Alcian Blue Staining Kit

Material provided

REF			Σ	SYSTEM
05279186001	860-002	15103EN	75	BenchMark Special Stains

Materials required but not provided

Some products specified in the method sheet may not be available in all geographies. Consult your local support representative to confirm product availability in your area. The following reagents and materials may be required for staining but are not provided:

REF		Description
06523072001	860-034	BenchMark Special Stains Liquid Coverslip
06523102001	860-036	BenchMark Special Stains Deparaffinization Solution (10X)
08309817001	860-041	BenchMark Special Stains Wash II
		General purpose laboratory equipment
		Microscope slides, positively charged
		Recommended control tissue
		BenchMark Special Stains instrument

Intended use

The Alcian Blue Staining Kit is intended for laboratory use as a qualitative histologic stain to demonstrate weakly acidic mucopolysaccharides by light microscopy in sections of formalin-fixed, paraffin-embedded (FFPE) tissue stained on a BenchMark Special Stains instrument.

This product should be interpreted by a qualified pathologist in conjunction with histological examination, relevant clinical information, and proper controls.

This product is intended for in vitro diagnostic (IVD) use.

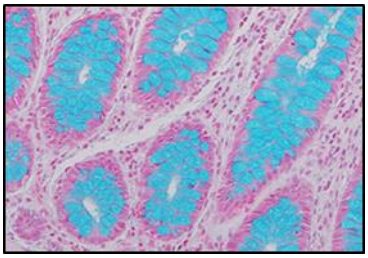

Figure 1. Alcian Blue Staining Kit stain of colon tissue.

Summary

Mucopolysaccharides (mucins) are a key component of goblet cells, intestinal mucosal epithelial cells, whose function is to synthesize and secrete mucus.[1] Goblet cells are normally found in the epithelium of the small and large intestines, and are generally absent from the esophagus or stomach.[2]

The chemical properties of Alcian Blue enable the dye to detect weakly acidic mucins in goblet cells. Polysaccharides of acidic, but not neutral, mucins are stained blue by the dye at pH 2.5.[3,4]

The Alcian Blue Staining Kit is used to aid the pathologist in the identification of goblet cells. The presence of goblet cells in the esophagus and stomach is abnormal, and the stain aids the pathologist in the diagnosis of intestinal metaplasia and Barrett's esophagus.

Test principle

The staining reaction is based on the reaction of Alcian Blue with a pH of 2.5 and polyanionic compounds. Alcian Blue is a polyvalent, basic, water soluble dye that derives its blue color from the copper phthalocyanine group which is modified with cationic solubilizing agents.[3,5] During this reaction, salt linkages are formed between Alcian Blue and the acid groups of the acid mucopolysaccharides, staining them blue. The Nuclear Fast Red Counterstain is applied to provide a pink contrasting background.

This kit is optimized for use on BenchMark Special Stains instruments. The reagents are applied to tissue on microscope slides and mixed over the entire specimen.

Reagent

The reagent vials are supplied in barcode labeled carriers to insert into the reagent tray of the instrument. Each kit contains sufficient reagent for 75 tests:

One 22 mL vial of Alcian Blue contains 1.2% alcian blue in a 3% acetic acid solution.

One 22 mL vial of Nuclear Fast Red Counterstain contains approximately 0.2% nuclear fast red and approximately 5% aluminum sulfate.

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Two vial inserts with Special Stains Stopper and Tube.

Warnings and precautions

1. For in vitro diagnostic (IVD) use.
2. For professional use only.
3. Do not use beyond the specified number of tests.
4. Positively charged slides may be susceptible to environmental stresses resulting in inappropriate staining. Ask your Roche representative for more information on how to use these types of slides.
5. Materials of human or animal origin should be handled as biohazardous materials and disposed of with proper precautions. In the event of exposure, the health directives of the responsible authorities should be followed.[7,8]
6. Avoid contact of reagents with eyes and mucous membranes. If reagents come in contact with sensitive areas, wash with copious amounts of water.
7. Avoid microbial contamination of reagents as it may cause incorrect results.
8. Consult local and/or state authorities with regard to recommended method of disposal.
9. Product safety labeling primarily follows EU GHS guidance. Safety data sheet available for professional user on request.

This product contains components classified as follows in accordance with the Regulation (EC) No. 1272/2008:

Table 1. Hazard information.

		
DANGER		
Hazard	H318	Causes serious eye damage.
Prevention	P280	Wear eye protection/ face protection.
Response	P305+ P351+ P338+ P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
Hazardous components	7784-31-8	Aluminum sulfate octadecahydrate

Storage and stability

Alcian Blue Staining Kit should be stored at 15-30 °C.

When properly stored, unopened reagents are stable to the date indicated on the label.

Do not use reagent beyond the expiration date indicated on the kit.

When properly stored, open reagents are stable to the expiration date indicated on the kit.

There are no obvious signs to indicate instability of these reagents; therefore, controls should be run simultaneously with unknown specimens. Contact your local support representative if positive control material shows a decrease in staining as it could indicate reagent instability.

Quality control

An example of a positive control material would be FFPE human tissue with acid mucins or acid mucopolysaccharides present, such as colon or small intestine. Control tissue should be fresh autopsy, biopsy, or surgical specimen prepared or fixed as soon as possible in a manner identical to test sections. Such tissues should monitor all steps of the analysis, from tissue preparation through staining.

Use of a tissue section fixed or processed differently from the test specimen provides control for all reagents and method steps except fixation and tissue processing. The cellular components of other tissue elements may serve as the negative control.

Optimal laboratory practice is to include a positive control section on the same slide as the test tissue. This helps identify any failures applying reagents to the slide. Control tissue may contain both positive and negative staining elements and serve as both the positive and negative control.

The control tissue must be tested with each run.

Known positive tissue controls should only be utilized for monitoring the correct performance of processed tissues and test reagents, not as an aid in formulating a specific diagnosis of patient samples.

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If the positive tissue components fail to demonstrate positive staining, results with the test specimens should be considered invalid. If the negative components demonstrate positive staining, results with patient specimens should also be considered invalid.

Unexplained discrepancies in control results should be referred to the local support representative immediately. If quality control results do not meet specifications, patient results are invalid. The cause must be identified and corrected, and the patient samples repeated.

Specimen collection and preparation

Routinely processed FFPE tissues are required for use with this product and BenchMark Special Stains instruments. The recommended tissue fixative is 10% neutral buffered formalin.[6]

Perform specimen collection and storage according to Histotechnology: A Self Instructional Text.[6] Cut sections to the appropriate thickness, approximately 4 µm, and place the sections on positively charged glass slides.

1. Dry the slides.[6]
2. Print appropriate barcode label(s).
3. Apply barcode labels to the frosted end of the slides prior to loading the slides onto the instrument (see the instrument User Guide for correct application of labels).

Refer to the Instructions for Use section for the recommended protocol for the BenchMark Special Stains instrument.

Test procedure

Prepare reagent vial

Before first use, a Special Stains Stopper and Tube (Polypipette tip) must be placed in the reagent vial.

Remove the shipping cap from the vial and place the Special Stains Stopper and Tube into the vial. The Special Stains Stopper and Tube should be left in the vial, once the vial has been opened.

Staining procedure

1. Load reagents and slides onto the instrument.
2. Place the soft cap into the slot on the reagent holder when the reagent is in use.
3. Perform the staining run according to the recommended protocol in Table 2, and the instructions in the User Guide.
4. When the run is complete, remove the slides from the instrument.
5. Use the soft cap to cover the reagent vial when reagent is not in use.
6. After use, store the reagents according to the recommended storage conditions.

Recommended protocol

The parameters for the automated procedures can be displayed, printed and edited according to the procedure in the instrument User Guide.

The following procedures allow flexibility to accommodate user preference. This product has been optimized for use with BenchMark Special Stains instruments but the user must validate results obtained with this product.

Table 2. Recommended staining protocol for Alcian Blue Staining Kit on a BenchMark Special Stains instrument.

Staining Procedure	S Alcian Blue
Protocol Step	**Method**
Deparaffinization	Select to automate paraffin removal
Baking **(optional)**	The default is not selected 75 °C for 4 minutes is recommended
Optimize Stain Intensity **(Alcian Blue)**	The default time is 8 minutes. Select to enable the adjustment of staining intensity:[a] Select an incubation time from 4 to 20 minutes: 4 min, lighter staining of mucin 20 min, darker staining of mucin

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Staining Procedure	S Alcian Blue
Protocol Step	**Method**
Optimize Counterstain Intensity (Alcian Blue NFR)	The default time is 4 minutes. Select to enable the adjustment of counterstain intensity:[a] Select an incubation time from 4 to 16 minutes: 4 min, lighter counterstain 16 min, darker counterstain

[a] To adjust staining preferences, increment the stain temperature and incubation time one parameter at a time.

Recommended post-instrument processing

1. Dehydrate slides in two changes of 95% ethanol to remove the leftover solution, followed by three changes of 100% ethanol.
2. Clear slides in 3 changes of 100% xylene.
3. Coverslip with permanent mounting media.
4. Compatible with the VENTANA HE 600 system coverslipping protocol. For further instructions, refer to the VENTANA HE 600 system User Guide.

Interpretation of results

Alcian Blue Staining Kit is tested upon manufacture to demonstrate weakly acidic mucopolysaccharides.

- Weakly Acidic Mucopolysaccharides (mucins): Bright Blue
- Nuclei: Pink to Red
- Cytoplasm: Pink

Blue staining has been observed in non-goblet cells.

Limitations and interferences

Only positively charged microscope slides have been used and validated for this assay.

Dilution

No reconstitution, mixing, dilution, or titration of kit reagents is required. Further dilution of any of the reagents may result in unsatisfactory staining.

The reagents in this kit have been optimally diluted for use on BenchMark Special Stains instruments.

Analytical performance data

Staining tests for sensitivity, specificity, and precision were conducted and the results are listed below.

Sensitivity and specificity

Analytical sensitivity and specificity for normal and diseased gastrointestinal tissues was evaluated. Sixty-one out of 62 (98.4%) evaluated tissue cases passed for acceptable staining as shown in Table 3 and Table 4.

Table 3. Sensitivity/Specificity of Alcian Blue Staining Kit was determined by testing the following FFPE normal tissues.

Tissue	# cases passed / # tested
Esophagus	7/7
Stomach	10[a]/11
Small Intestine	9/9
Colon	5/5

[a] In one case, excessive amount of blue staining was observed in non-goblet cells

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Table 4. Sensitivity/Specificity of Alcian Blue Staining Kit was determined by testing the following FFPE diseased tissues.

Tissue	# cases passed / # tested
Intestinal Metaplasia (Stomach)	8 / 8
Intestinal Metaplasia (Esophagus)	8 / 8
Barrett's Esophagus	14 / 14

Precision

Precision of Alcian Blue Staining Kit was determined across multiple runs, days, instruments, and reagent lots using multiple cut slides from 3 normal colon tissue cases and 3 normal small intestine tissue cases. All acceptance criteria were fully met. Precision slide studies were performed for the Alcian Blue Staining Kit according to Table 5.

Table 5. Precision slide studies for Alcian Blue Staining Kit.

Parameters Tested	# of conditions	# slides passed / # tested
Run to Run	3 runs, same day	54 / 54
Day to Day	5 days	90 / 90
Instrument to Instrument	3 instruments	54 / 54
Intra Run	same day, same instrument	54 / 54
Lot to lot	3 lots	54 / 54

Troubleshooting

1. Section thickness may affect quality and intensity of staining. If staining is inappropriate, contact your local support representative for assistance.
2. Necrotic or autolyzed tissue may exhibit nonspecific staining.
3. If the positive control is negative, tissue may have been improperly collected, fixed, or deparaffinized. Follow the proper procedure for collection, storage, and fixation.
4. If the positive control is negative, check that the slide has the proper barcode label. If the slide is labeled properly, check the other positive controls from the same run to determine if the controls were properly stained.
5. If excessive background staining occurs: incomplete paraffin removal could cause staining artifacts or no staining. If all paraffin is not removed from the slide, repeat the staining run using the extended deparaffinization option, if available.
6. If tissue sections wash off the slide, confirm the slides are positively charged.
7. Extended stay of the slides on the instrument after run completion may affect quality and intensity of the staining.
8. For corrective action, refer to the Instructions for Use section, the instrument User Guide or contact your local support representative.

Customer support

Contact your Roche representative for assistance. A list of all Roche affiliates can be found at:
www.roche.com/worldwide

Additional information

- For further information, refer to the User Guide for the corresponding instrument, to the corresponding application sheets, and to the Method Sheets of all necessary components (if available in your country).
- A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the boundary between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.
- Report any serious incident that has occurred in relation to the device to the manufacturer and the competent authority of the member state in which the user and/or patient is established.

Symbols

For definition of symbols used, refer to elabdoc-prod.roche.com/eLD/web/symbols.

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References

1. Dao D, Le, PH. Histology, Goblet Cells. In:04/09/2020 ed. Treasure Island, FL: StatPearls; 2020.
2. Pleskow D, Tolga E. Barrett's Esophagus: Emerging Evidence for Improved Clinical Practice. Elsevier Inc.; 2016.
3. Scott JE. Alcian dyes: I.C.I. cease manufacture and release details of composition. Histochemie. 1973;37(4):379-380.
4. Scott JE, Quintarelli G, Dellovo MC. The chemical and histochemical properties of Alcian Blue. I. The mechanism of Alcian Blue staining. Histochemie. 1964;4(2):73-85.
5. Fagan C, Dapson RW, Horobin RW, Kiernan JA. Revised tests and standards for Biological Stain Commission certification of Alcian blue dyes. Biotech Histochem. 2020;95(5):333-340.
6. Carson FL, Cappellano C. Histotechnology; A Self-Instructional Text, 5th edition. American Society for Clinical Pathology Press; 2020, 2022.
7. Occupational Safety and Health Standards: Occupational exposure to hazardous chemicals in laboratories. (29 CFR Part 1910.1450). Fed. Register.
8. Directive 2000/54/EC of the European Parliament and Council of 24 June 2020 on the protection of workers from risks related to exposure to biological agents at work.

IVD CE

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Revision history

Important edits to the latest revision of this method sheet are included in this section. Minor edits are not listed. This is not a comprehensive history of the document.

Updated sections or content in this revision include:

- Warnings and precautions
- Administrative update, no change to content