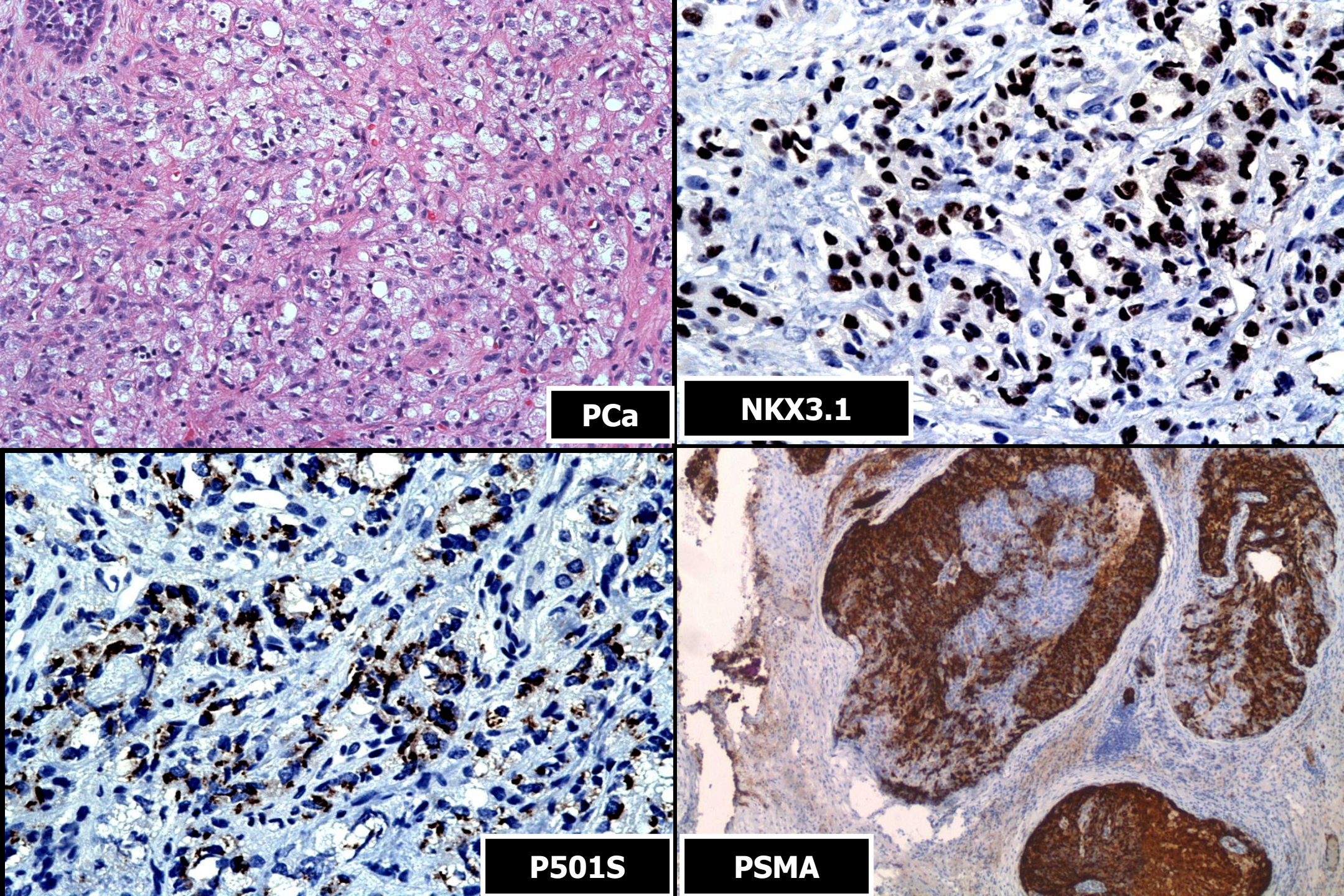
?Urothelial Carcinoma vs. ?Prostatic Carcinoma

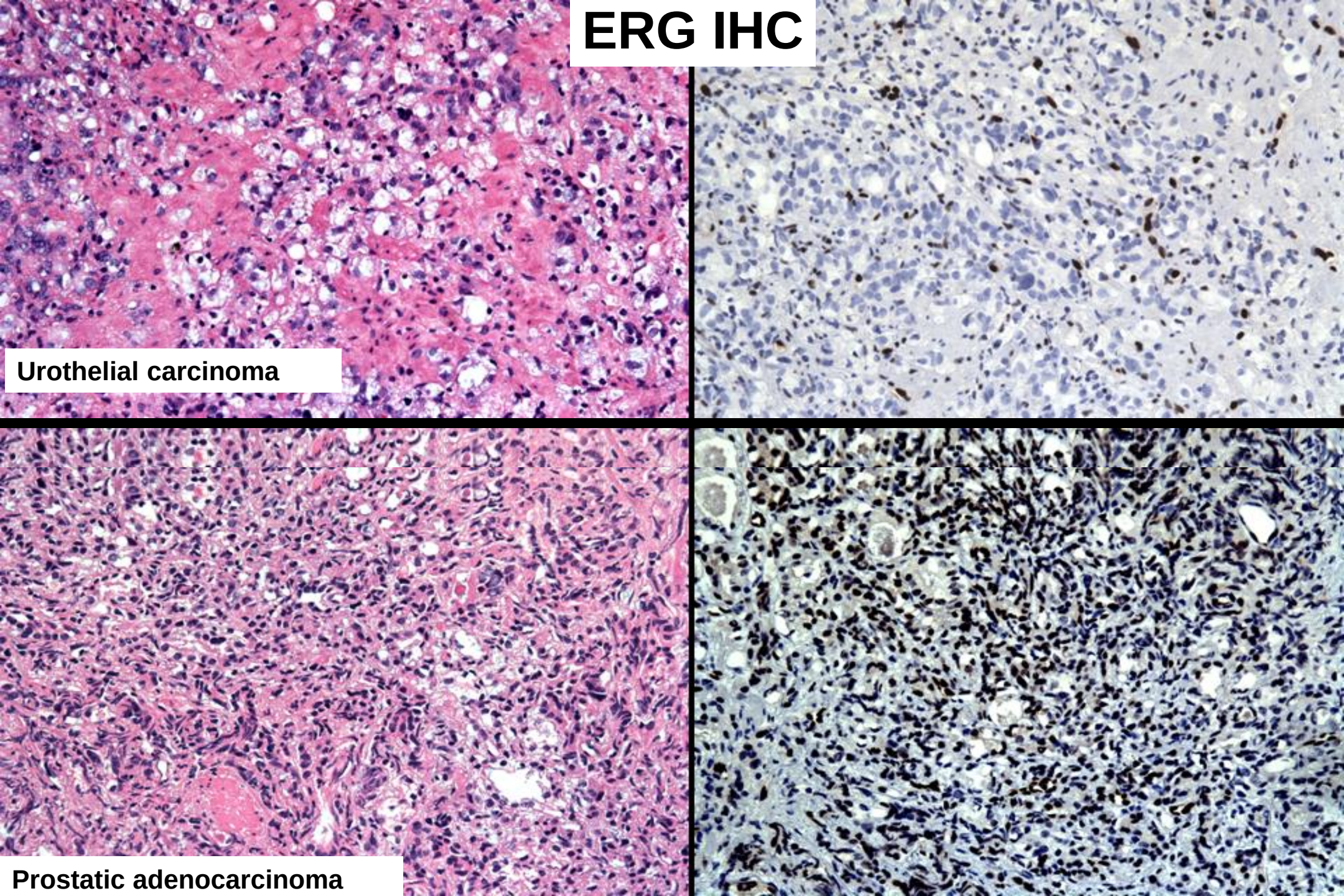


?Urothelial Carcinoma vs. ?Prostatic Carcinoma

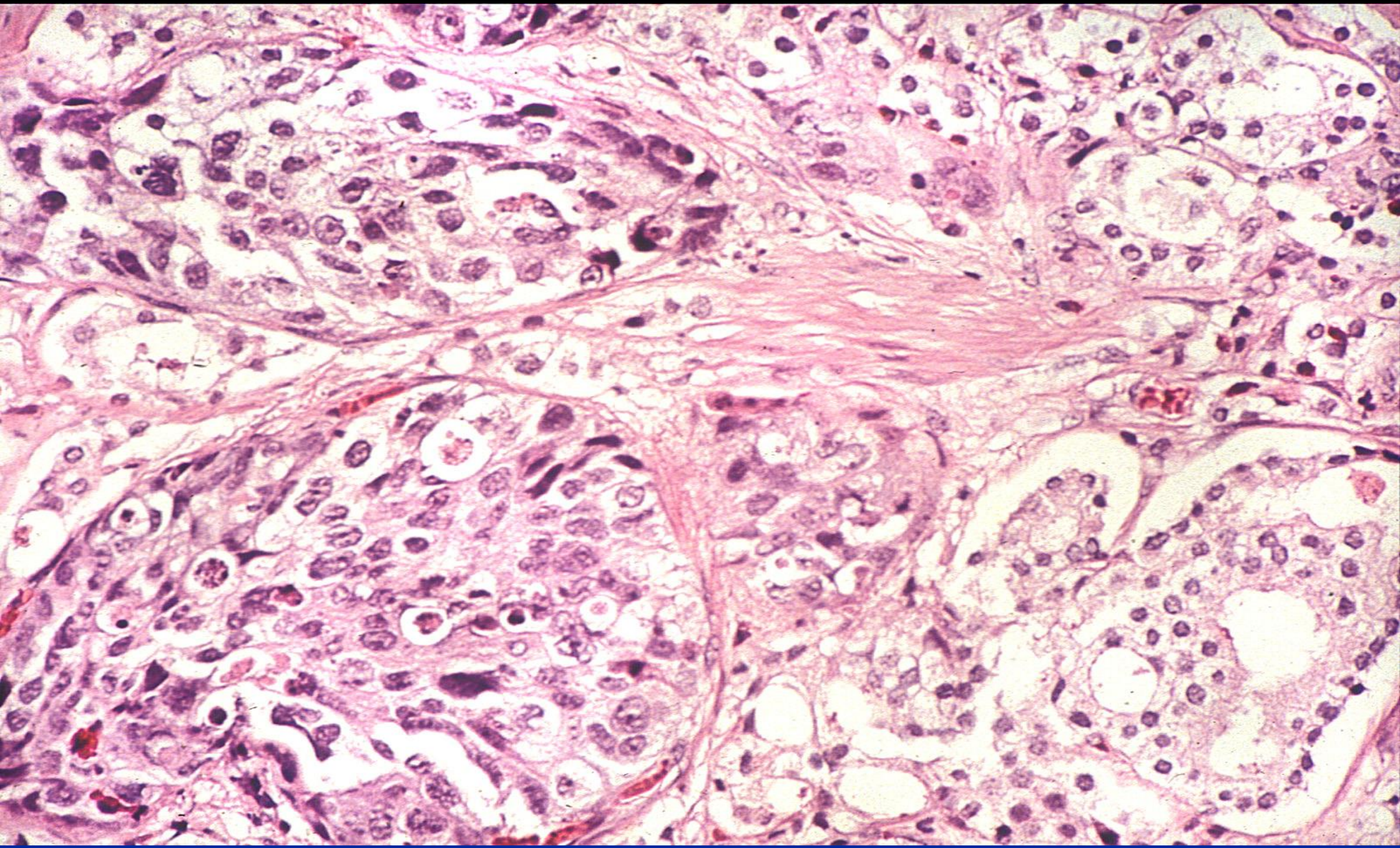



UCa
GATA3
CK5/6
S100P


PCa
NKX3.1
P501S
PSMA


ERG IHC
Urothelial carcinoma
Prostatic adenocarcinoma

Concurrent PCa & UCa

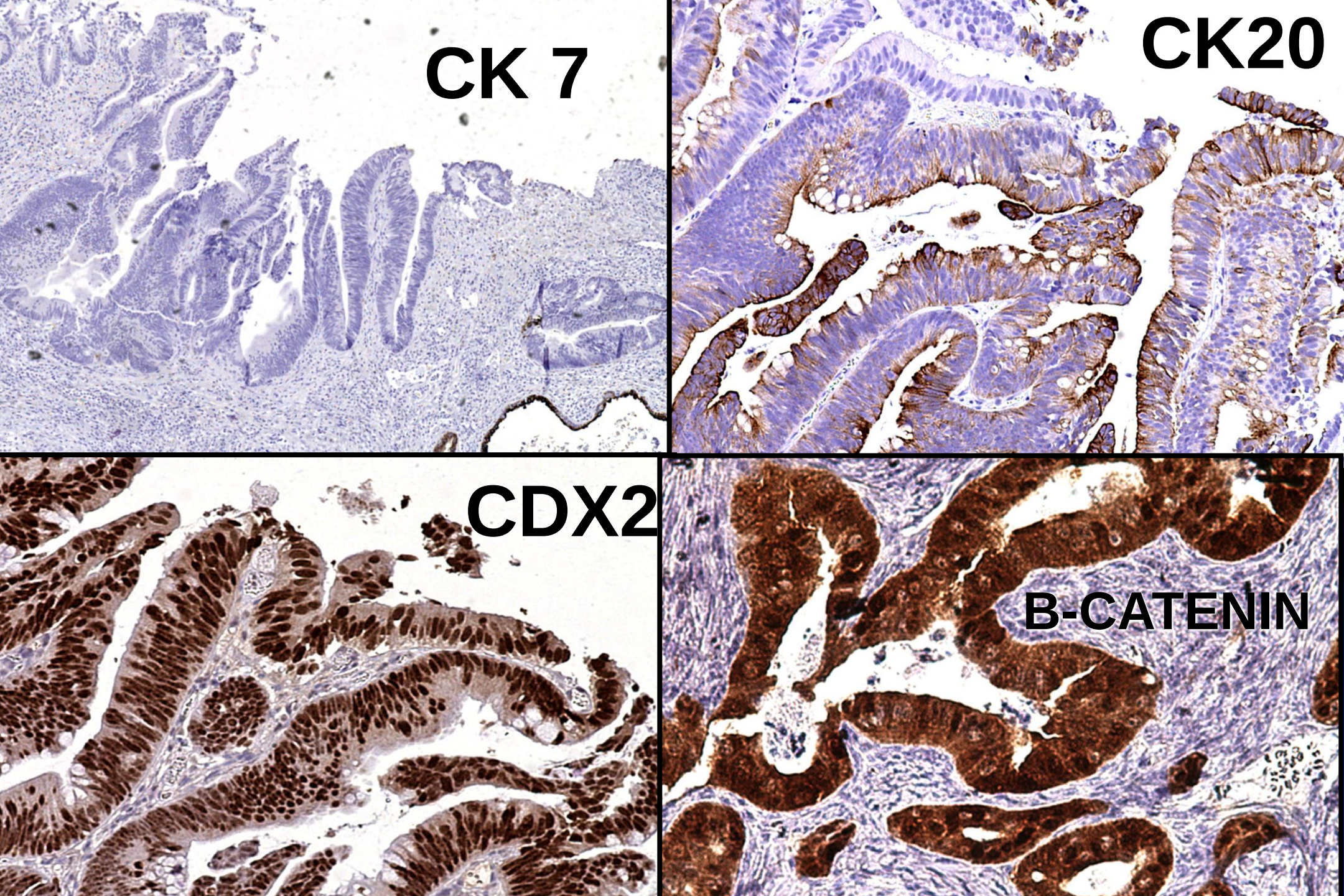


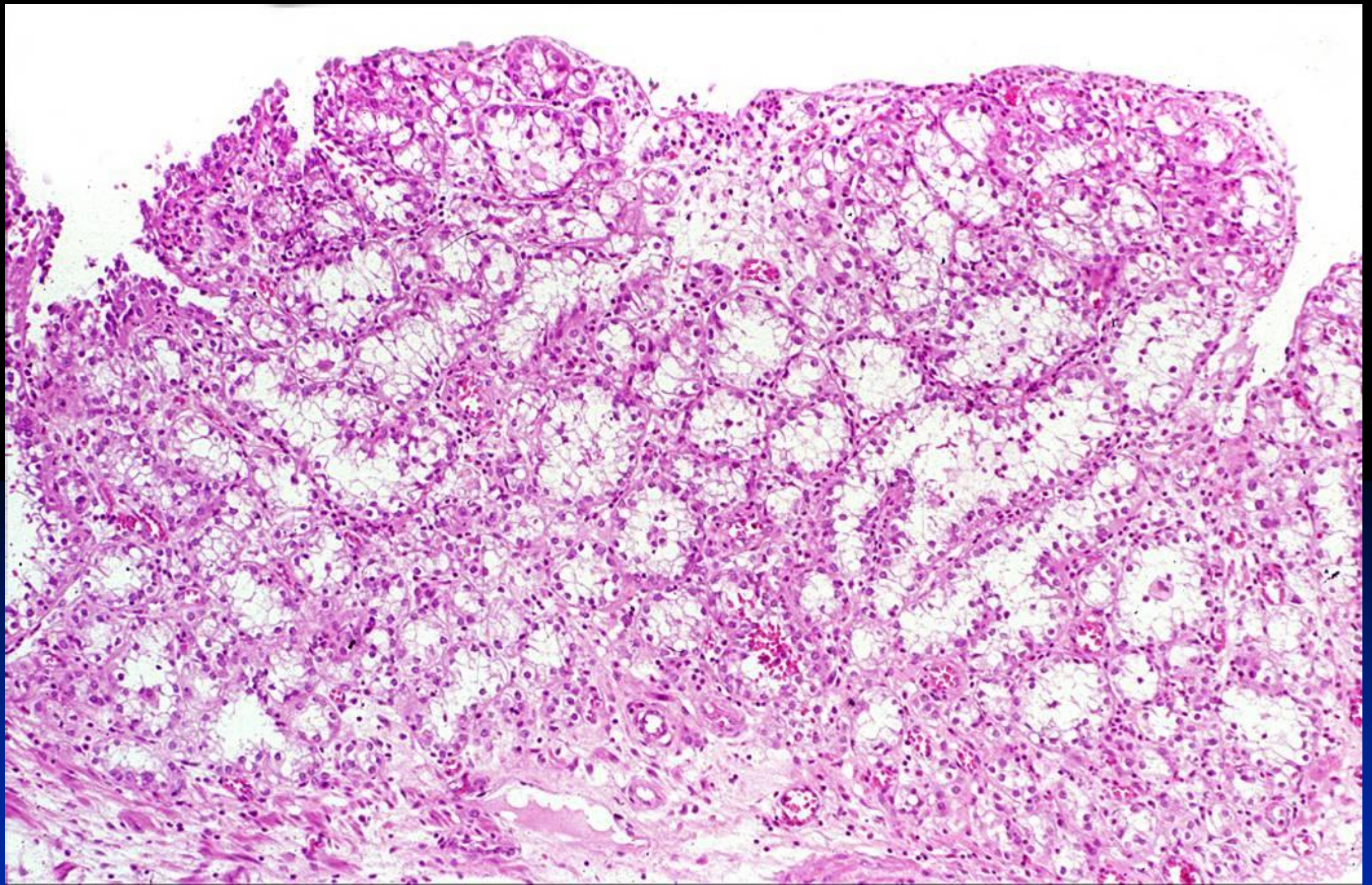
METASTATIC ADENOCARCINOMA TO THE BLADDER

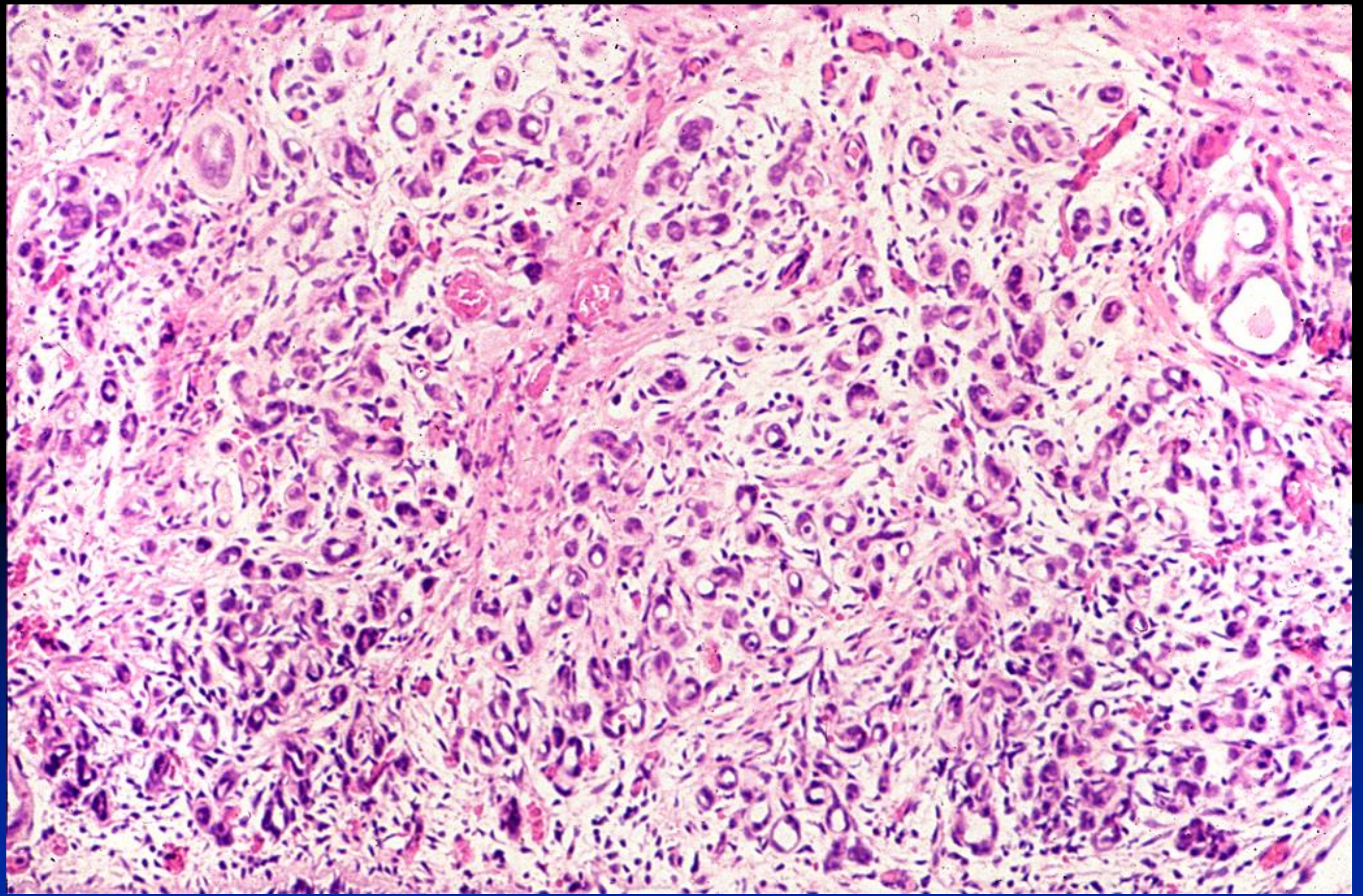
Virtually any tumor from the body can spread to the bladder on occasion. Problem areas:

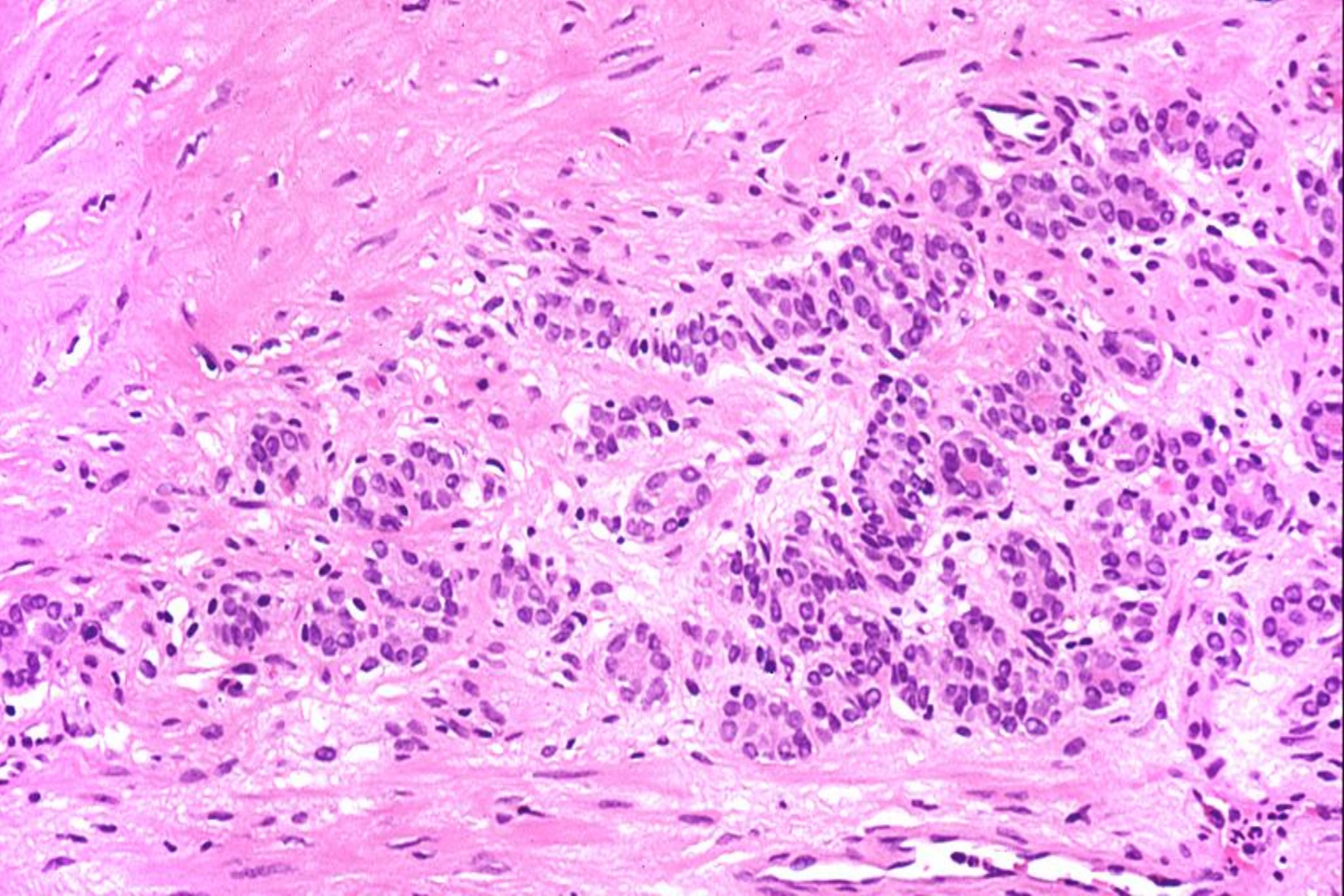
Enteric morphology: Colon and appendiceal primary vs. bladder primary

- **Morphologically identical**
- **May have a surface well-differentiated "villous adenoma" surface component**
- **Helpful features: - Clinical history of high-stage colon cancer**
  - **Absence of intestinal metaplasia**
- **Immunohistochemistry (CK7, CK20, CDX2) not helpful (β-catenin, nuclear positivity, limited role)**


CK 7
CK20
CDX2
B-CATENIN







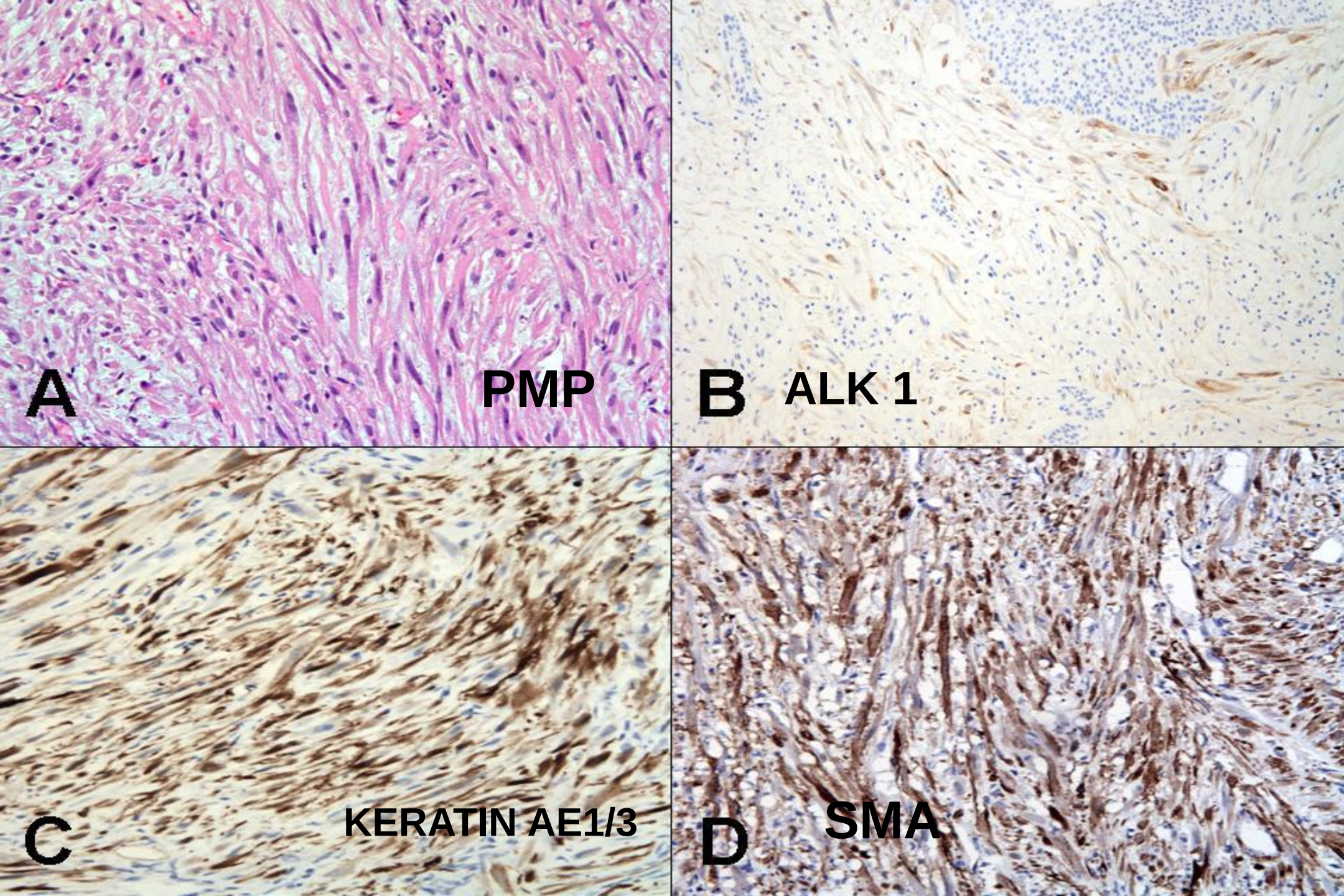
	Nephrogenic adenoma	Clear cell adenoCa of bladder	Urothelial Ca with glandular morphology	Prostatic adenoCa
Pax2/8	**90%**	**10-20%**	**0%**	**0%**
AMACR	**100%**	**75%**	**Frequently positive**	**70-100%**
S100A1	**94%**	**10%**	**0%**	**0%**
Ki67 % + nuclei	**2-5%**	**40-50%**	**30-40%**	**2-25%**
PSA	**0 -2%**	**0**	**0**	**70-100%**

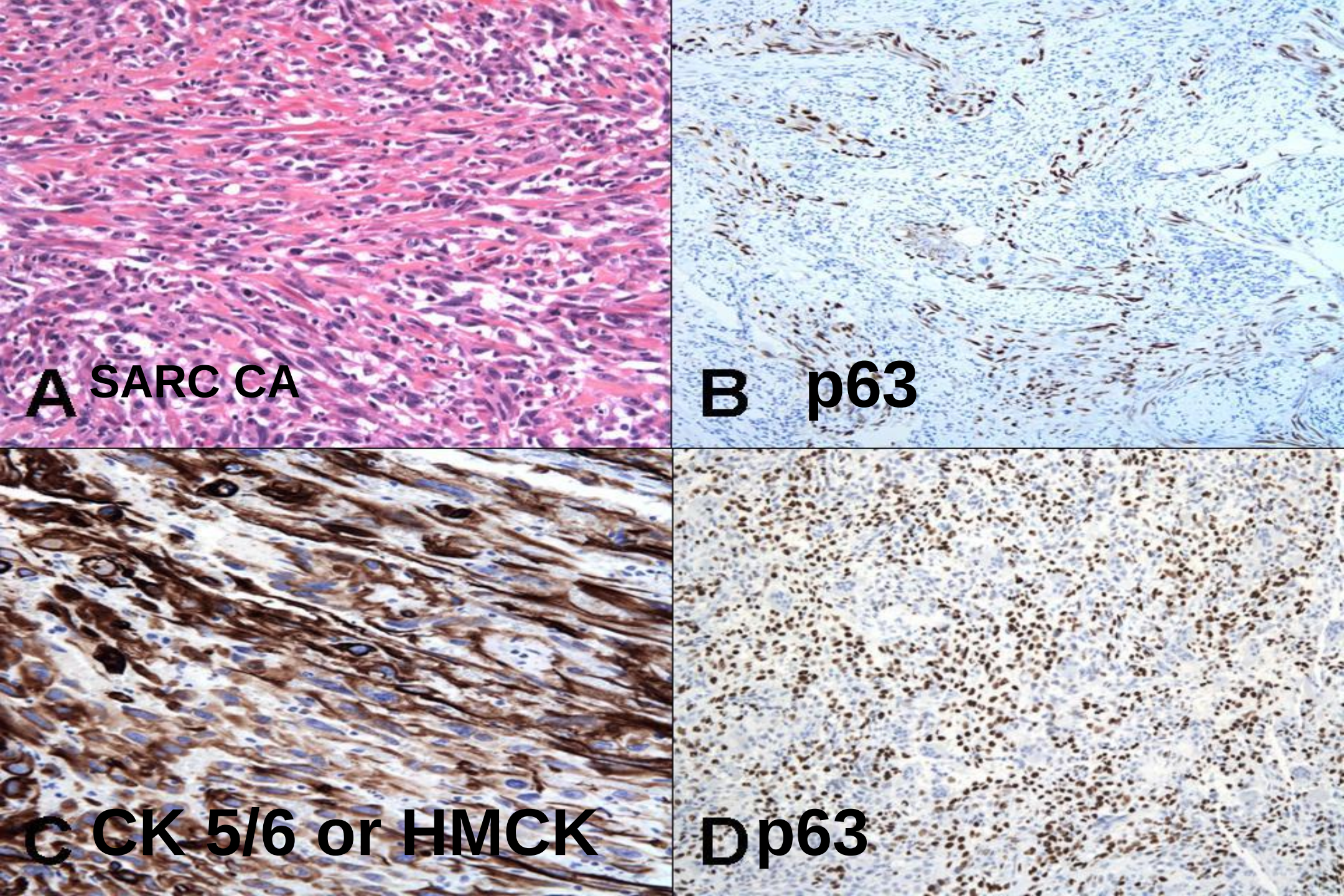
Spindle cell lesions

Benign (PMP) vs. Malignant - H&E diagnosis

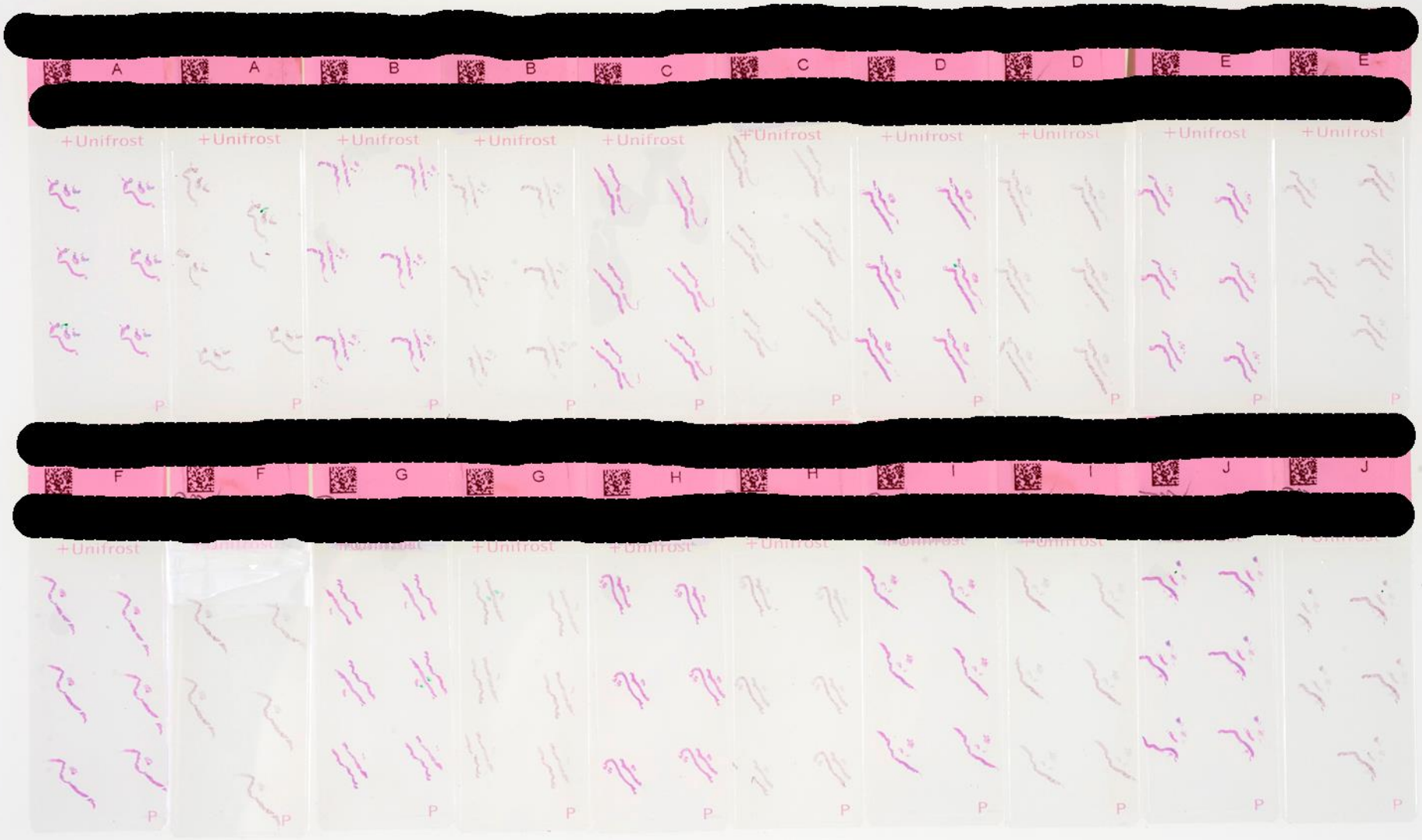
- **PMP / PSFMT**
- **Sarc. Ca**
- **LMS**

- **keratin(+/-),SMA(+), desmin(+/-), p63(-), Alk-1(+)**
- **keratin (+/-), SMA(-), desmin(-), p63(+/-), Alk-1 (-), HMCK & CK5/6 (+)**
- **keratin (-/+),SMA(+), desmin(+), Alk1(-/+),p63(-)**


A
PMP
B
ALK 1
C
KERATIN AE1/3
D
SMA


A SARC CA
B p63
C CK 5/6 or HMCK
D p63

		support this diagnosis.
(15A)	Right Lat Base	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(16A)	Right Base	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(17A)	Right Lat Lat Mid	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(18A)	Right Lat Medial Mid	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(19A)	Right Lat Mid	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(20A)	Right Mid	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(21A)	Right Lat Lat Apex	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(22A)	Right Lat Medial Apex	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(23A)	Right Lat Apex	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(24A)	Right Apex	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(25A)	Left Base Margin	Benign fibromuscular tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(26A)	Right Apex Margin	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(27A)	Left Apex Margin	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.
(28A)	Right Base Margin	Benign prostatic tissue. Immunostains for basal cell-specific high molecular weight keratin (34BE12), p63, c-myc and racemase support this diagnosis.


A
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+Unifrost
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J

Indications for IHC – Needle Biopsy

Atypical small cell proliferations

- To confirm focus as cancer
- Confirm benignity in ASAP felt to be benign
- Unusual patterns
  - Atrophic
  - Pseudohyperplastic
  - Double – layer
  - PIN-like

Atypical large acinar proliferations (intraductal patterns)

Post – treatment setting

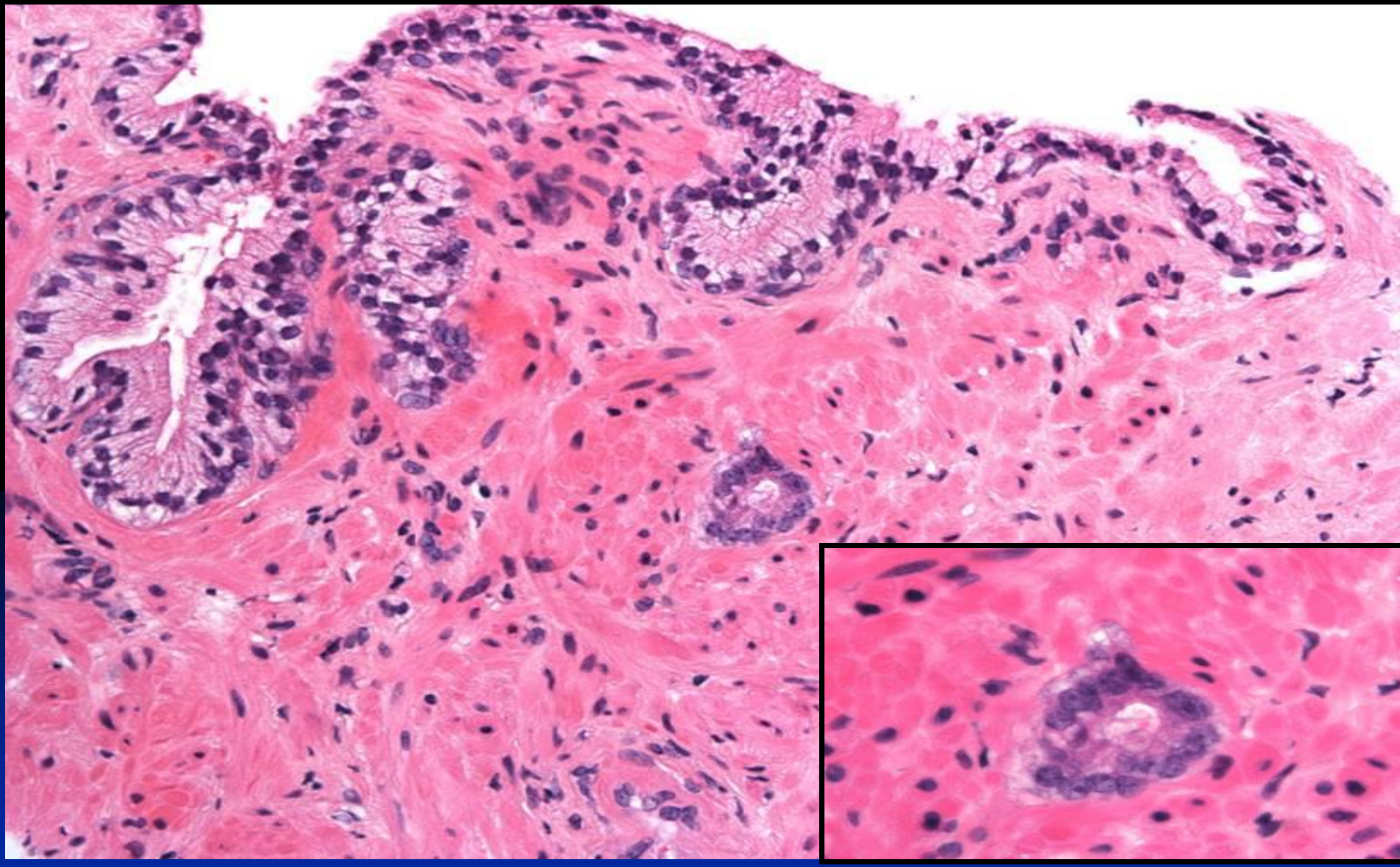
IHC in Prostate Needle Bxs.

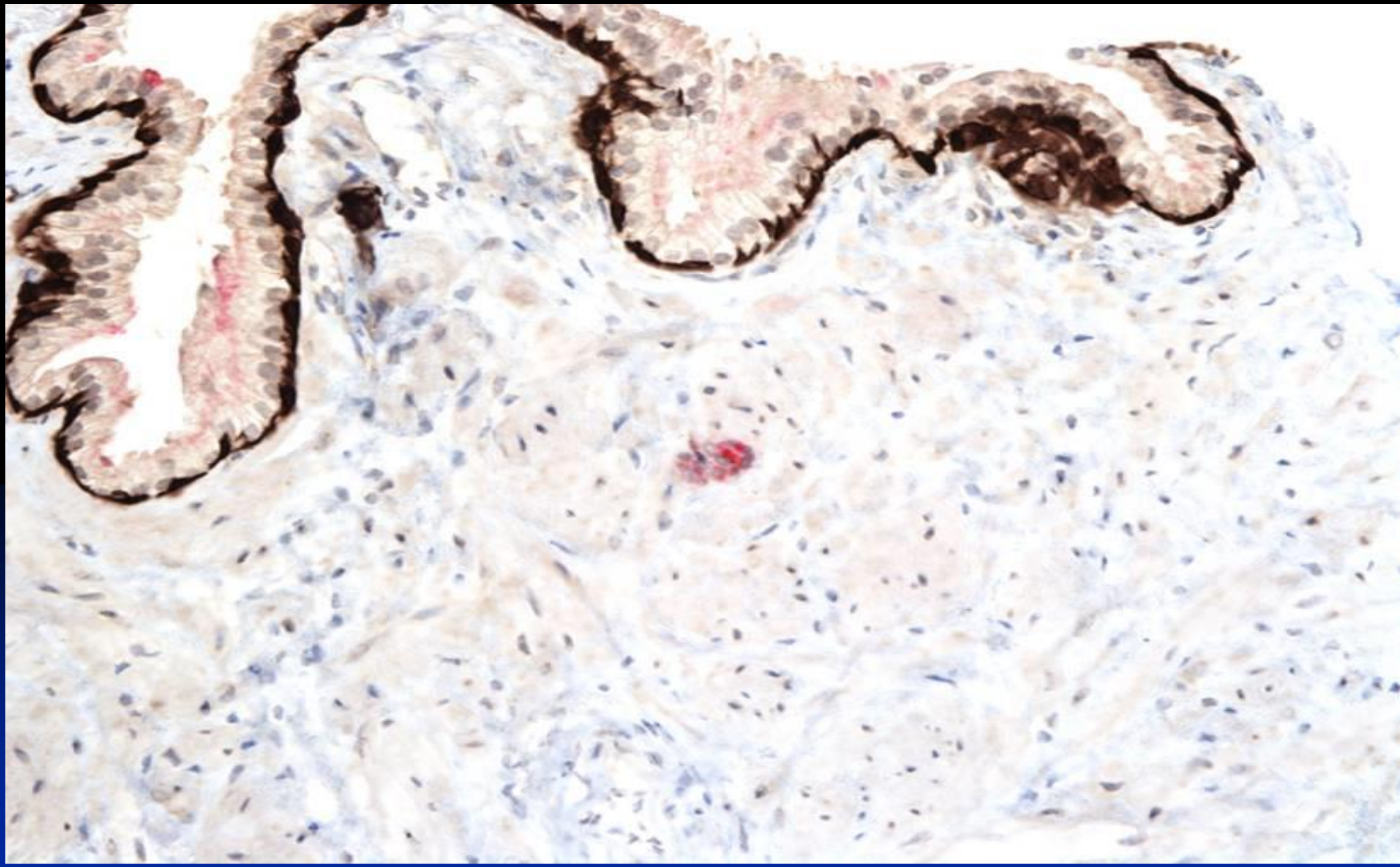
- **Basal cell cocktail**
  - **p63 and 34βE12**
- **Triple cocktail "PIN cocktail"**
  - **p63/34βE12/AMACR**
- **ERG immunohistochemistry**
  - **Additional marker, only if triple not conclusive**

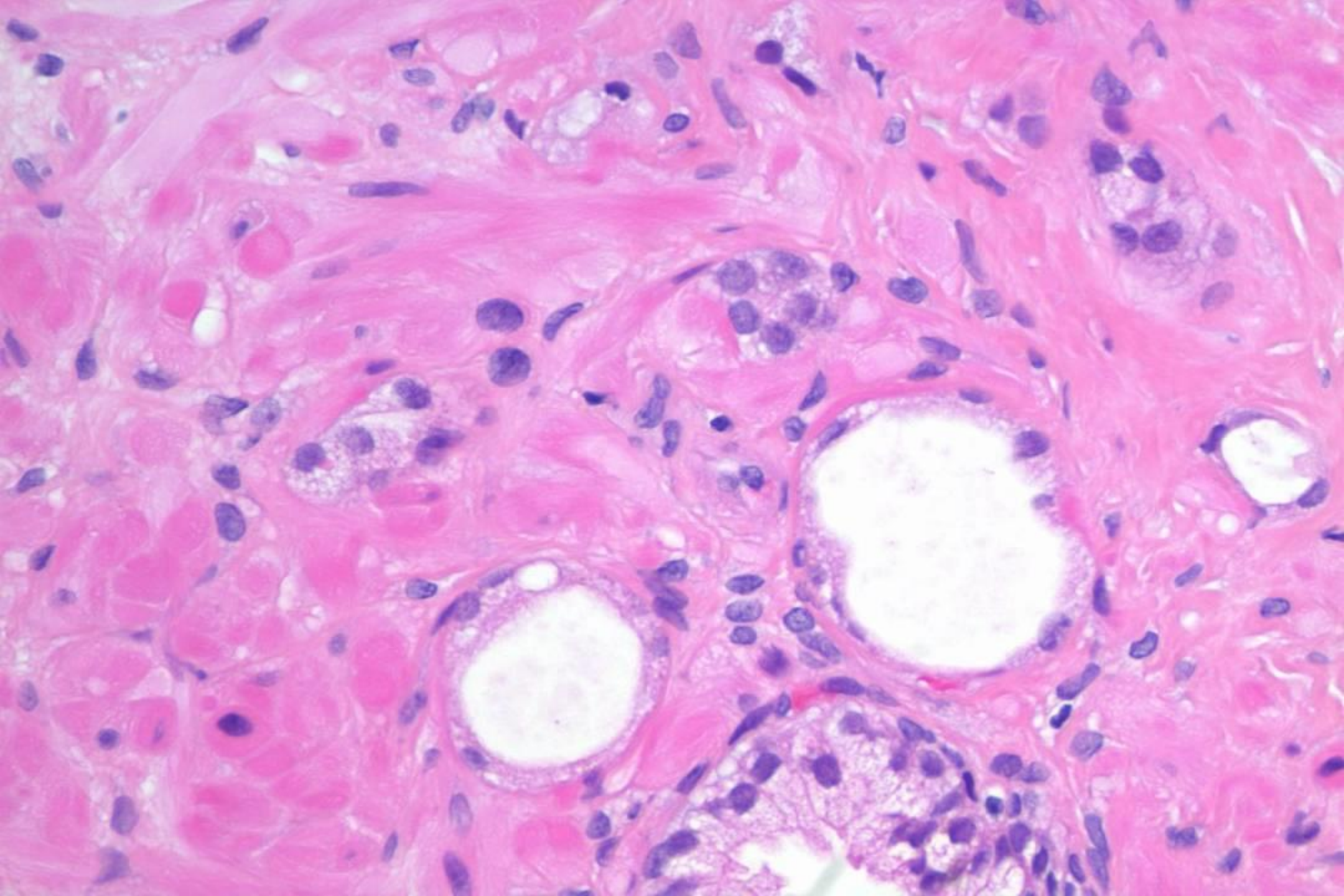
PSA – to prove prostate origin – NA, Cowper's glands

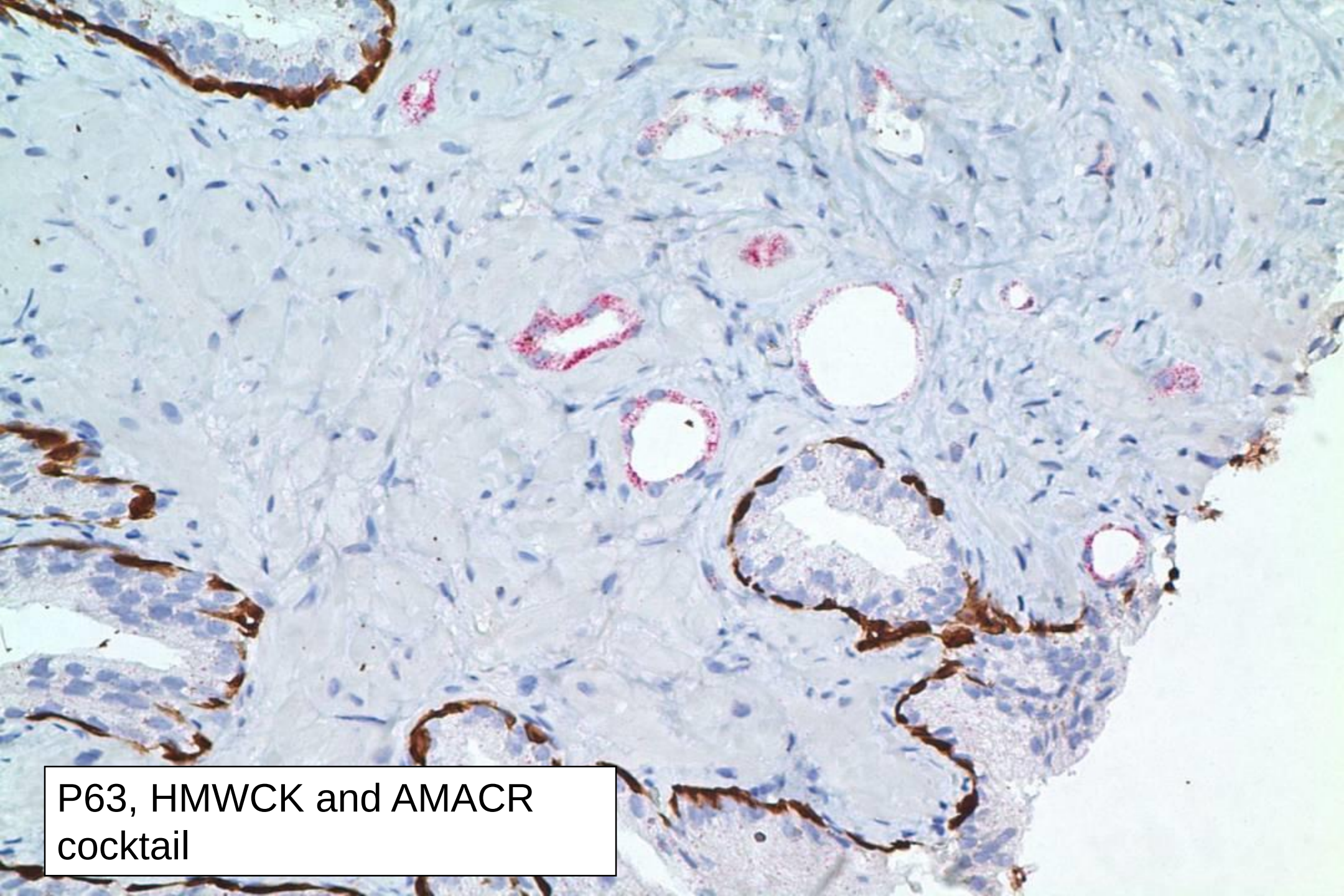
Triple cocktail

- **Expected reactions**
  - **PCa: p63(-), HMCK(-), AMACR(+)**
  - **Benign small cancer mimics: p63, HMCK(+), AMACR(-)**
  - **HGPIN: p63, HMCK(+), AMACR(-/+)**
  - **Ductal cancer:**
    - ***Invasive component: p63, HMCK(-), AMACR(+)***
    - ***Intraductal component: p63, HMCK(+), AMACR(+)***
  - **Urothelial cancer: p63, HMCK(+/-), AMACR(+)**







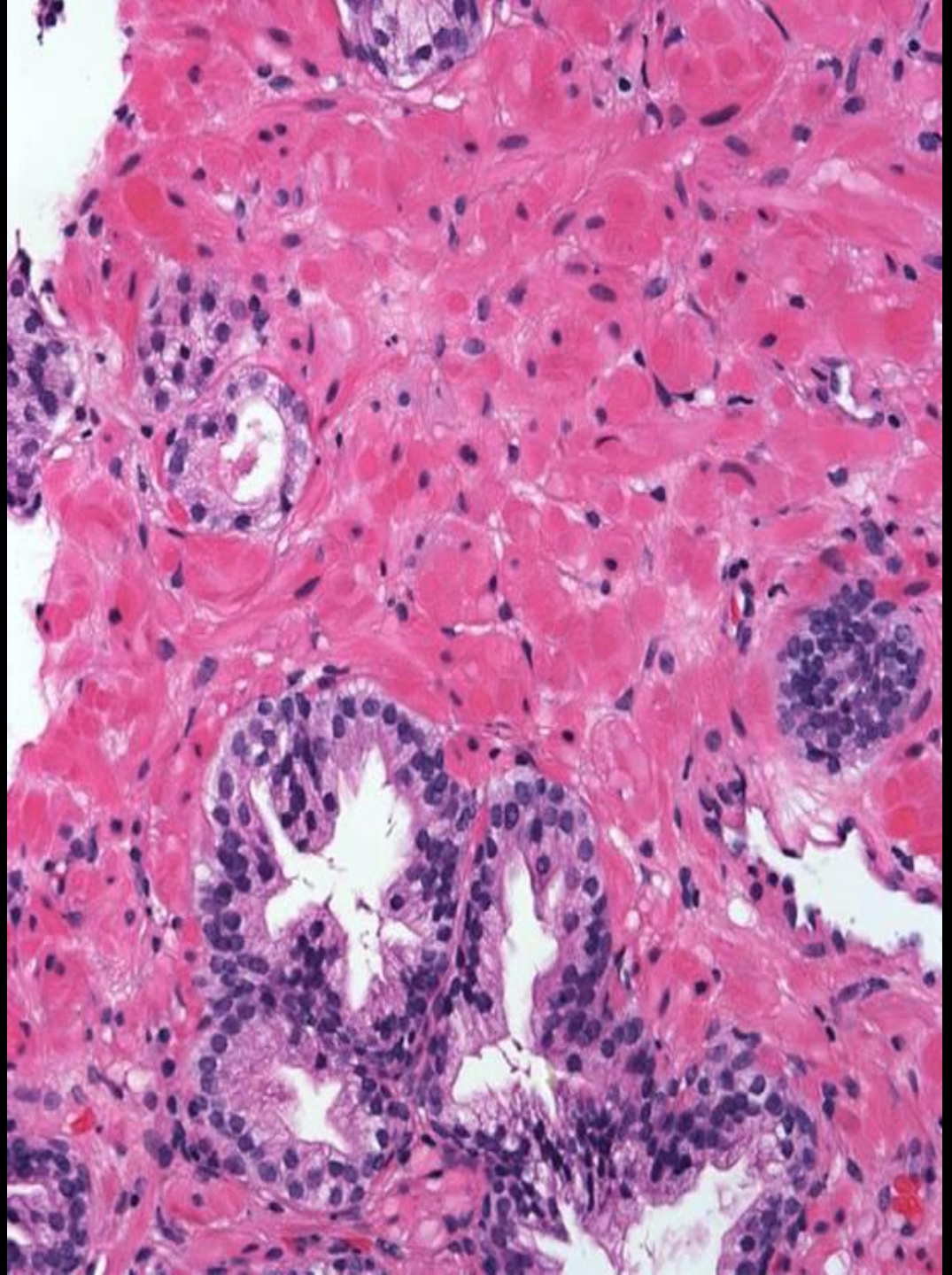

P63, HMWCK and AMACR
cocktail

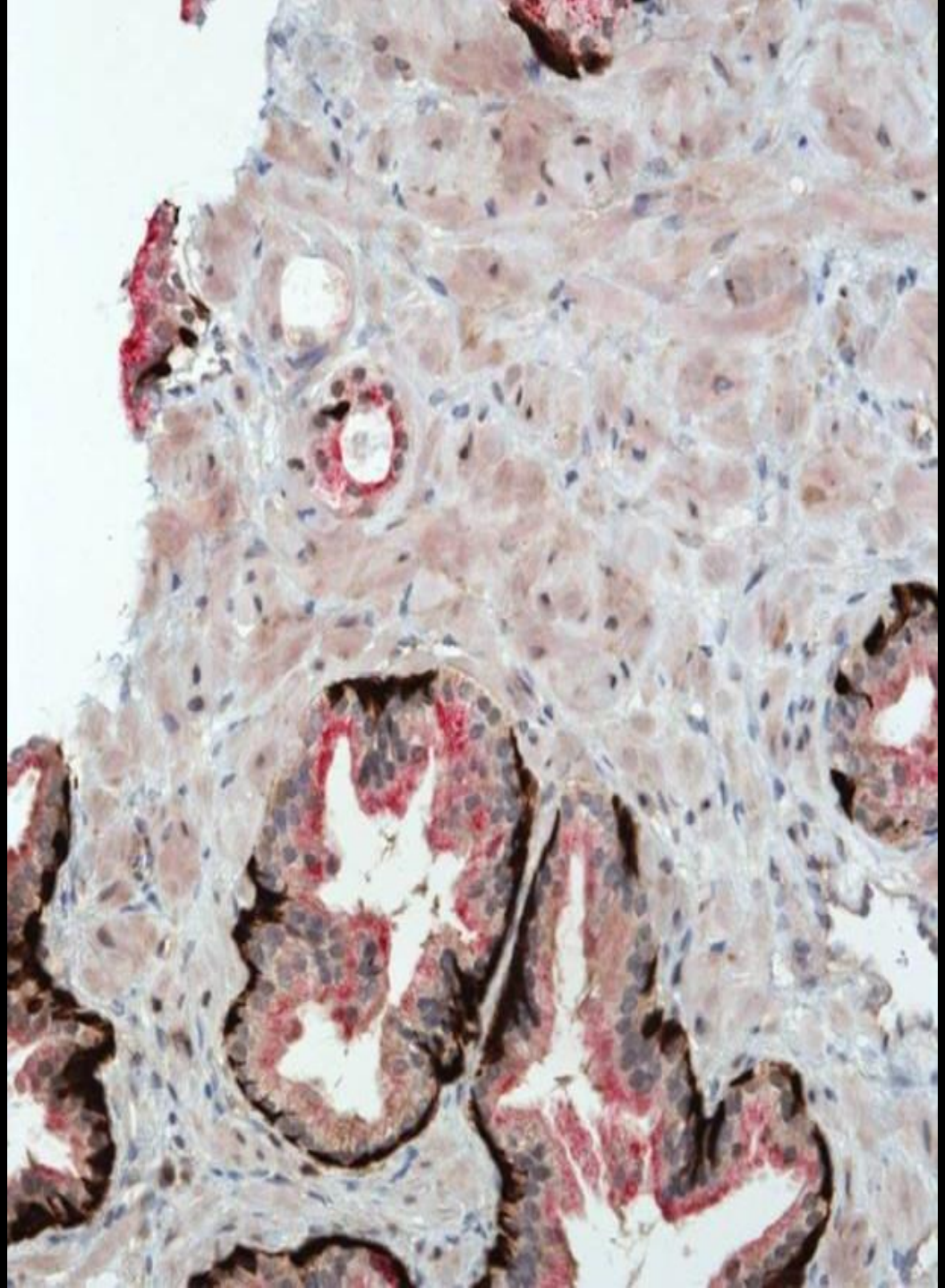
EQUIVOCAL IHC

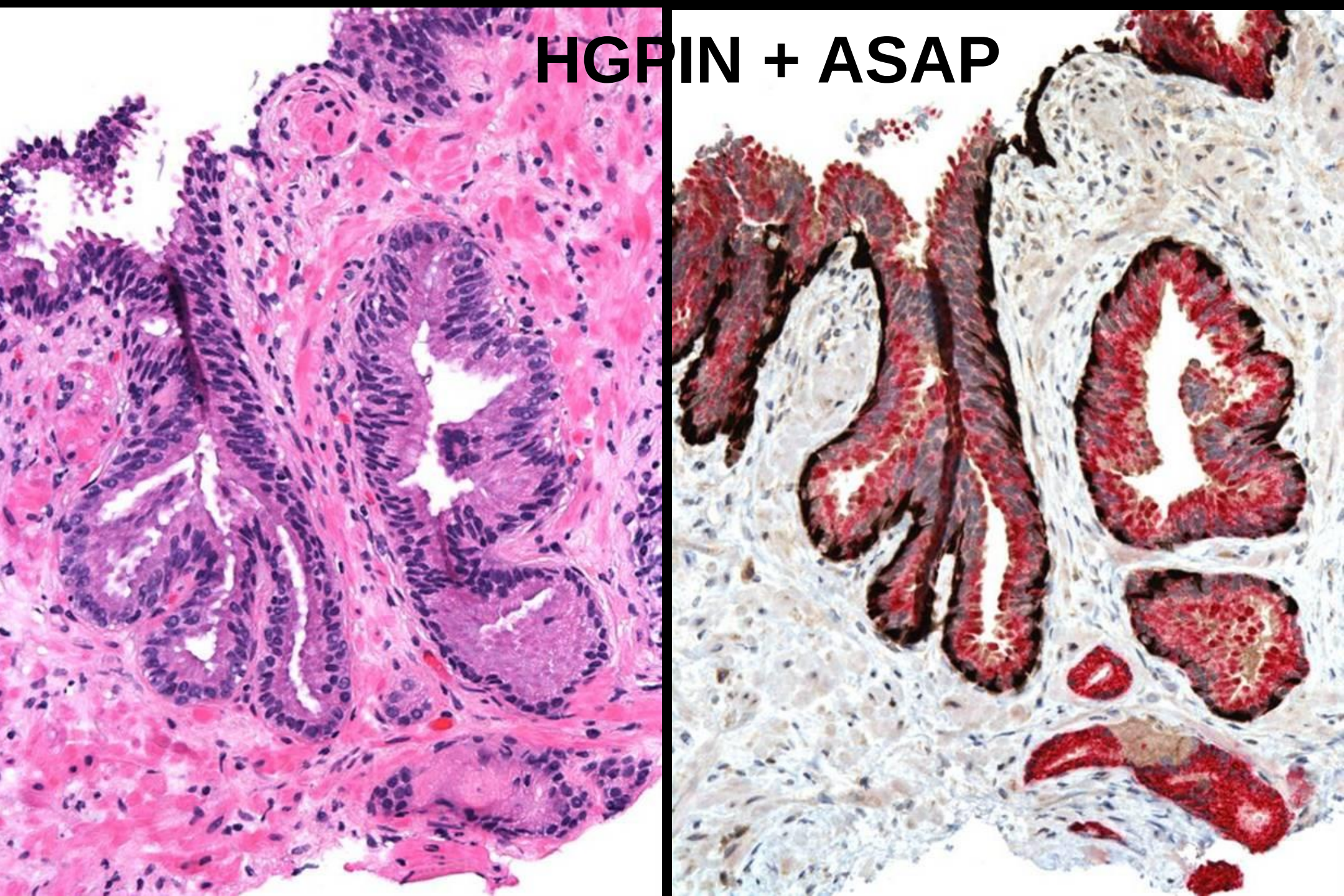
- **Results not entirely complimentary**

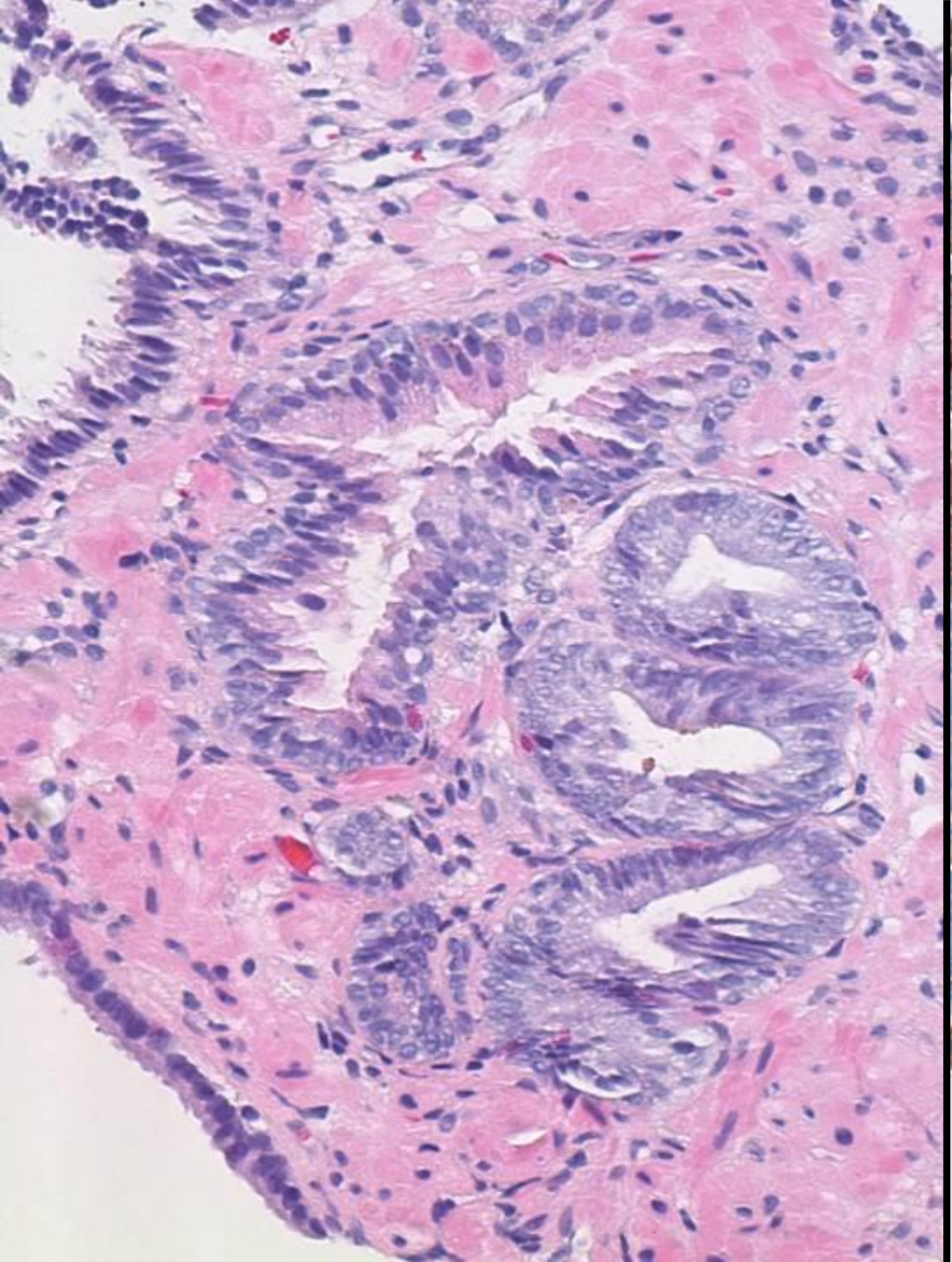
- Unexpected basal cell layer staining

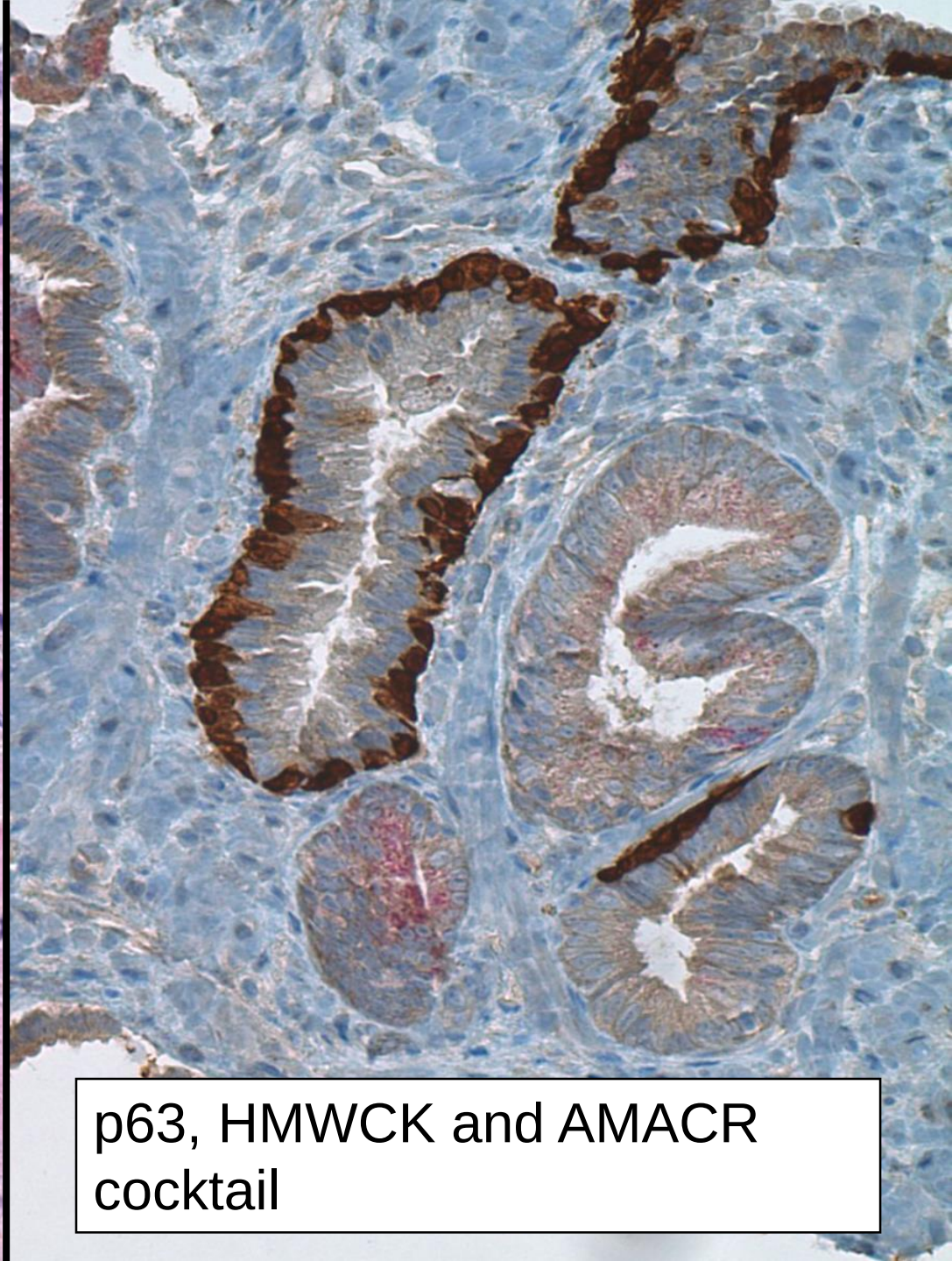
- Results supportive but all glands in an already small or difficult focus not represented in the IHC



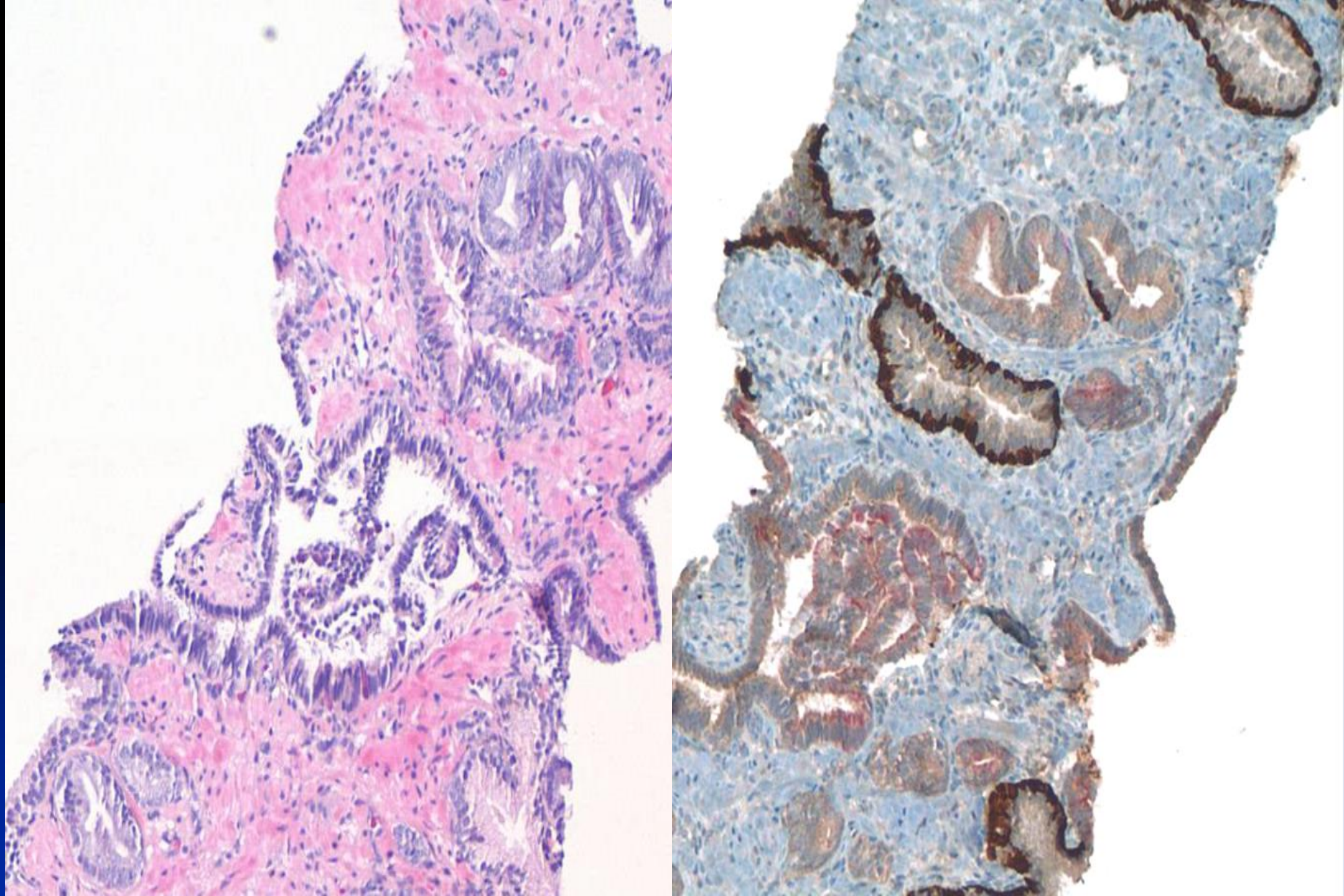



HGPIN + ASAP



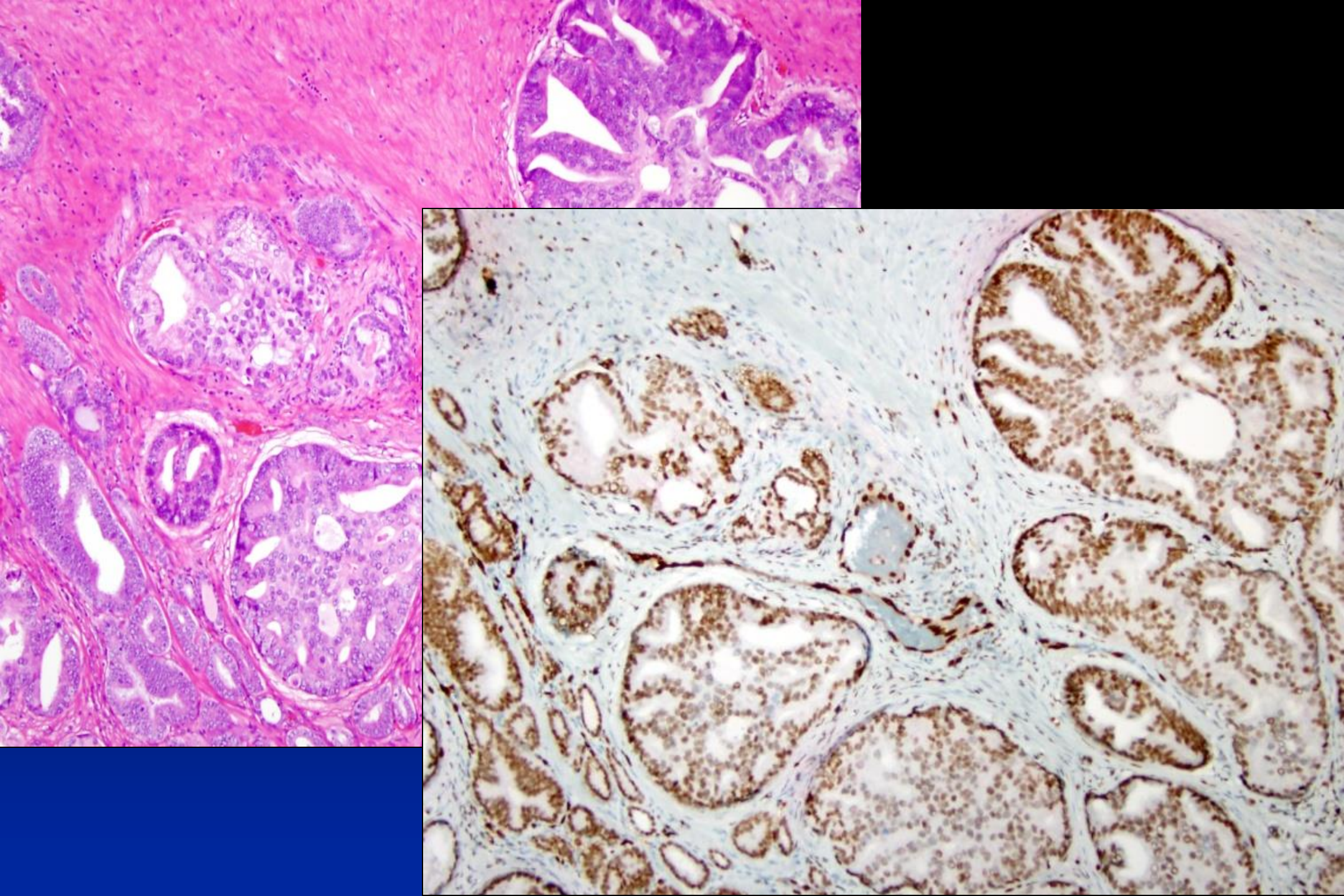


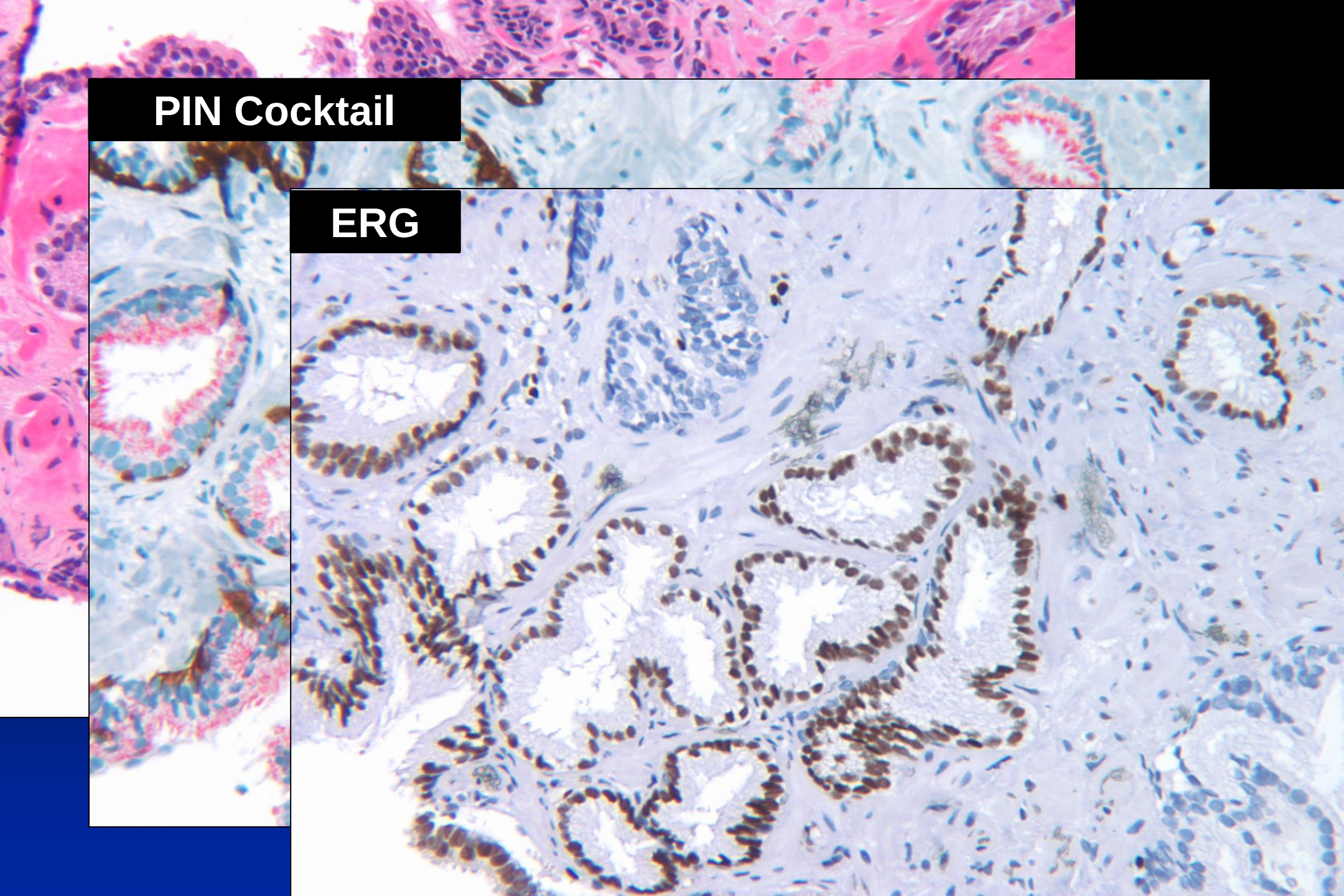
p63, HMWCK and AMACR cocktail



ERG Immunohistochemistry

- 60% of PCa harbor any ETS-rearrangement
- 50% of PCa – TMPRSS2-ERG
- Detection by IHC or FISH
  - High concordance in hormone naive
- IHC detection in ~30% in needle setting
- Do we need a 4th marker?
  - – Helps in about 5% of cases with equivocal triple cocktail
- Additional: Marker of prostate histogenesis




PIN Cocktail
ERG

IHC in a pt. with one (+) core

- **Confirm bilaterality-** clinical staging - almost 50% patients with prostate cancer treated with RT
- Accurate assessment of # of cores involved – **Active surveillance**
- Quantitation of cancer **– Active surveillance (>50% may exclude)**

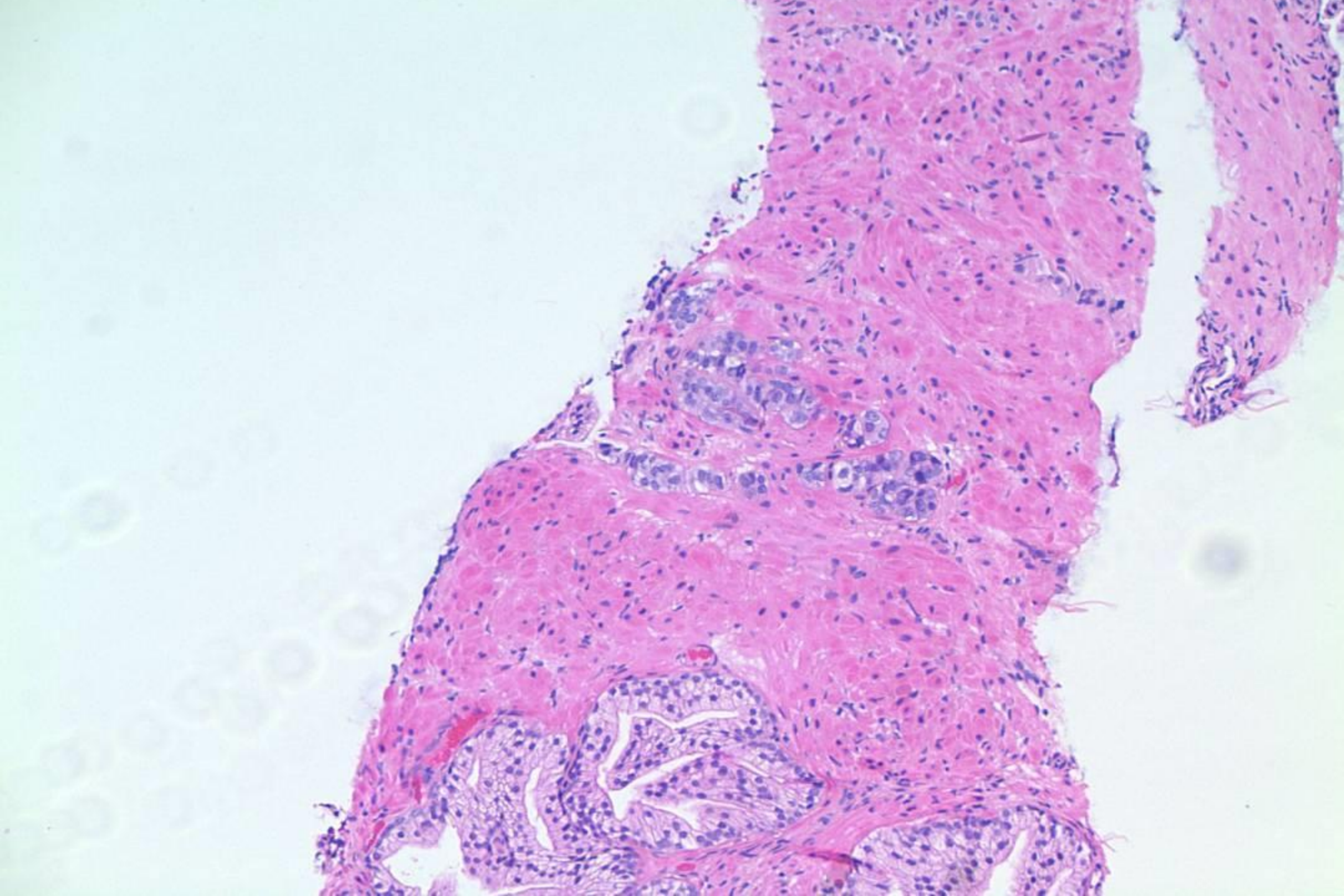
Work-up of Atypical Foci with Definite Cancer in Other Parts

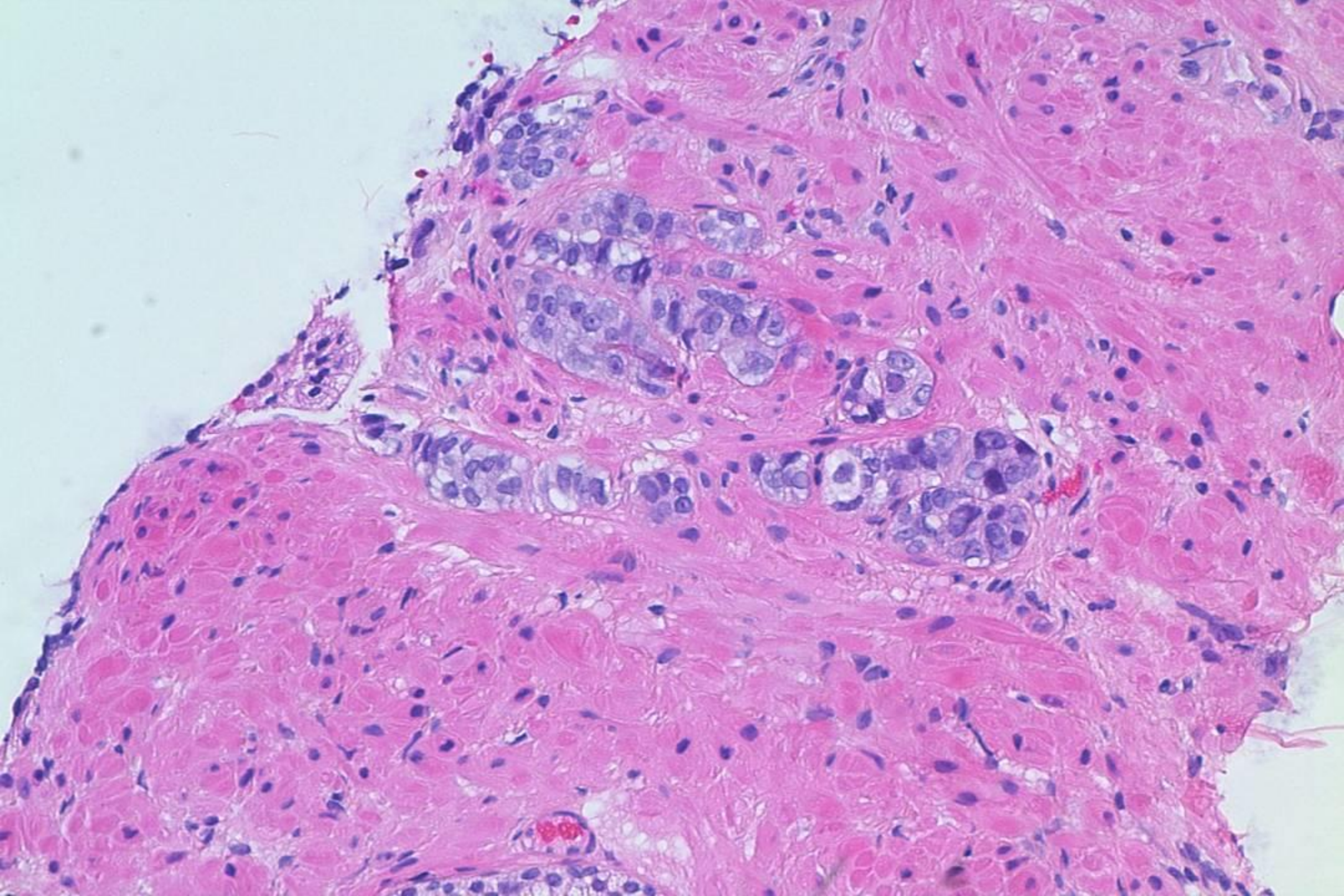
Patient with Gleason score 3+4 or higher grade cancer on at least one part.

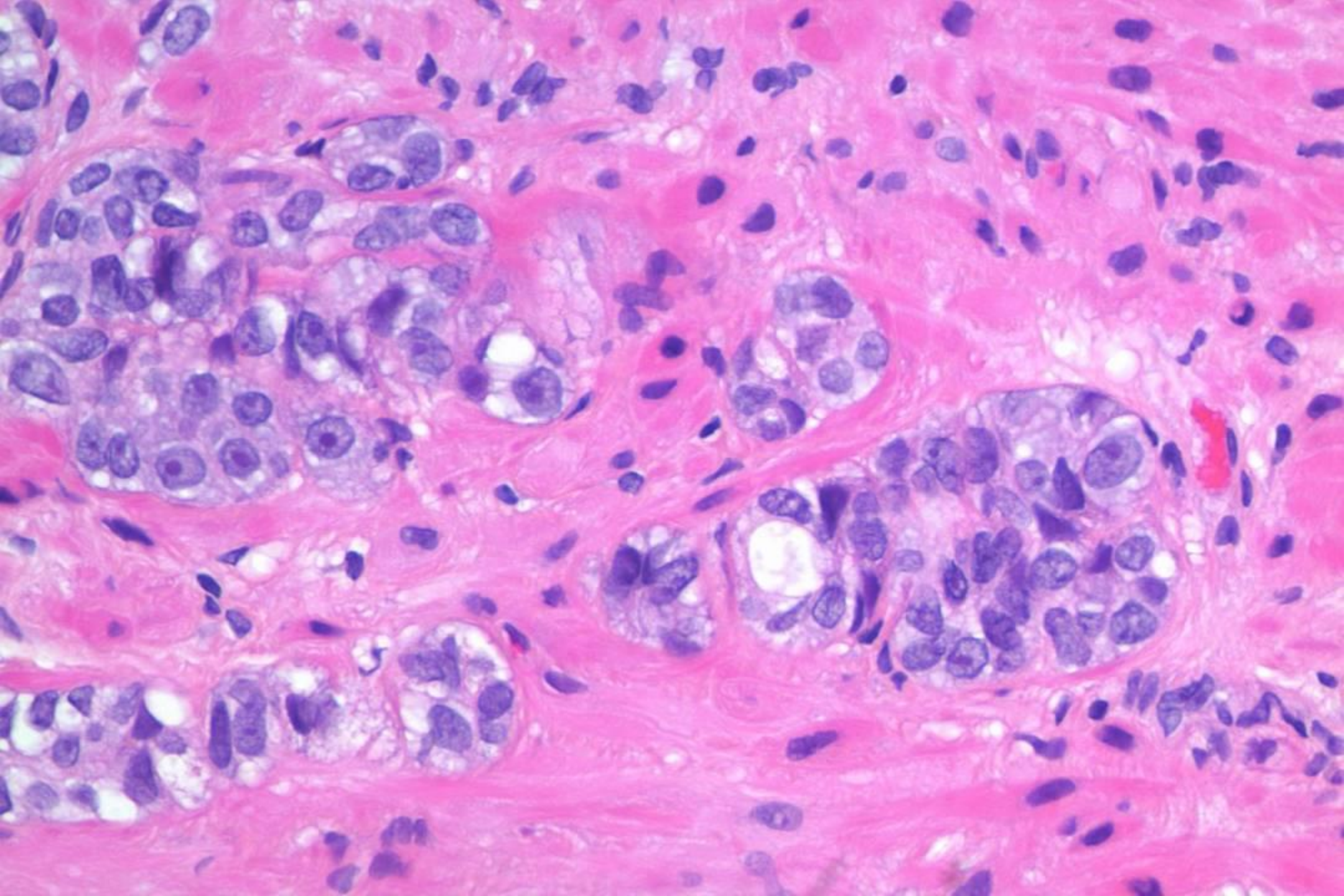
? Work up other parts with small foci of possible 3+3=6

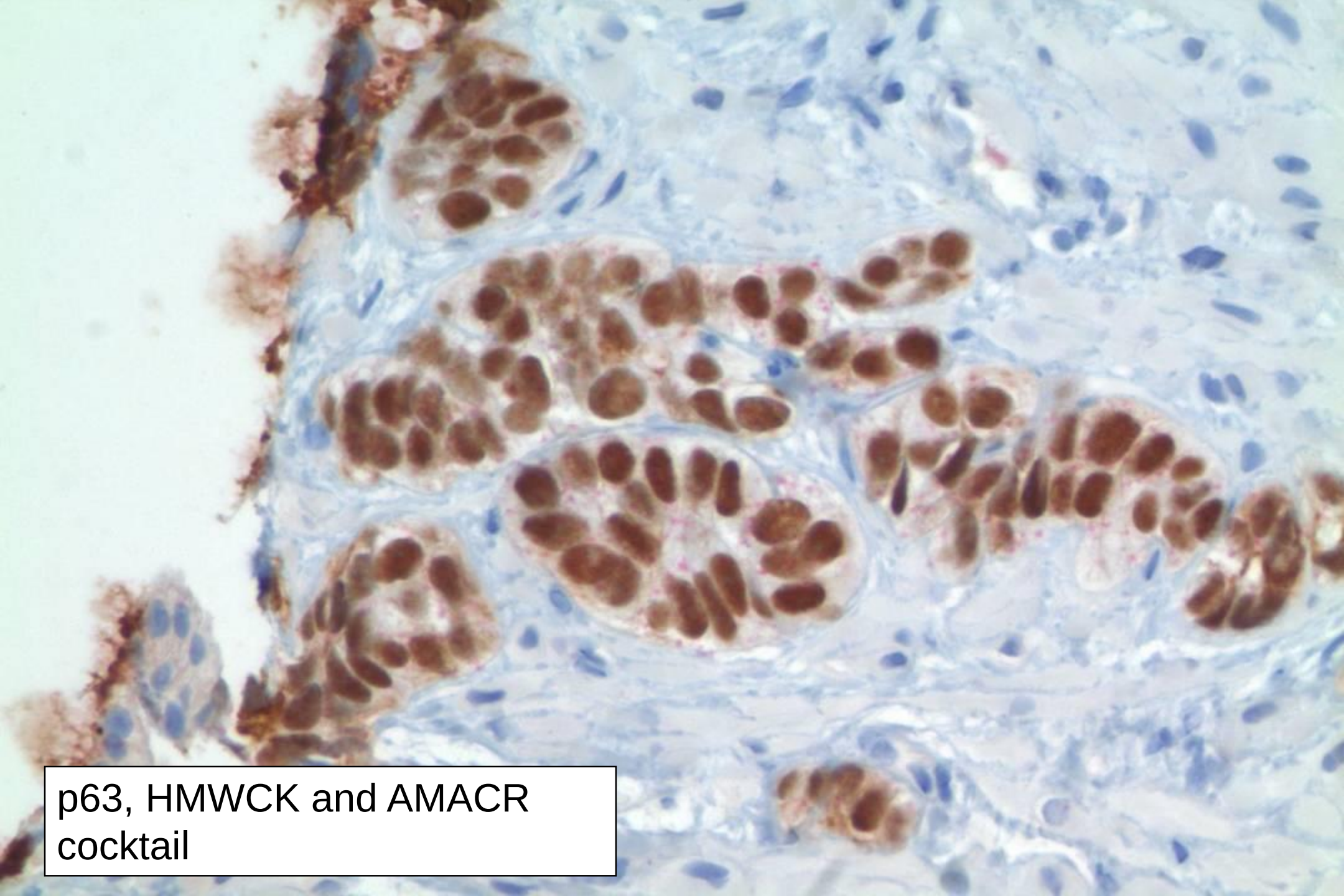
Generally, not indicated, as additional IHC confirmation will likely not change management

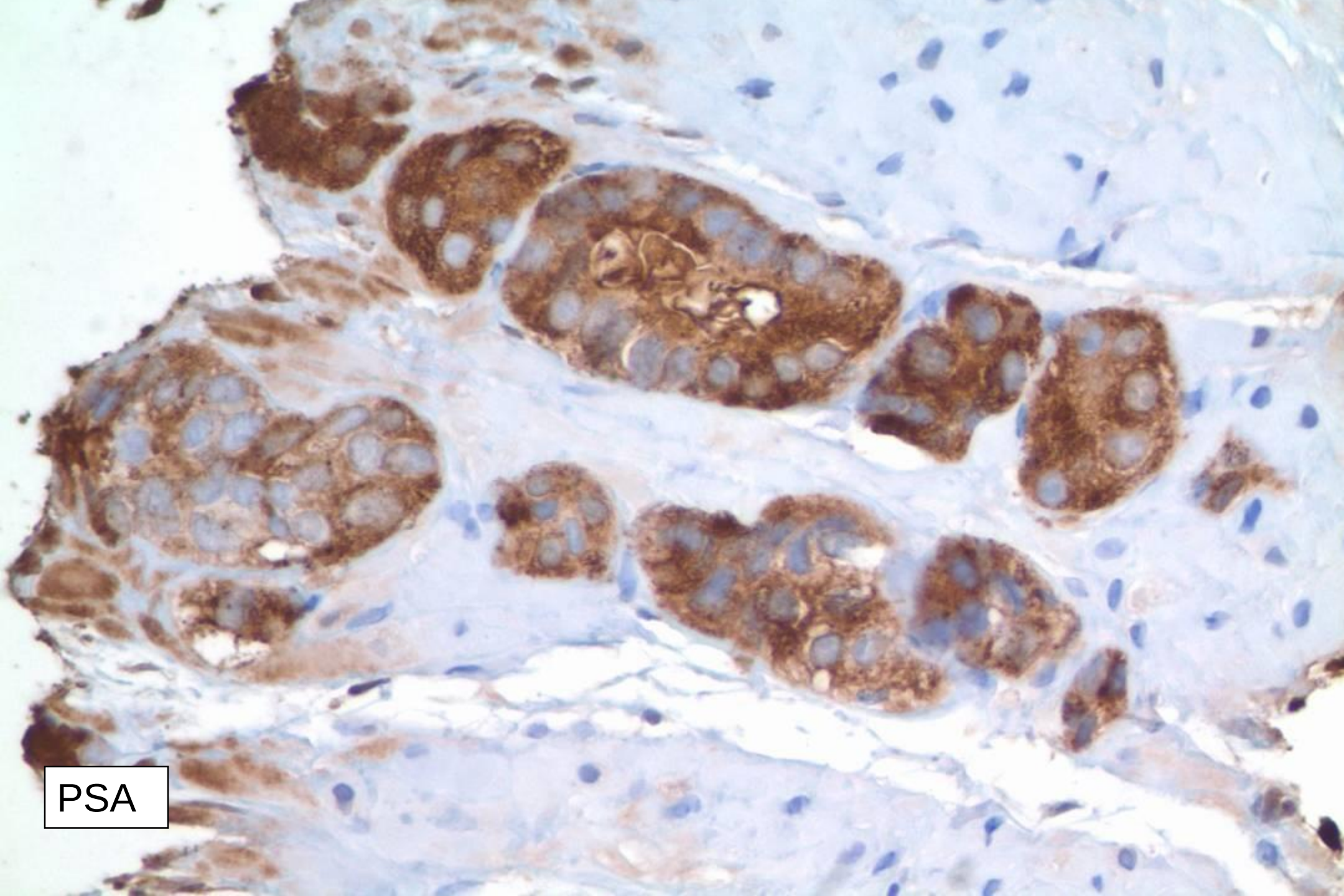
Abberant expression p63 in Prostate cancer







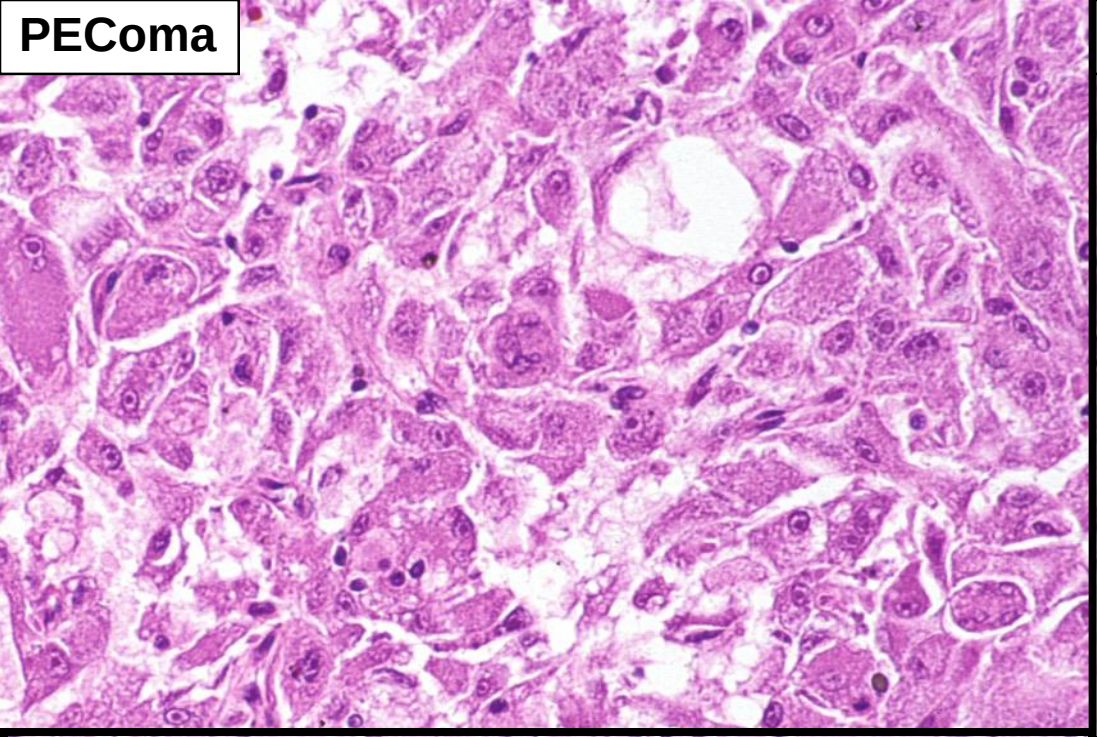

p63, HMWCK and AMACR
cocktail

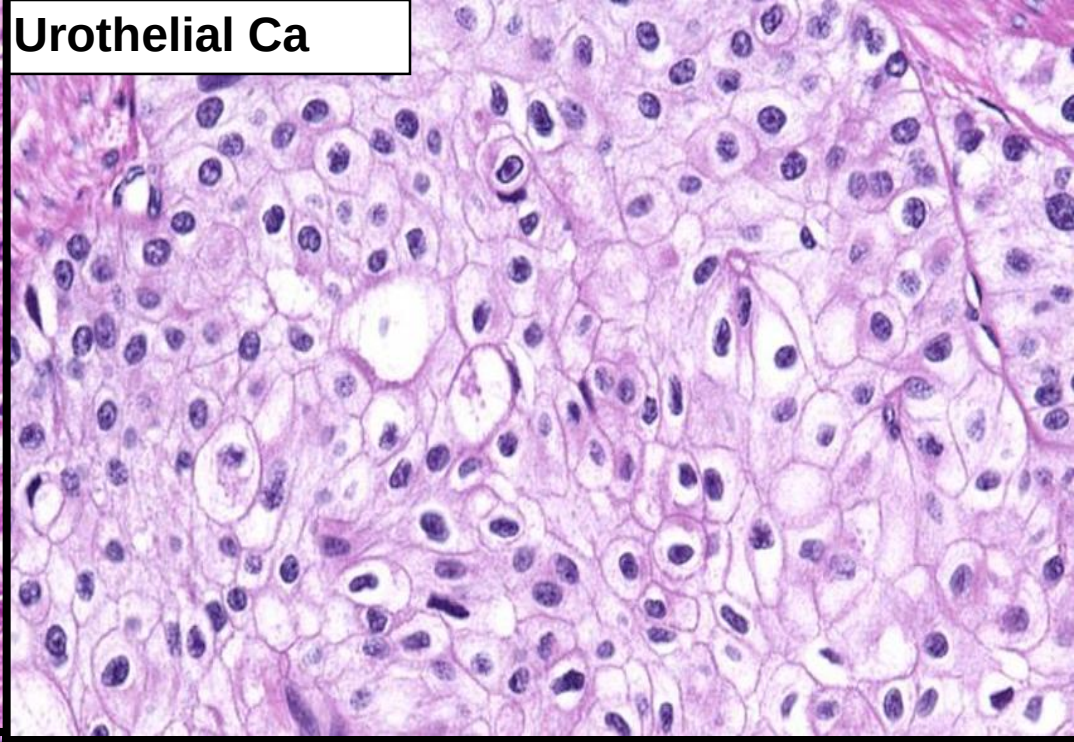

PSA

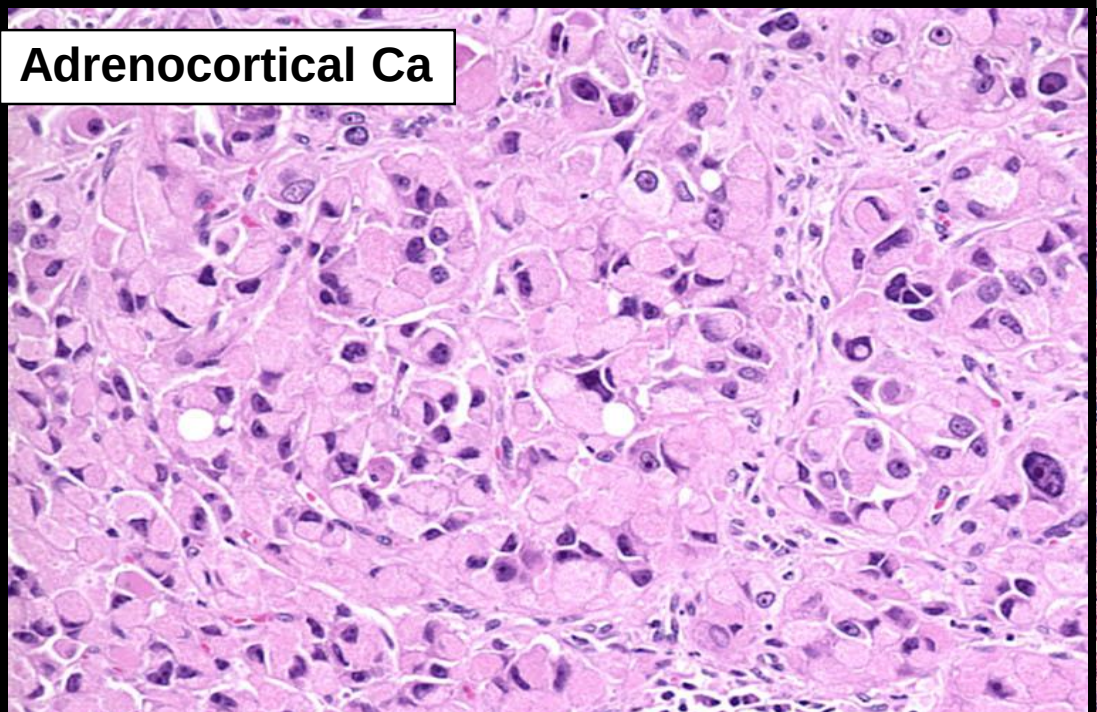
IHC IN KIDNEY SURGICAL PATHOLOGY

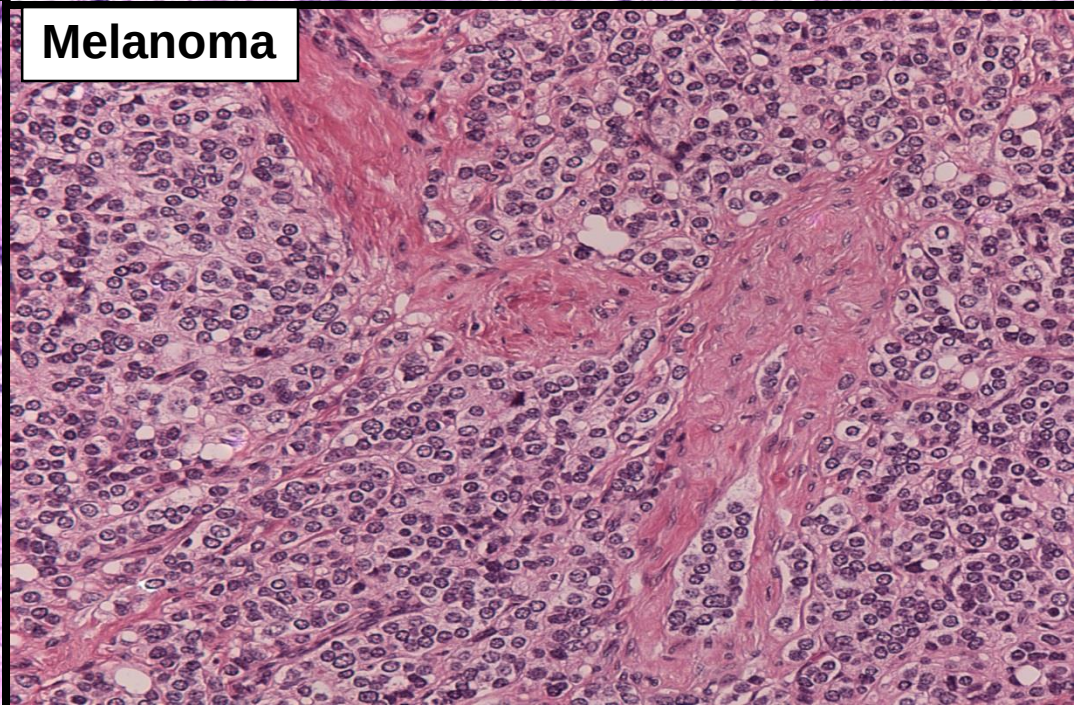
- **Confirming Renal origin**
- ***Histologic subtyping of RCC***

Metastatic sites
Primary tumors
Small biopsies and FNAS


PEComa


Urothelial Ca


Adrenocortical Ca


Melanoma

CONFIRMING RENAL ORIGIN

Carcinoma of unknown origin or patient with history of RCC:

- Lymph node
- Lung
- Liver
- Bone
- Other

"Unusual carcinoma" in the kidney

- Epithelioid PEComa
- Urothelial Carcinoma
- Metastatic carcinoma to the kidney

versus

- Poorly differentiated, high grade RCC (unclassified)

versus

- Lymphoma, sarcoma, melanoma, other

APPROACH TO APPLICATION OF IHC IN RENAL TUMORS

Is the neoplasm a carcinoma?:
rule out Epi AML (PEComa), lymphoma, sarcoma, melanoma etc

↓

Is the carcinoma a renal primary?:
rule out urothelial carcinoma, metastasis

↓

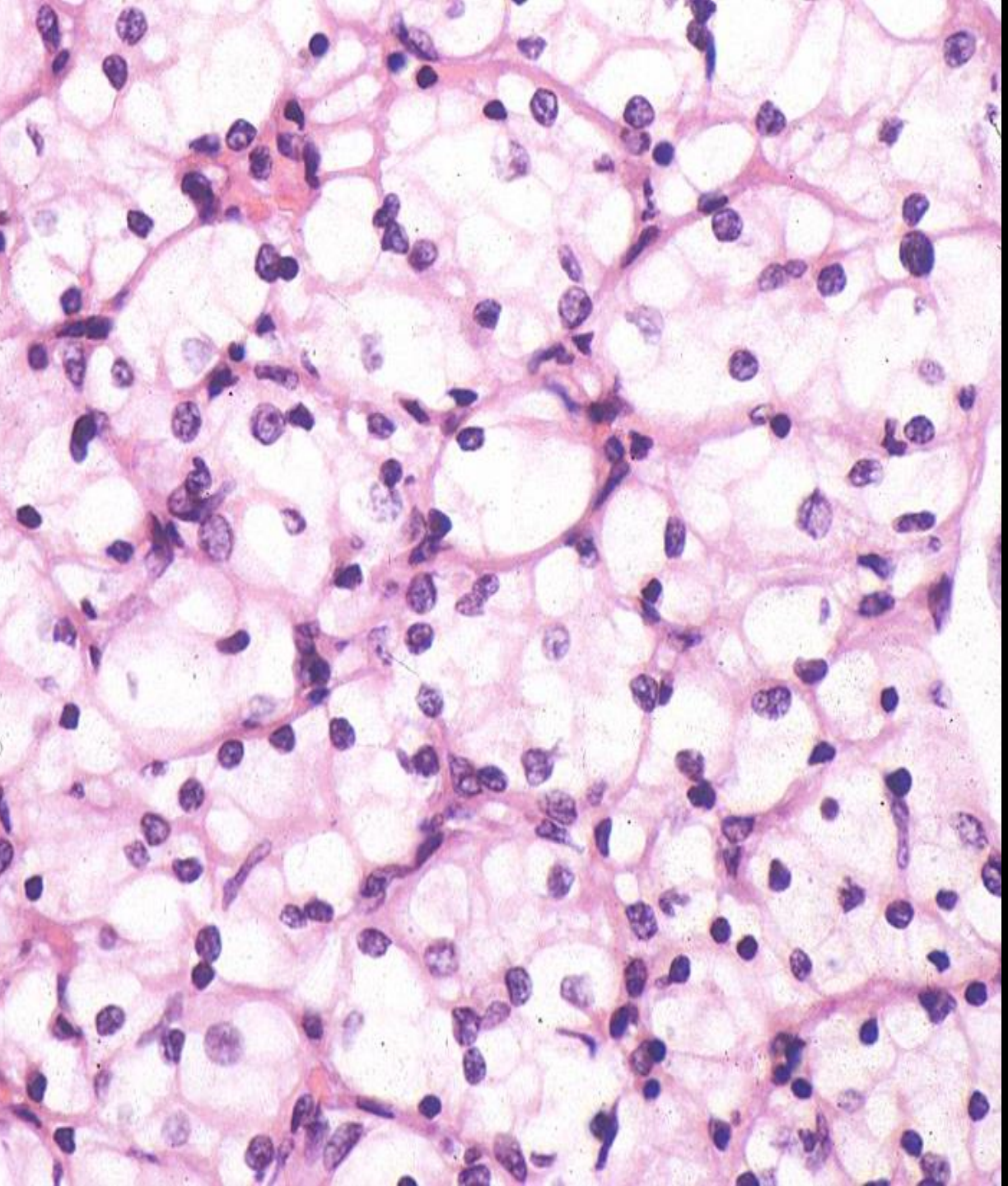
Can you subtype the renal cell carcinoma?:
Clear cell vs papillary vs chromophone vs oncocytoma vs translocation associated Ca …..

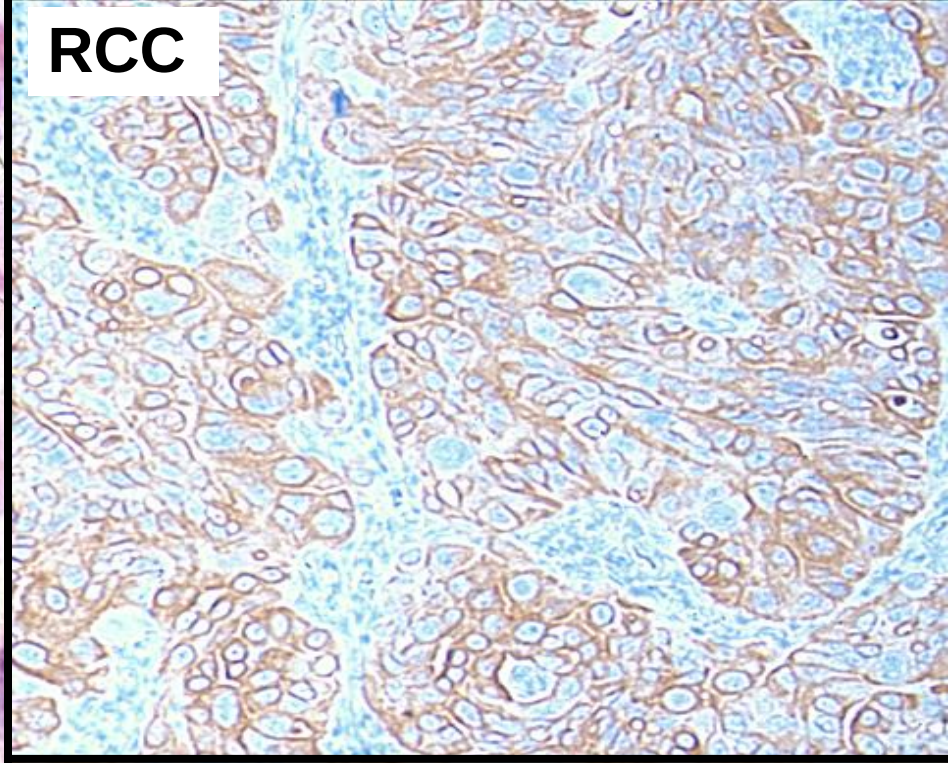
RCC antigen

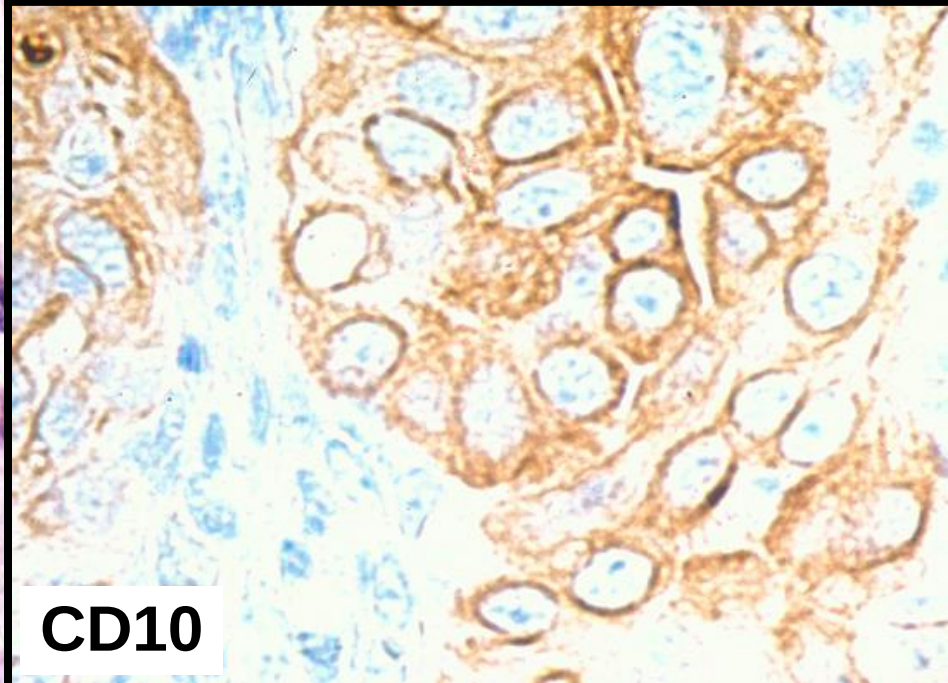
Monoclonal antibody against brush border of healthy PCT

- **RCC types**
- Clear cell RCC (85%)
- Papillary RCC (95%)
- *Oncocytoma & Chromophome (-/+)*
- *Collecting duct Ca (-/+)*

- **Other tumors**
- Breast ca
- Parathyroid ca
- Embryonal ca, testis
- Lung
- Prostate
- Ovary
- Melanoma
- Epididymal cystadenoma
- Mesothelioma




RCC


CD10

PAX8

Paired box transcription factor, similar to PAX2
Predominantly data from polyclonal antibody – new monoclonal

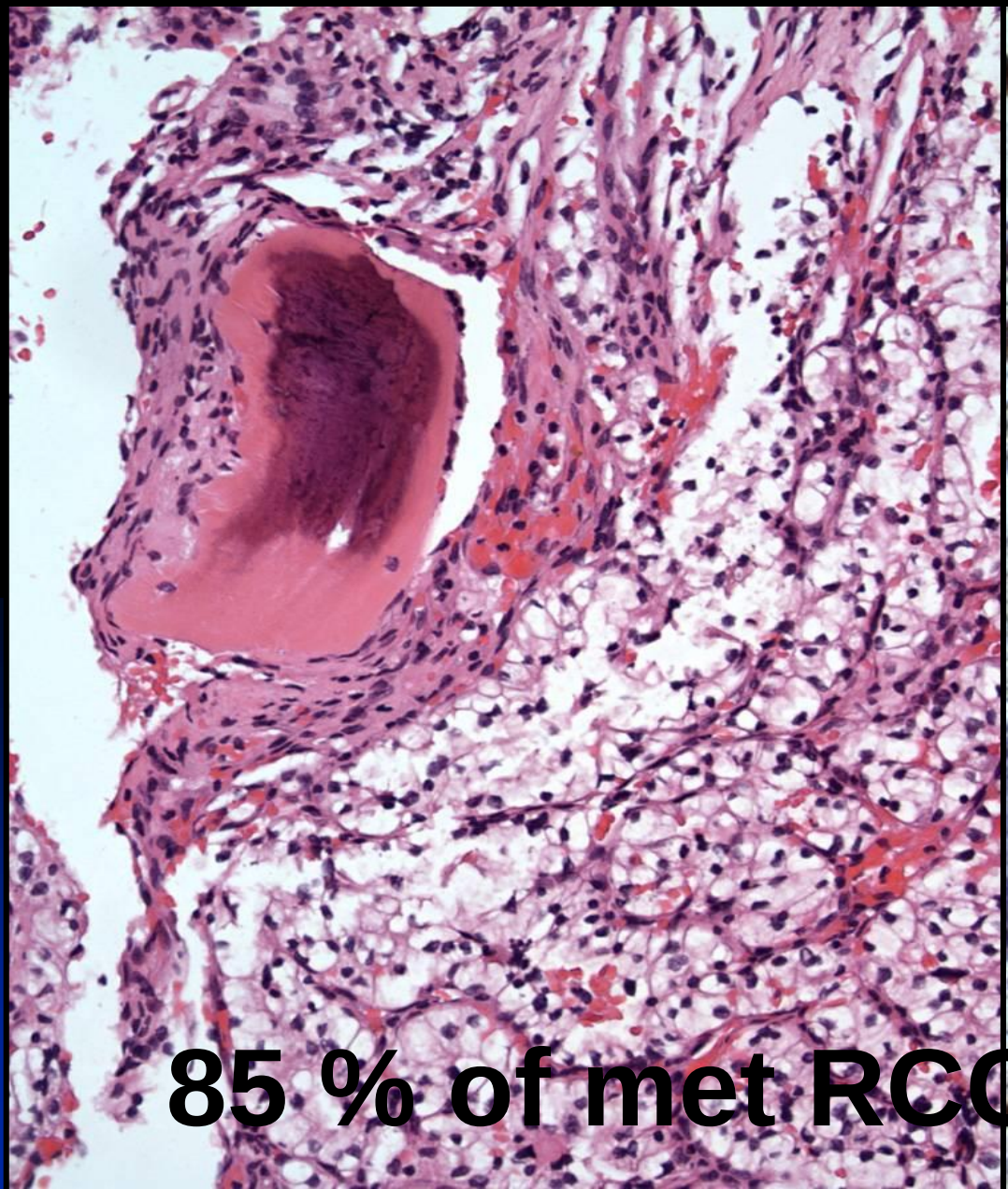
RCC types

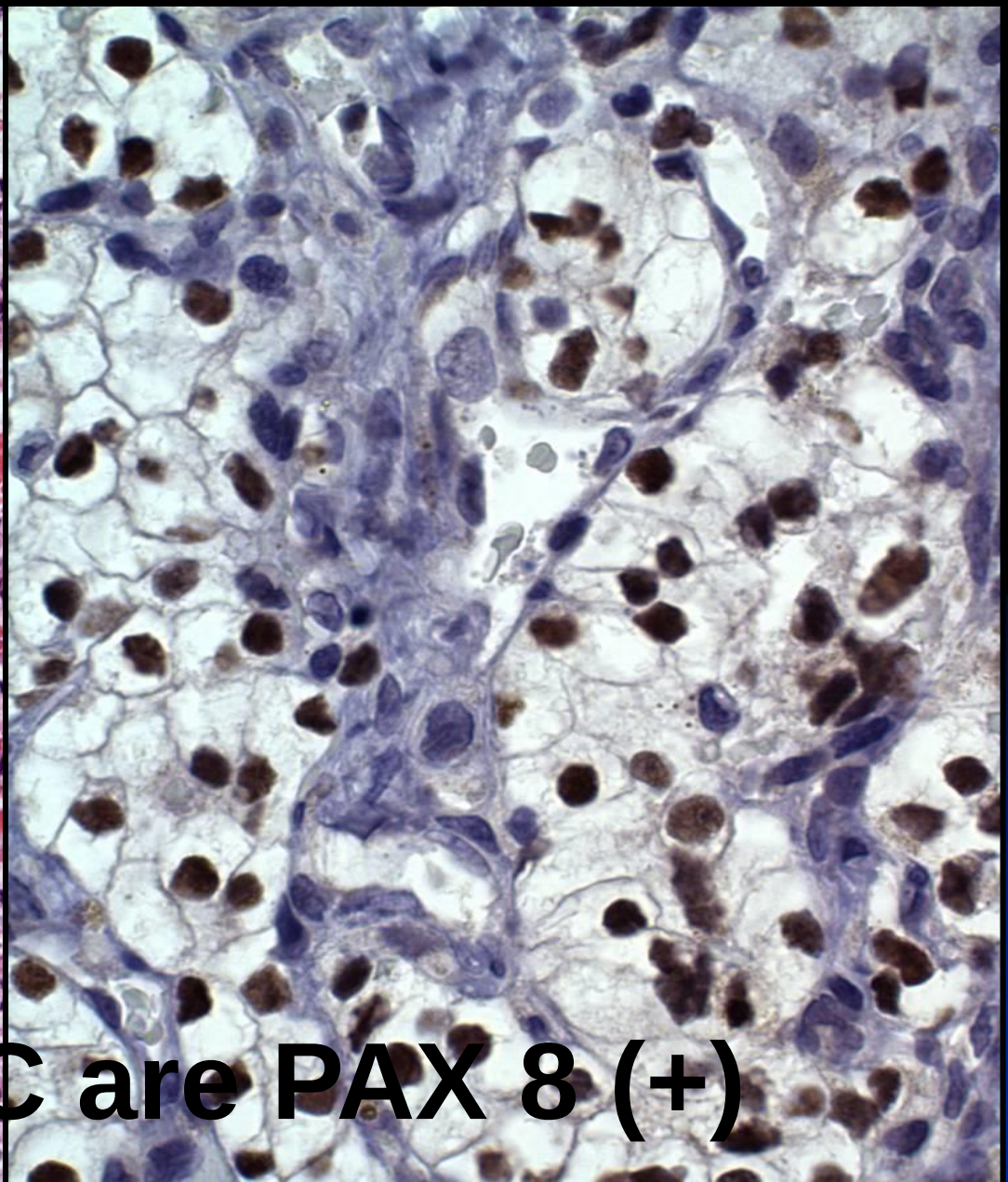
- *Clear cell RCC (>95%)*
- *Papillary RCC (>95%)*
- *Wilms tumor*
- *Metanephric (+) adenoma*
- *Oncocytoma (+)*
- *Chromophobe RCC (-/+)*
- *Collecting duct Ca (-/+)*
- *Translocation assoc. Ca (-/+)*

Other tumors

- *Similar to Pax2*
- *Thyroid neoplasms*
- *Extensive GYN positivity*

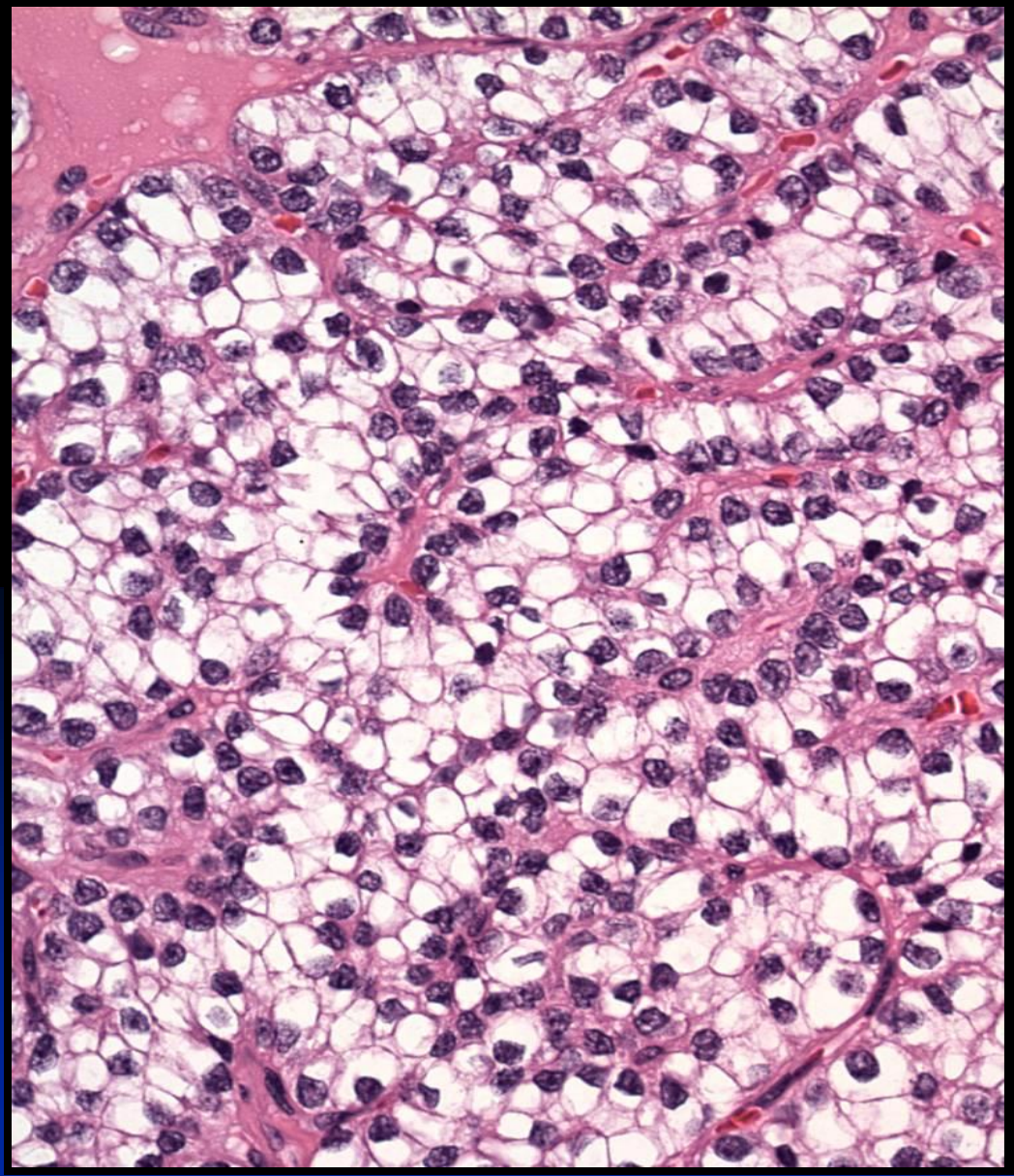
Metastatic Clear cell RCC (Bone)

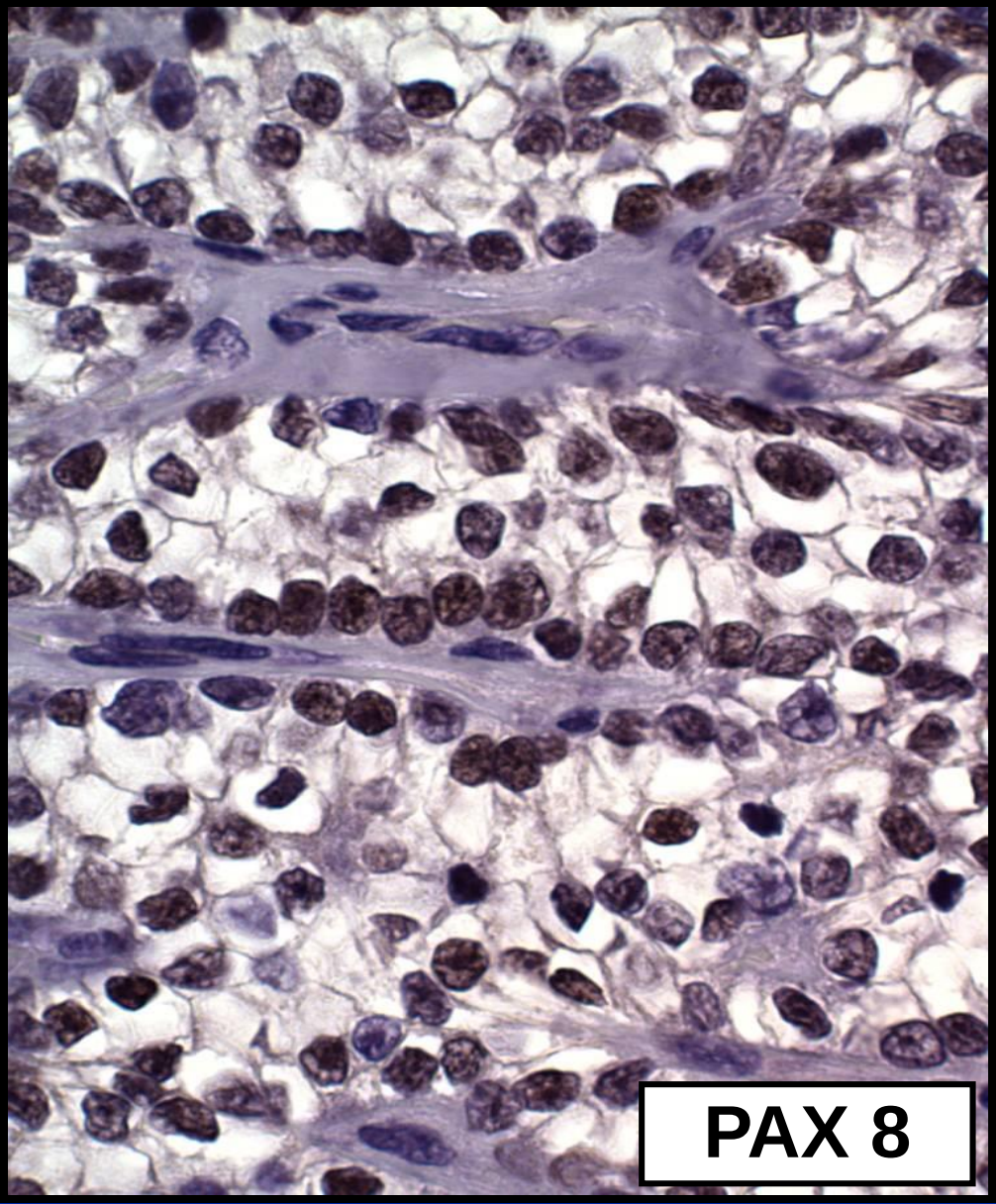




85 % of met RCC are PAX 8 (+)

PARATHYROID CARCINOMA





S100A1

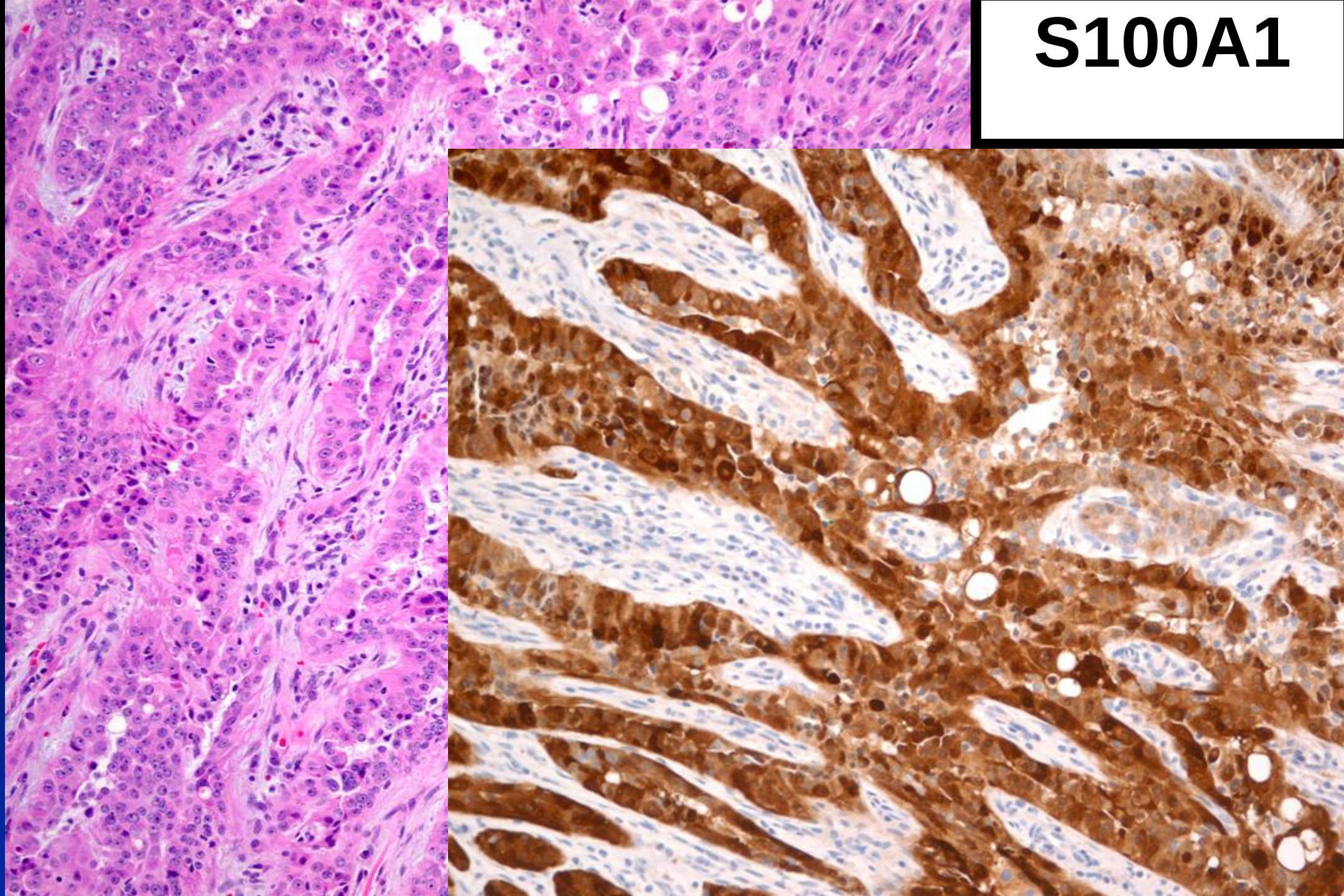
Among the 13 member S100 protein family.
Expressed in numerous cell types, not well studied

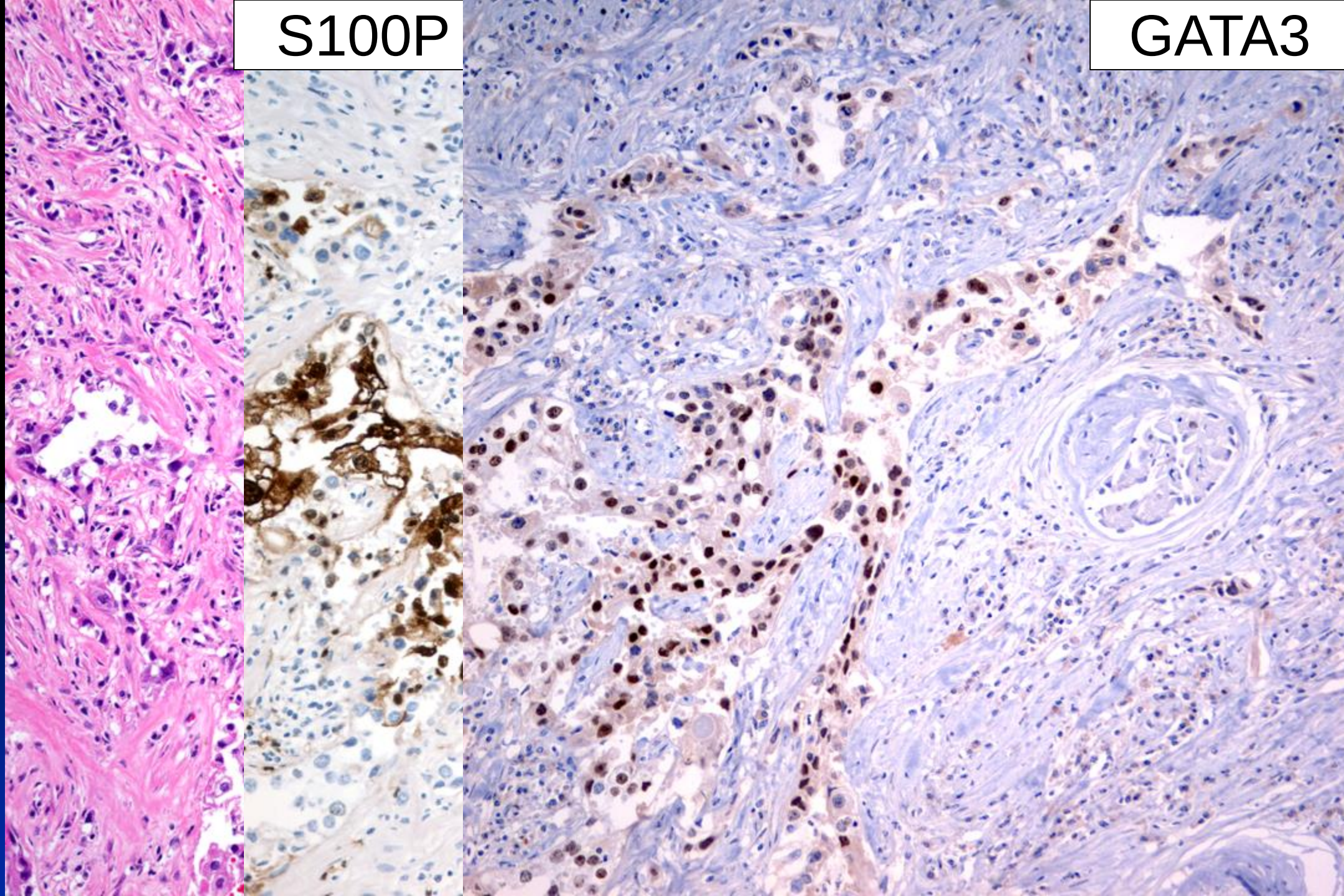
Positive in RCC

- Clear cell RCC (60%)
- Pap RCC (80%)
- Clear cell-pap RCC
- Oncocytoma
- Translocation assoc RCC
- Chromophobe RCC (-)

Other tumors

- Ovarian Ca (serous, clear)
- Endometrial Ca


S100A1


S100P
GATA3

Carbonic anhydrase IX

•Family of zinc containing metalloproteinase that regulates cell proliferation, adhesion and metastasis

Kidney tumors

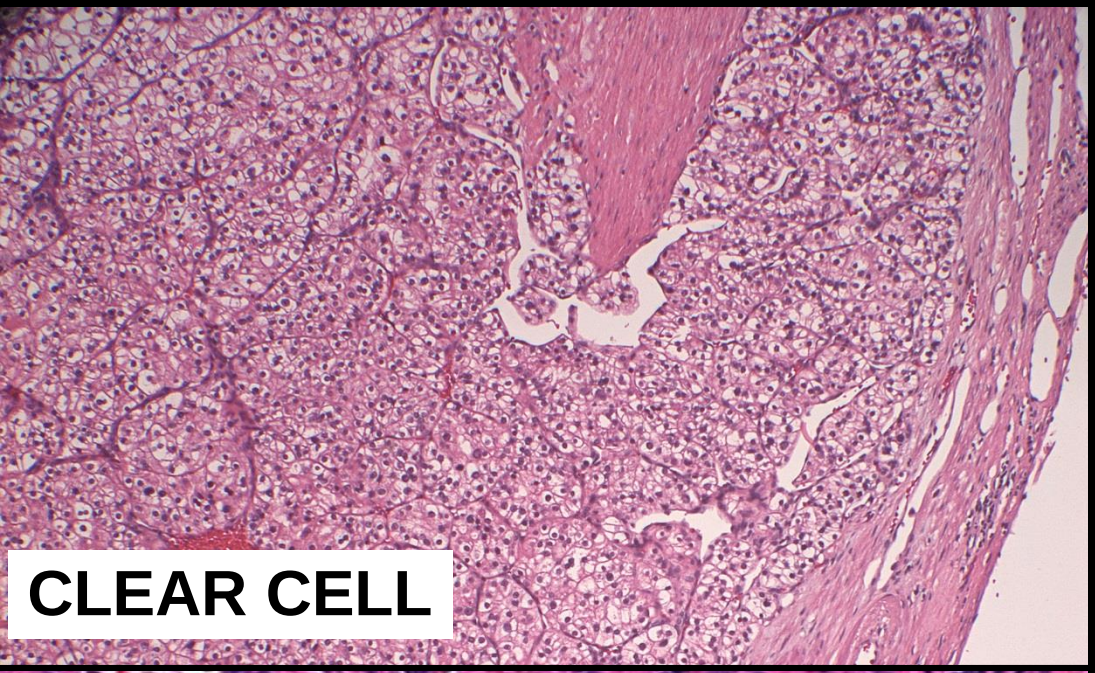
- Clear cell RCC (+)
- Papillary RCC (-/+)
- Chromophobe RCC (-)
- Oncocytoma (-)
- Urothelial Ca (+/-)

Other tumors

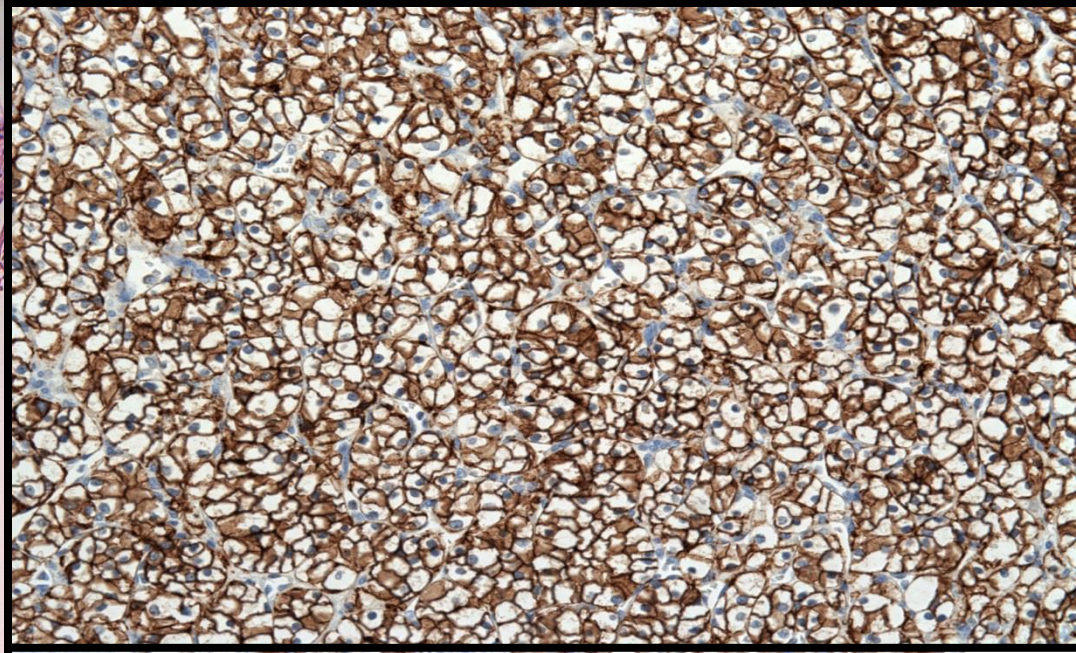
Most carcinomas of endometrium, stomach, lung, cervix, liver, breast etc.

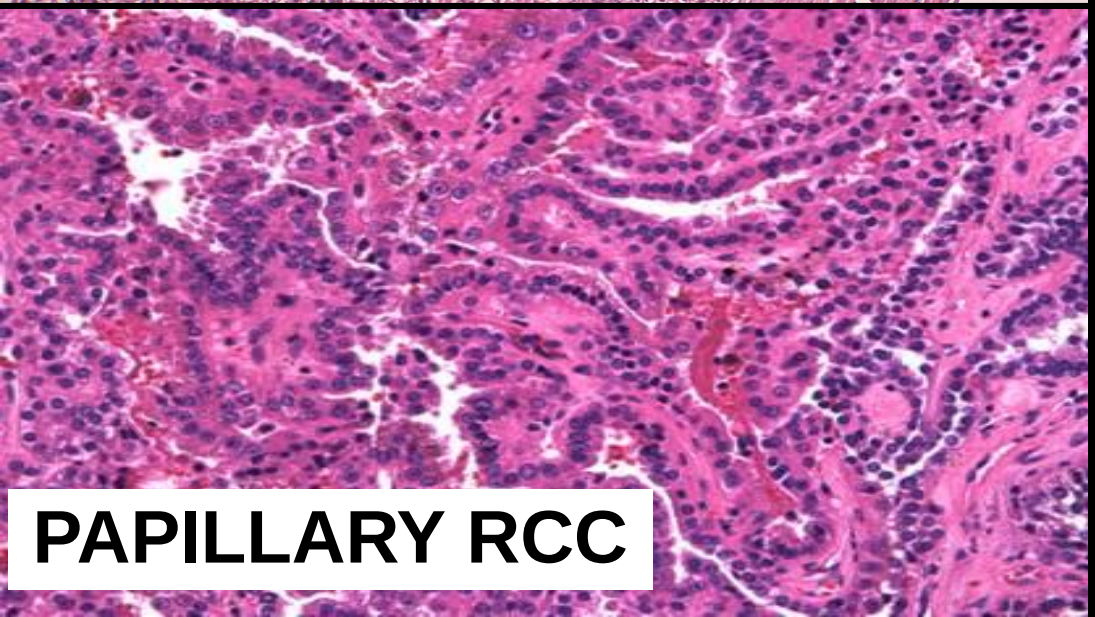
Prognostic utility of CA IX in clear cell RCC

CARBONIC ANHYDRASE IX

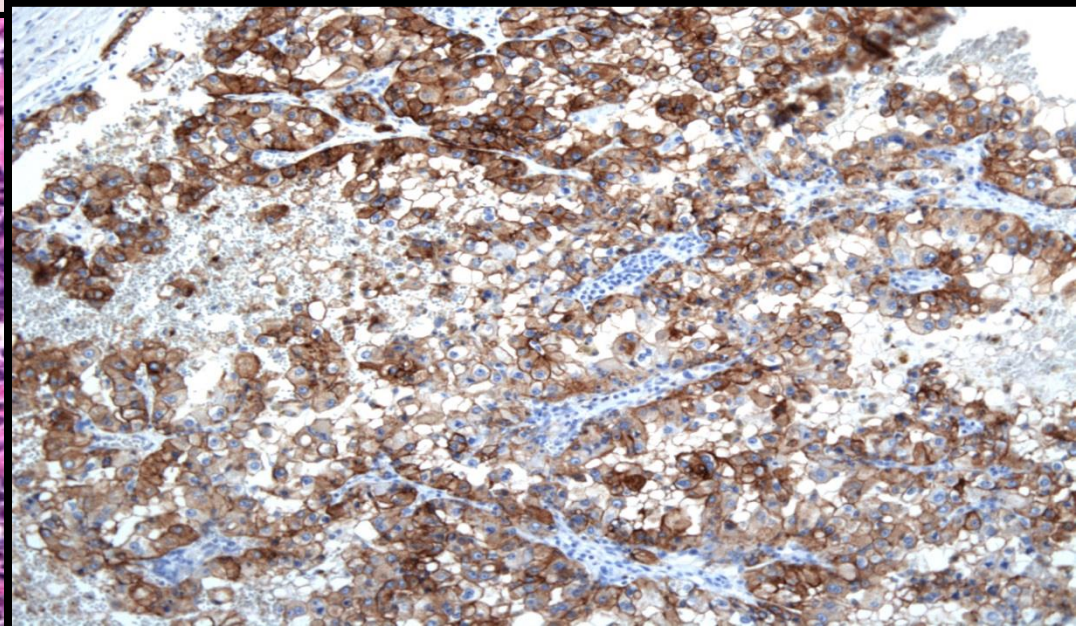


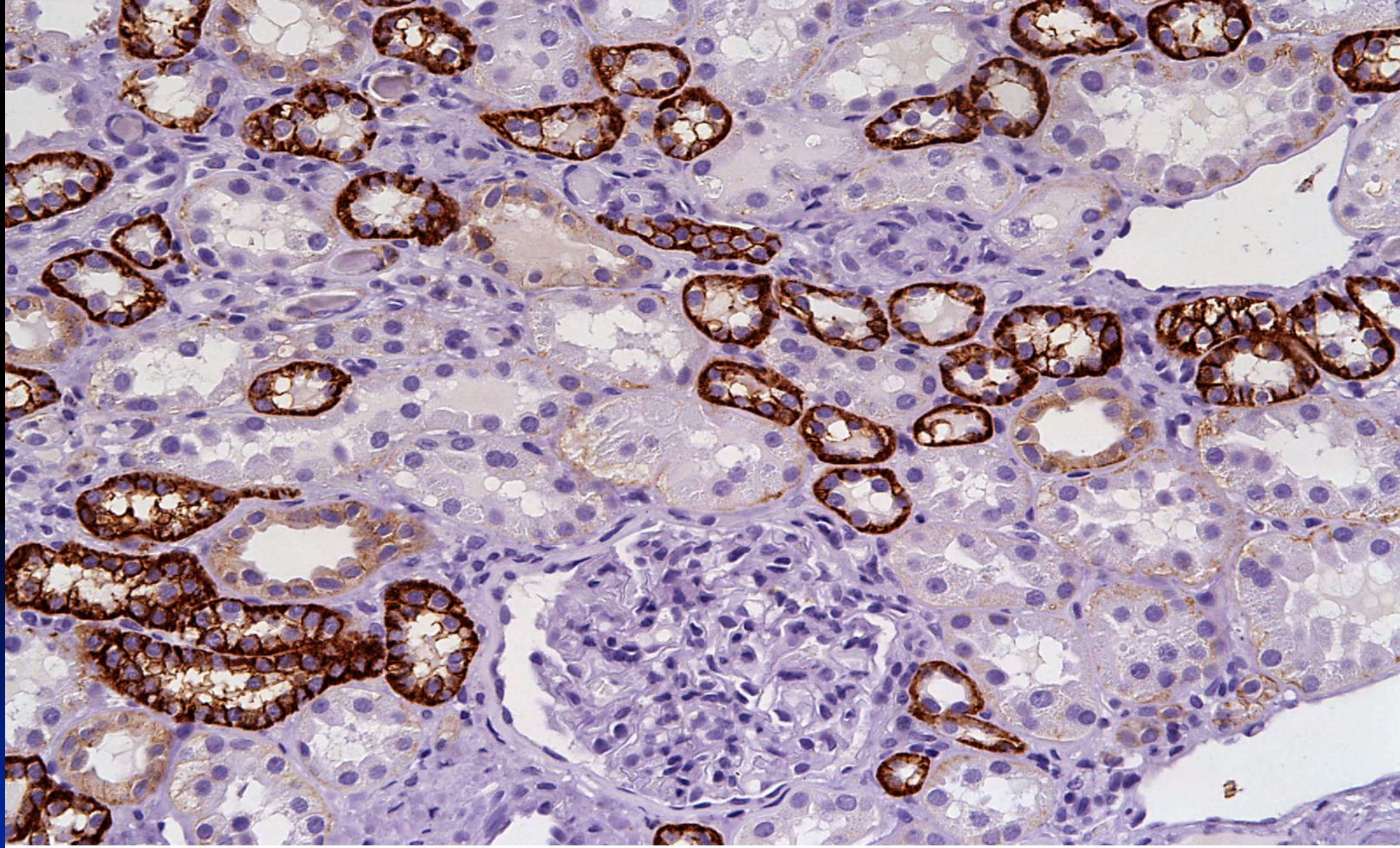
CLEAR CELL



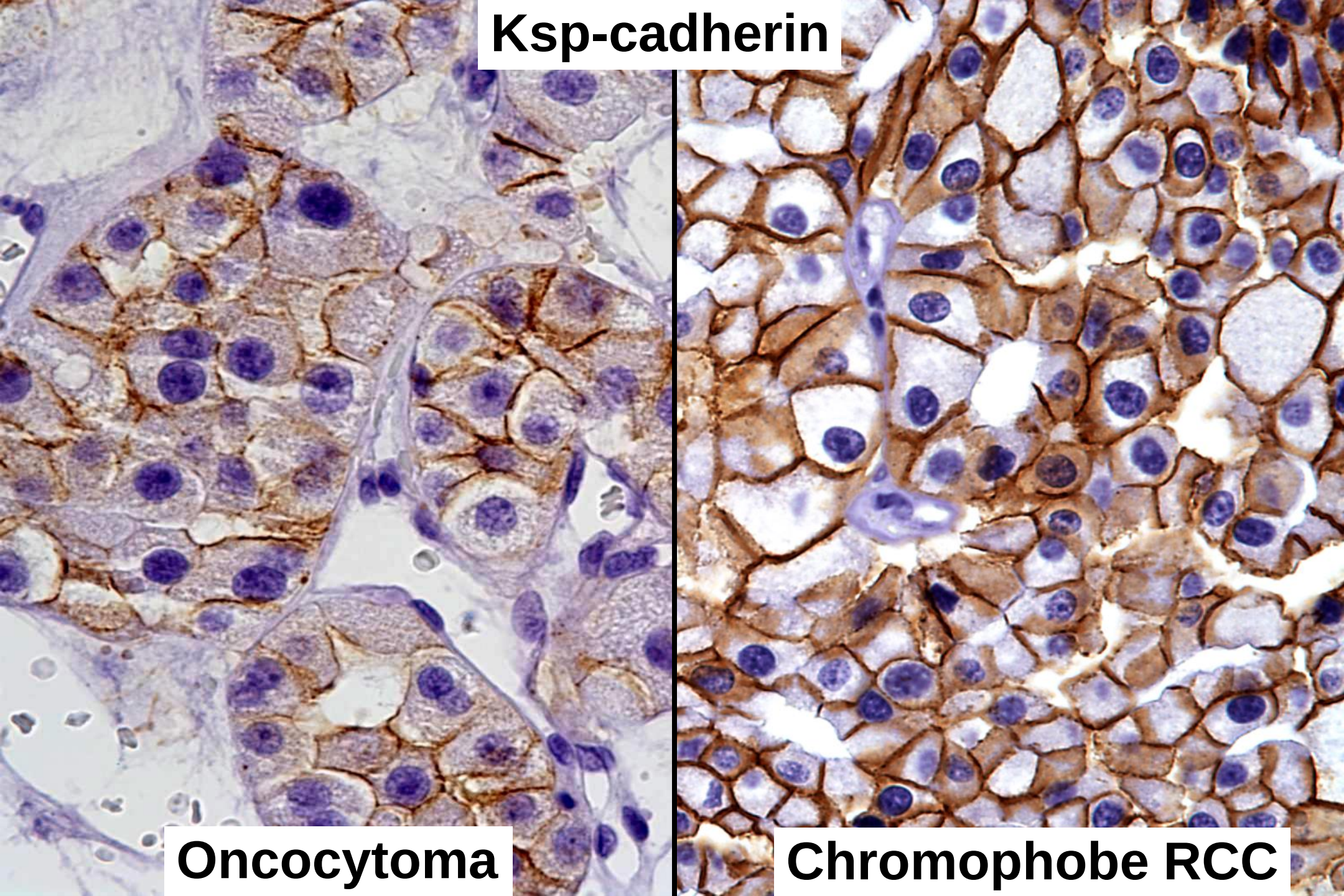


PAPILLARY RCC





Ksp-cadherin in distal convoluted tubules

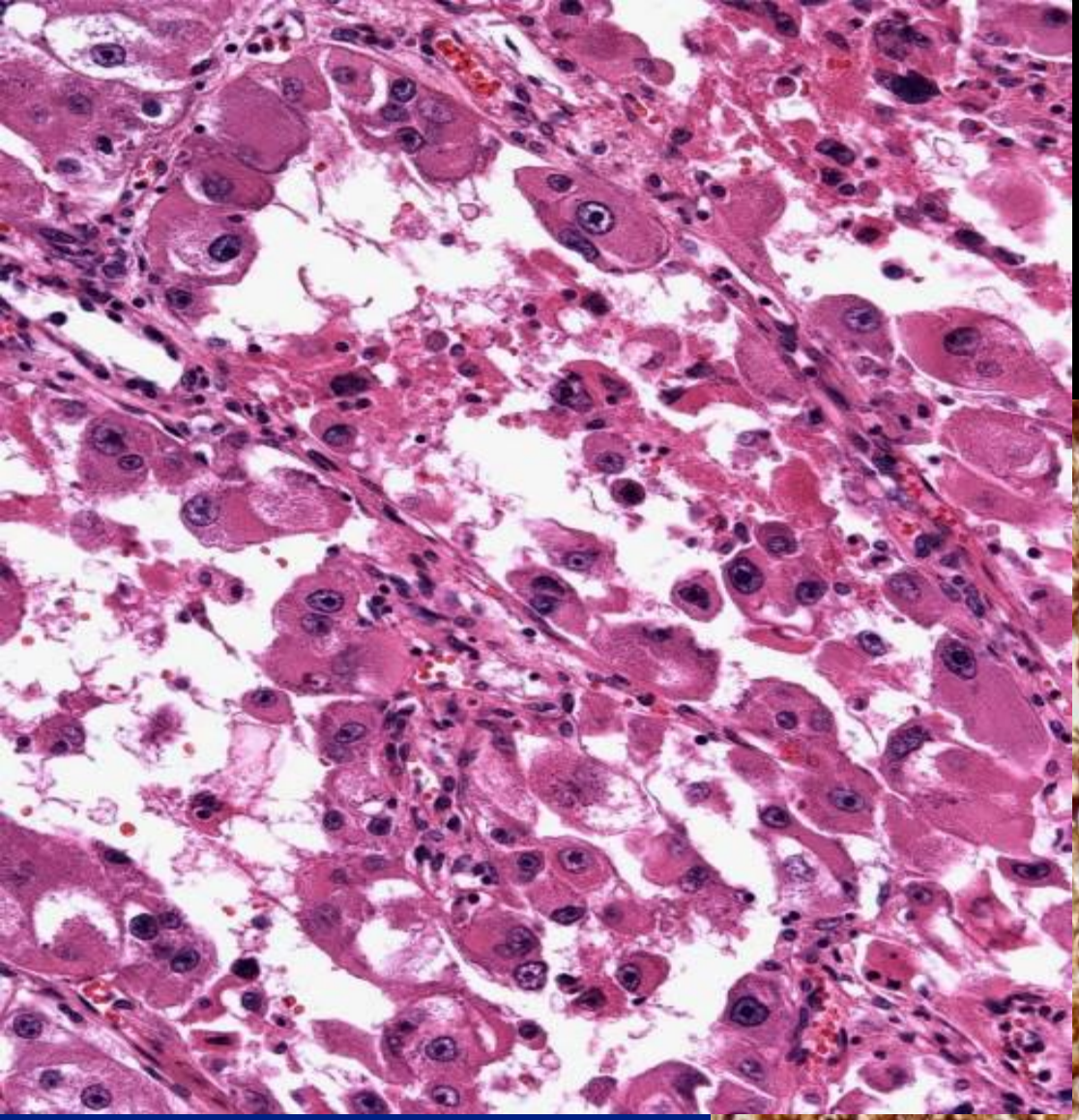

Ksp-cadherin
Oncocytoma
Chromophobe RCC

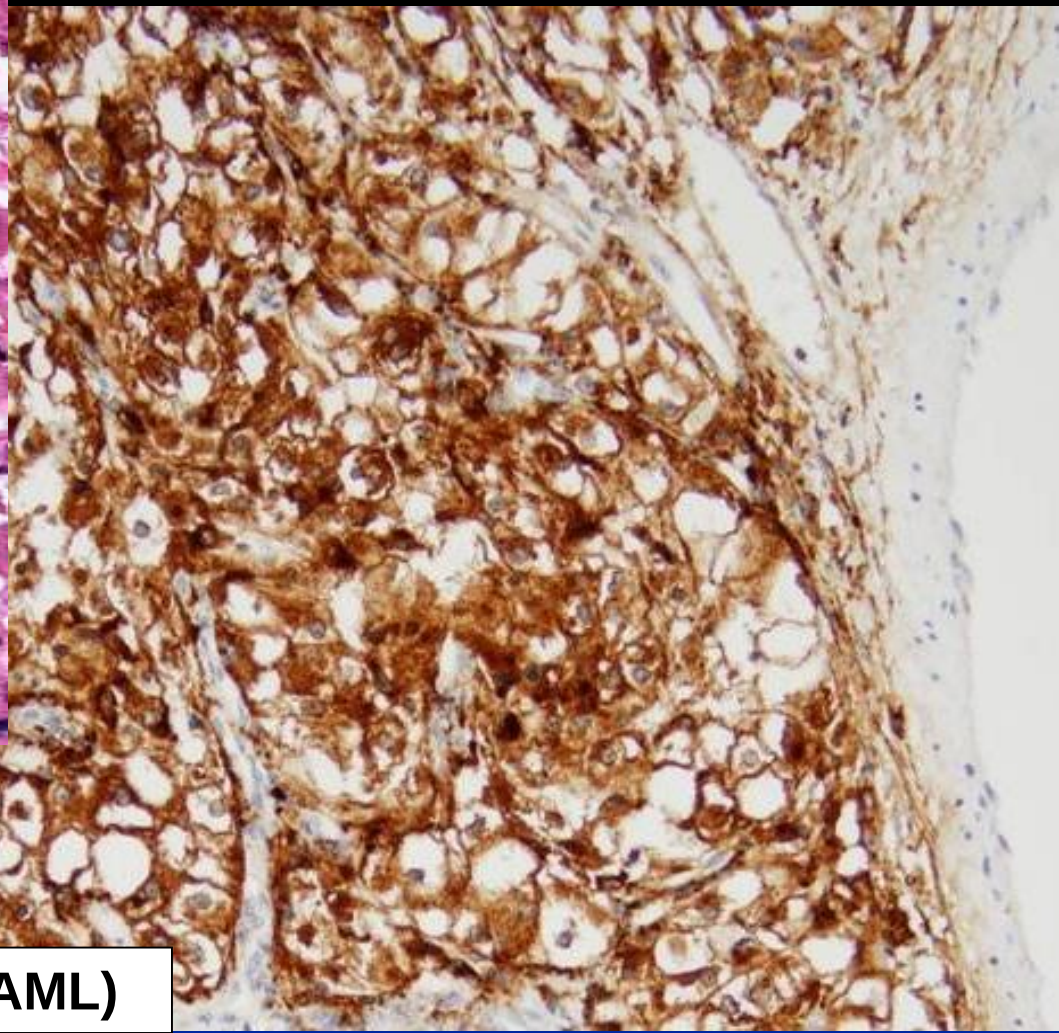
Cathepsin K

- Expression is related to overexpression of MiTF
- PEComas: moderate to strong and diffuse cytoplasmic staining is seen in all variants
  - co-expressed with other melanocytic markers (more diffuse than HMB-45)
- MiTF-TFE3 translocation associated carcinomas
  - t(X;1): >85% cases, diffuse
  - t(X;17): 0%
  - t(6;11): 100% of cases, diffuse

Other renal tumors:
Negative except nonspecific in necrotic areas

Cathepsin K





PEComa (E-AML)

CONFIRMING RENAL ORIGIN

Is the neoplasm a carcinoma?:

- **Renal "related"**
  - ***AE1/AE3 (+)***
  - ***EMA (+)***
  - ***Vimentin (+)***
  - ***CK7 (-), CK20 (-)***

Is the carcinoma a renal primary?:

- **Renal associated**
  - ***"RCC marker" (80%)***
  - ***PAX8 (>90%)***
  - ***S100A1****
  - ***CD10 (+) (94%)***

If history of renal mass and renal histogenesis markers are negative?

- Consider: Chromophobe carcinoma
  - CD117 (+) and Ksp-Cadherin (+)
- Consider: Epithelioid PEComa and translocation carcinoma
  - Cathepsin K, MelanA/HMB45

Renal Clear and Papillary Tumors

Clear cell RCC

CA-9 (+)

RCC (+)

Pax8 (+)

Vimentin (+)

Clear –Papillary RCC

CK 7(+)

Racemase (-)

HMCK (+)

RCC, CD10(-)

Papillary RCC

RCC (+)

CK7 (+)

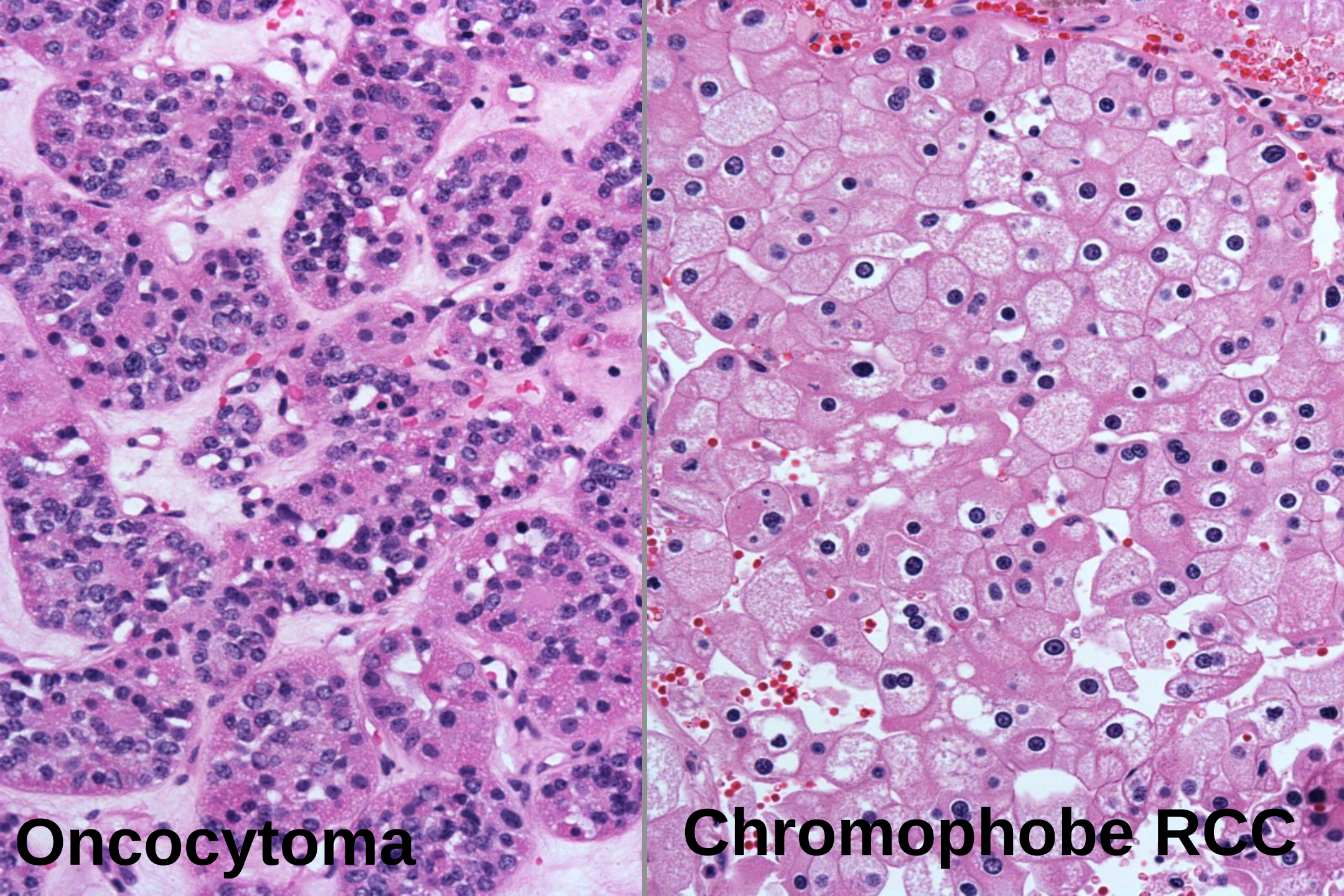
Racemase (+)

Metanephric adenoma

RCC (+)

CK7 (+)

Racemase (+)


Oncocytoma
Chromophobe RCC

Renal Oncocytic Tumors

Oncocytoma

CK 7 (- / +)

S100 A1 (+)

Barttin (cytoplasmic)

Chromophobe RCC

CK 7 (+ / -)

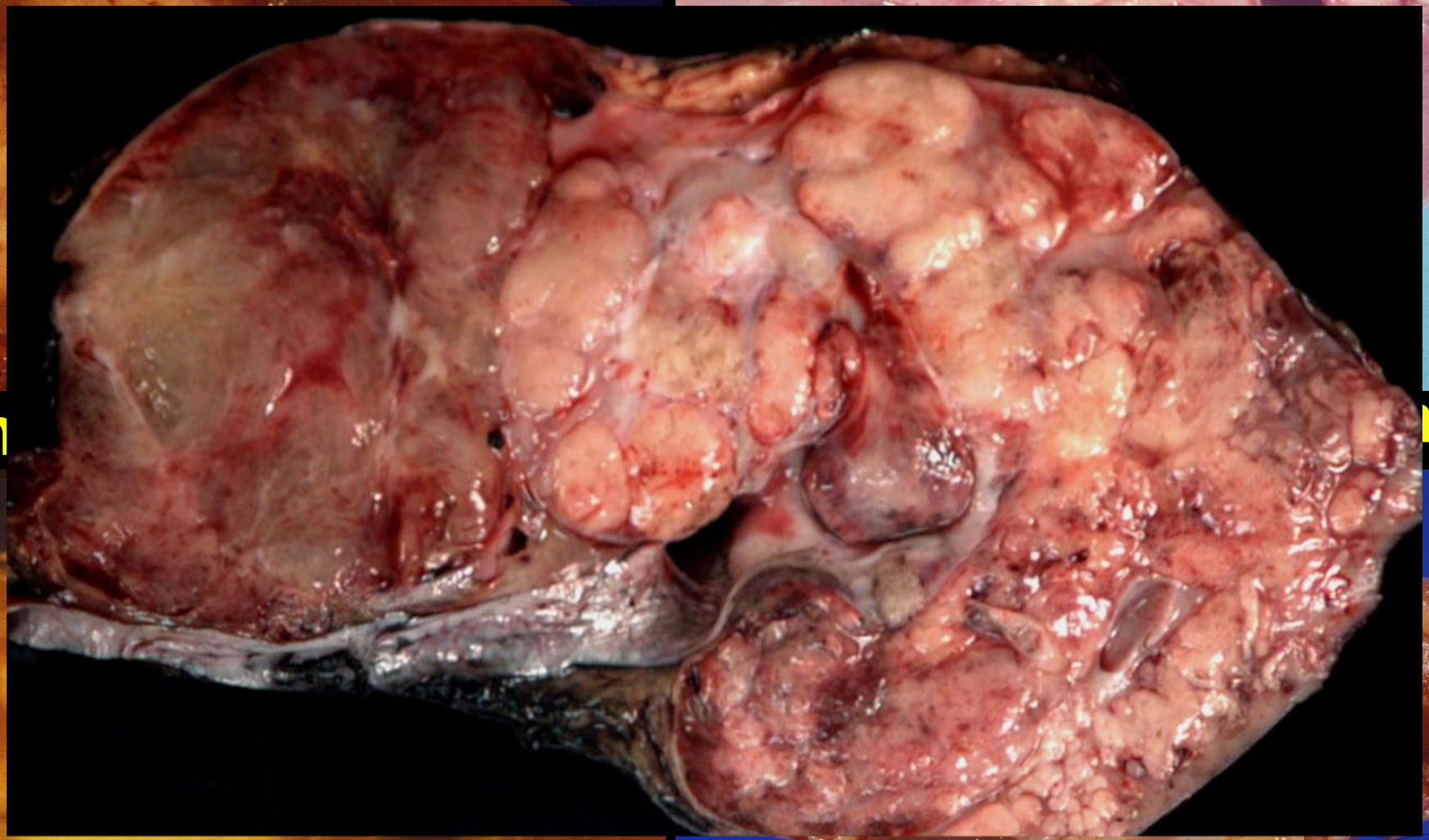
S100A1 (-)

Barttin (membranous)

Amylase 1A (AMY1A), EPCAM, Claudin and Caveolin 1 - Investigational

**Not adequately studied: preliminary data*
*Not tested in hybrid oncocytic tumors**

HLRCC-RCC



Collecting duct ca.

Urothelial carcinoma

IHC FOR HIGH GRADE DISTAL NEPHRON CA

RENAL CELL CA incl. CDC

- PAX8
- RCC
- S100 A1
- CK 7 & 20 (-)

UROTHELIAL CA

- GATA 3
- S100P
- HMCK
- P63
- Uroplakin 2
- CK 7 & 20 (+)

RENAL MEDULLARY CA

- OCT3/4 (+)
- INI1 lost (-)
- PAX8

- HLRCC-RCC/FH deficient
- FH lost (-)
- 2SC positive

CAIX and Vimentin immunoreactivity can be seen in UCa

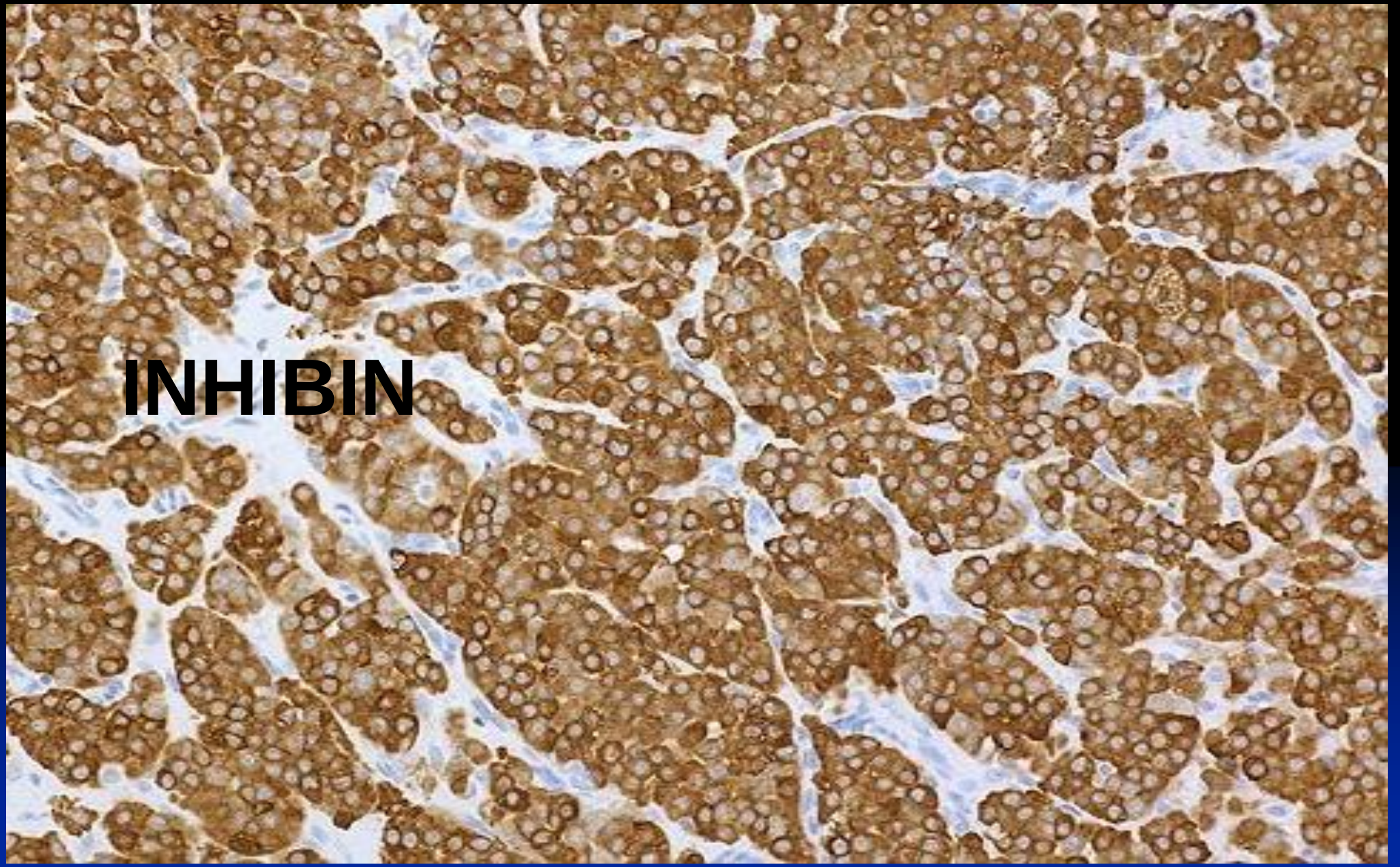
TESTIS IHC: Screening panels

- **Germ cell tumors**
  - *OCT 3/4*
  - *SALL4*
  - *PLAP*
  - *EMA(-)*
  - *Vimentin (-)*

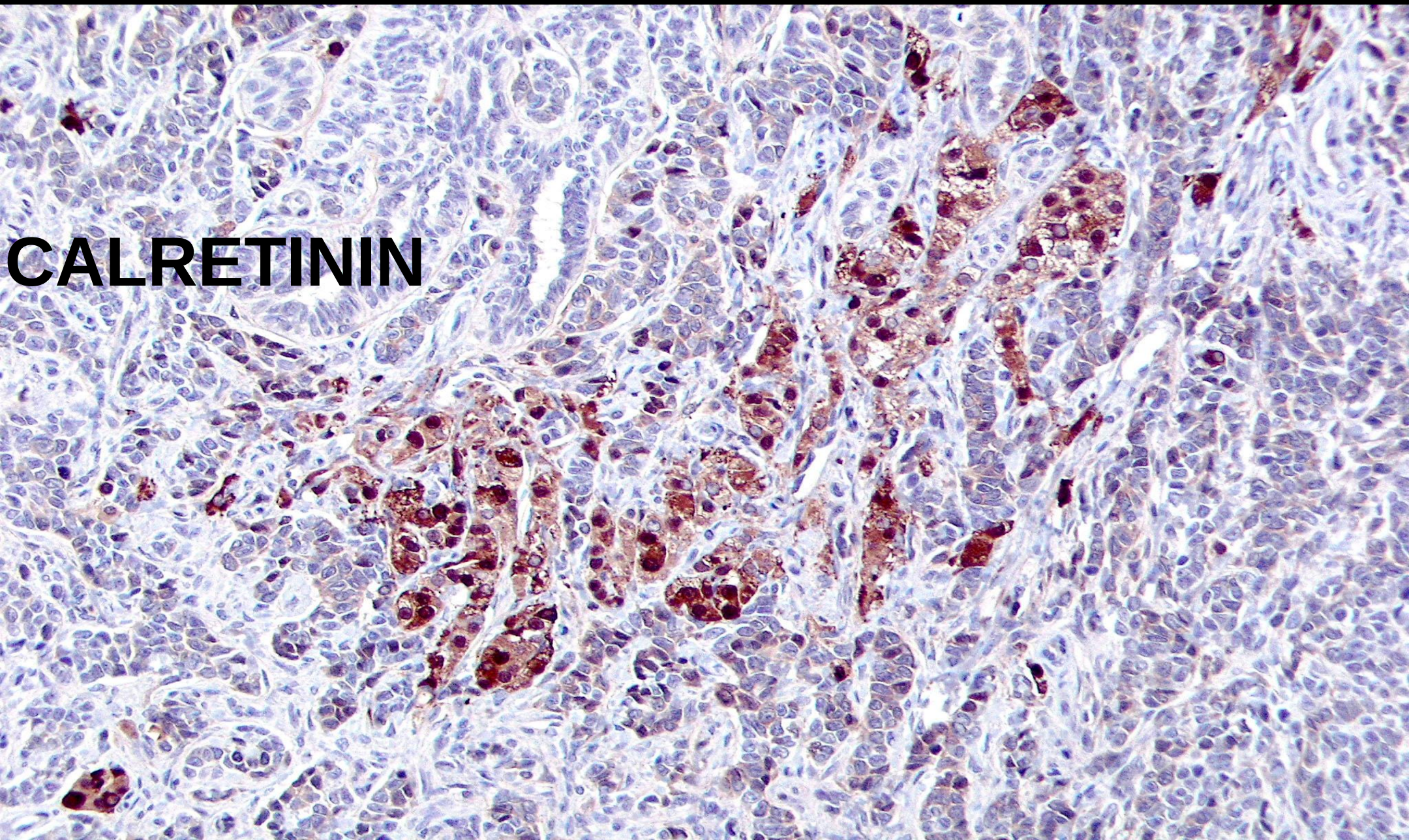
- **Sex cord tumors**
  - *SF1*
  - *Melan A*
  - *Inhibin*
  - *Calretinin*
  - *CD99*
  - *Synaptophysin*
  - *S-100*
  - *FOXL2*

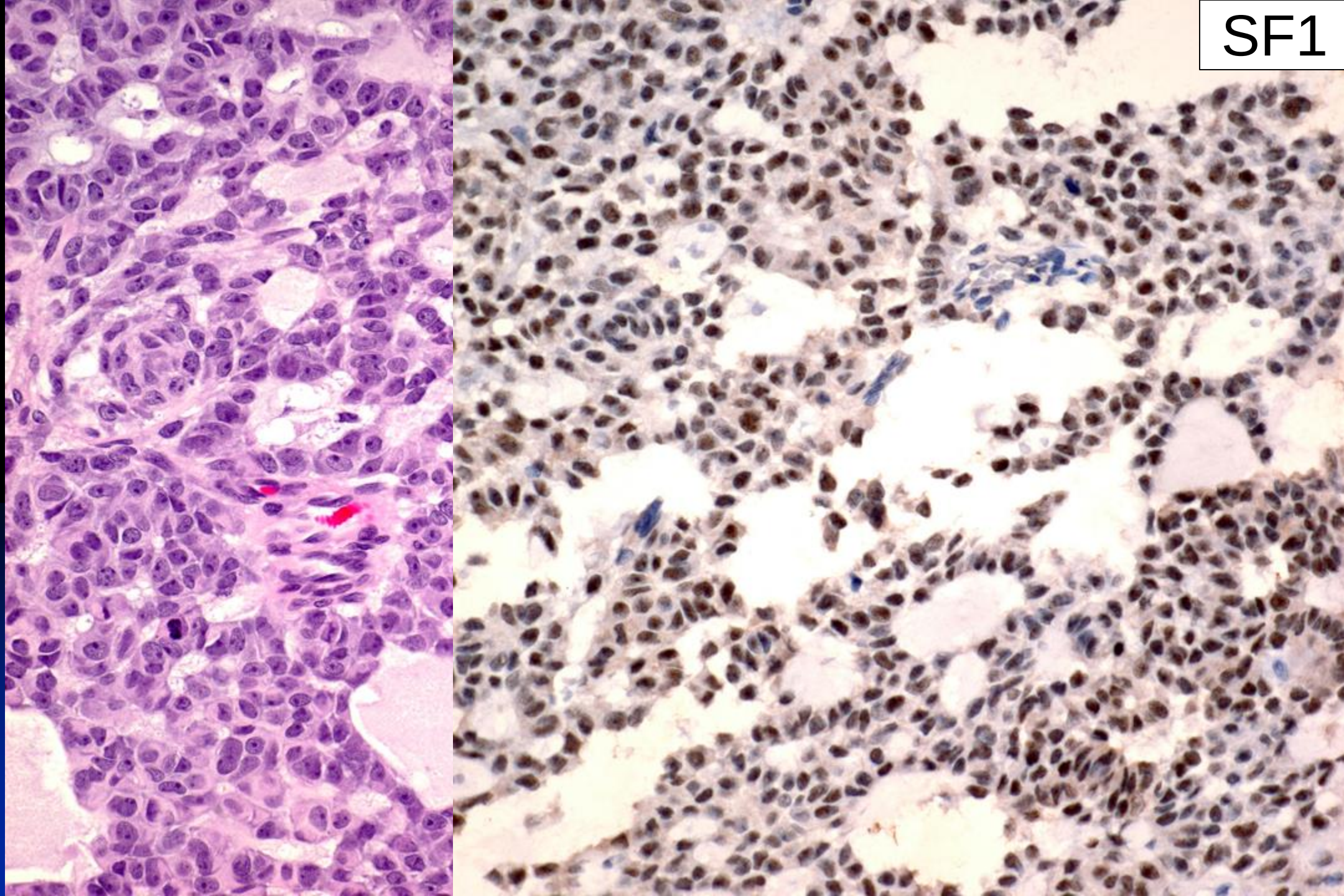
- **Lymphoma:** *CD-45, CD3, L26*
- **Visceral malignancy:** *EMA (+), vimentin (±)*

LEYDIG CELL TUMOR



SERTOLI CELL TUMOR




SF1

IHC in characterizing the different germ cell components

- There is no substitute to well (overnight) fixed sections
- Adequate sampling is key - the # of IHCs should ***NEVER*** exceed the H&E slides
- Remember what matters in germ cell tumors

GERM CELL TUMOR – What really matters?

One does not necessarily have to characterize every morphologically different focus

- Pure classic Seminoma vs. non-seminomatous components
- Mixed germ cell tumor
  - -Specify components (as accurately as you can)
  - ->80% or pure embryonal carcinoma (↓)
  - ->50% teratoma (↑)

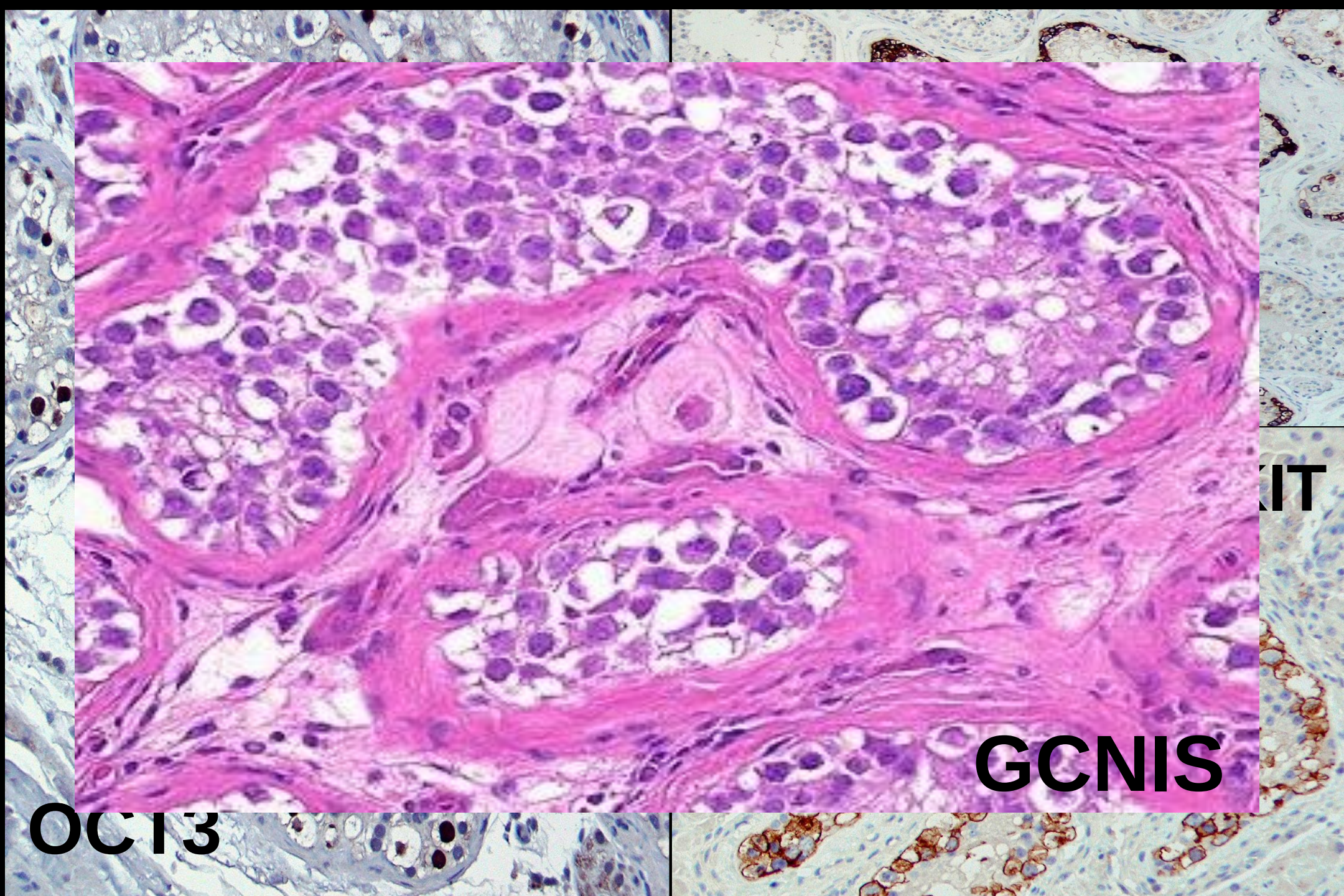
Vascular-lymphatic invasion – pathologic stage

Margin status

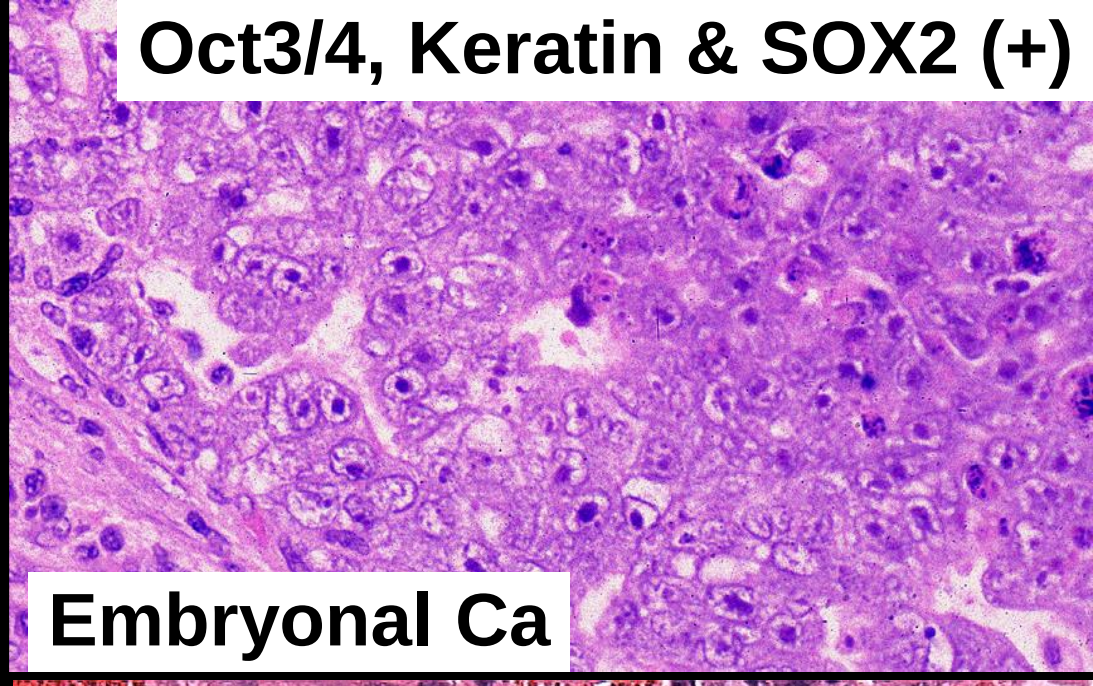
IHC IN GERM CELL TUMORS

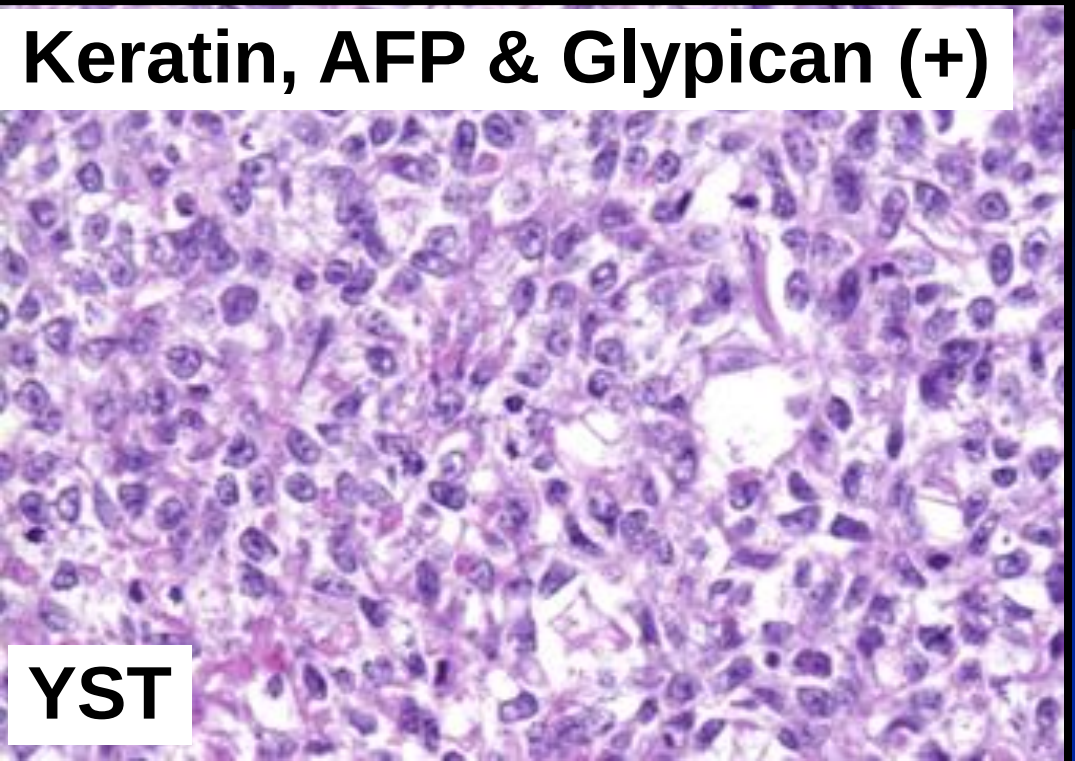
- **GCNIS:** Oct3/4, c- kit, SALL4, Podoplanin, PLAP - all (+)
- **Seminoma:** Oct3/4, c-kit, Podoplanin – all (+)
- **Embryonal Ca:** Oct3/4, CD30, SOX2, Keratin weak, – all (+)
- **YST:** Glypican, AFP, Keratin strong
- **CC:** HPL, βHCG, Glypican-syncytiotrophoblasts
- **SS:** CD117, SAL4 (weak)

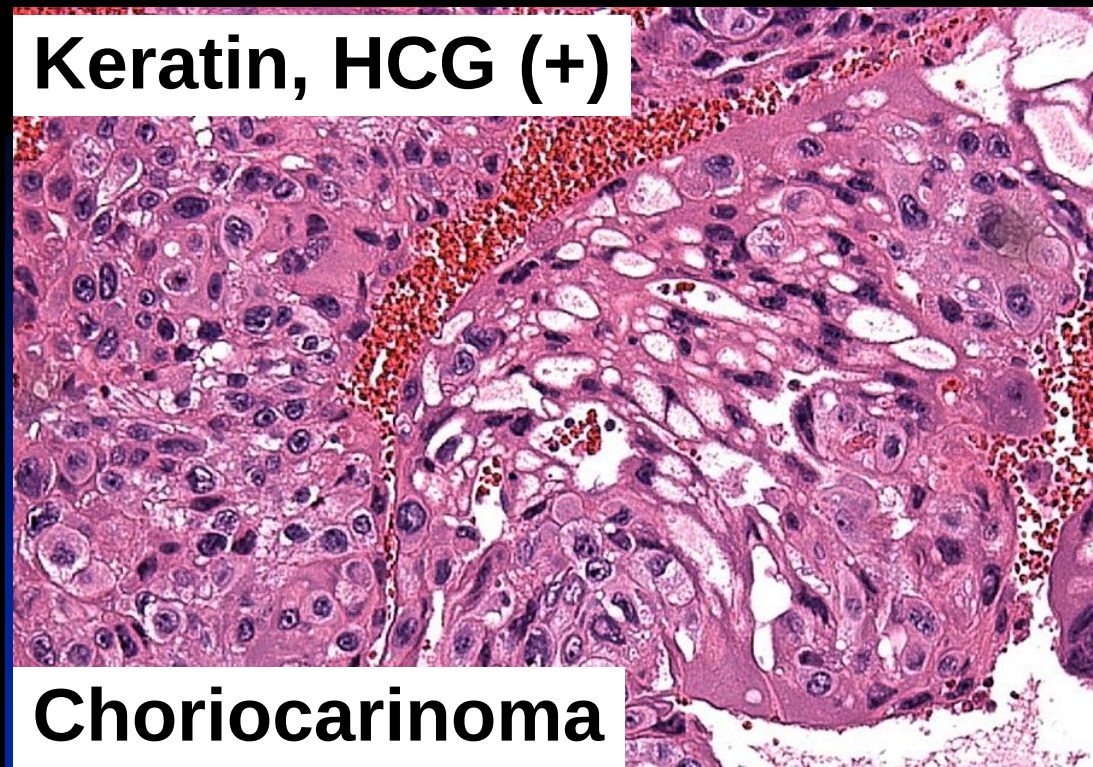
Cytokeratin AE1/AE3: *E Ca, YST, T, CC*
Oct 3/4: *Seminoma, E Ca*
PLAP: *Minimal / no value – except in GCNIS*

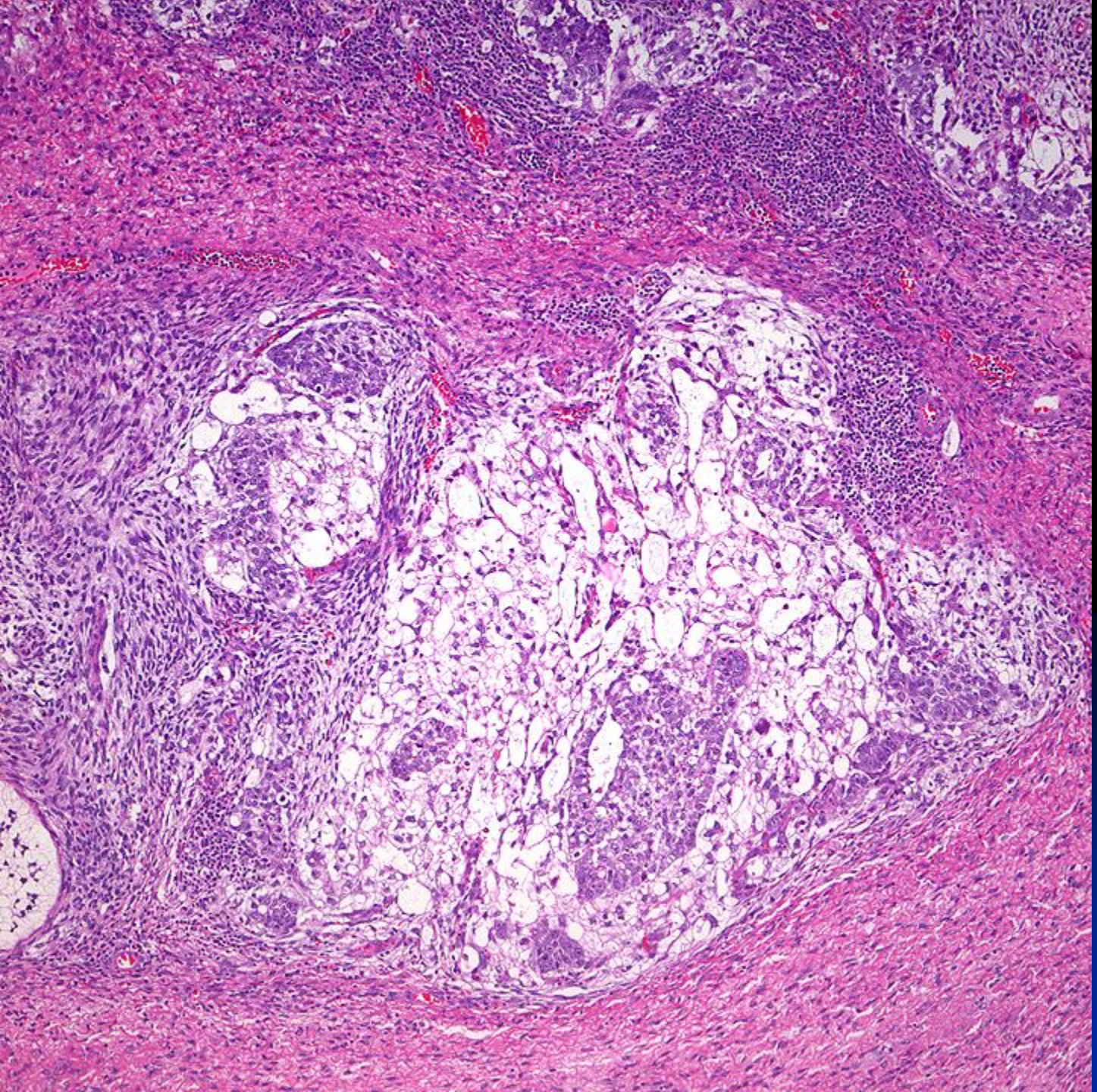

GCNIS
OCT3
IT

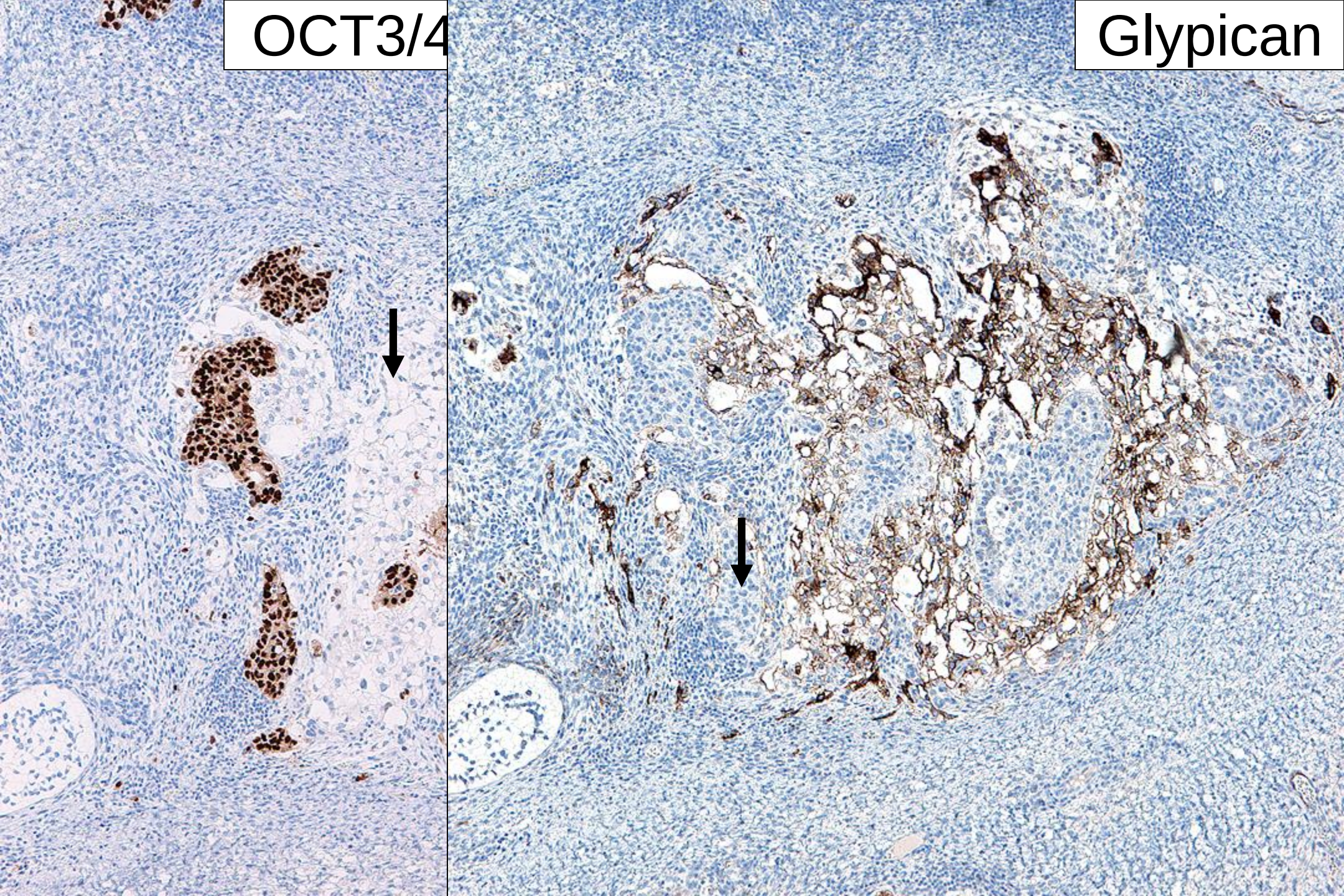

Oct3/4, podoplanin, Ckit (+)
Keratin & SOX2 (-)
Seminoma


Oct3/4, Keratin & SOX2 (+)
Embryonal Ca


Keratin, AFP & Glypican (+)
YST


Keratin, HCG (+)
Choriocarinoma




OCT3/4
Glypican