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Immunohistochemical Detection of *Helicobacter pylori*

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Introduction

Helicobacter pylori is easily demonstrated in formalin-fixed, paraffin-embedded tissue sections by established and modified Avidin-biotin immunochemical methodology.[1-3] The use of rabbit polyclonal antibody specific to *H. pylori* offers increased sensitivity in detection and allows confirmatory identification of this unique bacterium[4,5] as compared to the use of conventional special stains which can stain other bacteria present in the stomach.[6]

Materials and Methods

The following procedure is used daily in our laboratory and produces consistent and reliable results. The majority of gastrointestinal specimens submitted to pathology in buffered formalin are small biopsies and may have been processed with a shorter fixation and processing schedule. Our experience has shown pepsin enzyme digestion is optimal when demonstrating *H. pylori* in formalin-fixed tissue sections. However, overdigestion can deteriorate the sections. This problem is eliminated by treating the cleared and hydrated tissue sections with buffered formalin prior to applying the stable pepsin. With minor changes, this protocol can be utilized with many primary antibodies. Modifications, such as deleting the proteolytic enzyme step, adding a heat/microwave antigen recovery protocol, using monoclonal primary antibodies, and employing a different secondary antibody (such as biotin-labeled goat anti-mouse IgG), can give the laboratory a reliable and stable immunohistochemical staining system. Purchasing reagents from concentrated stocks and preparing them yourself can reduce cost and produce an economical immunostaining system. Key reagents and materials used in this procedure are available from the following sources:

Rabbit anti-*Helicobacter pylori* and phosphate buffered saline (PBS):
Dako Corp., Carpinteria, CA.

Biotinylated goat anti-rabbit IgG (H&L):
Vector Laboratories, Burlingame, CA.

Horseradish peroxidase labeled streptavidin:
Jackson Immuno Research Laboratories, West Grove, PA.

Pepsin bovine albumin, and 3,3' diaminobenzidine tetrahydrochloride:
Sigma Chemical Co., St. Louis, MO.

IN THIS ISSUE

afety Requirements

afety glasses	Gloves
ask	Laboratory coat or apron

icrotomy

araffin sections cut at 4 to 5 micron thickness are ken from formalin-fixed tissue blocks.

quipment

lus treated microscope slides, Fisher Scientific 12-550-15

oplin jars or	Graduated cylinders
ain dishes	Volumetric flasks
rlenmeyer flasks	Calibrated pipets (1-5 mL)
ipeting devices	Calibrated capillary
asteur pipets	micropipets
imwipe tissues	Humidity-controlled
0°C incubator	incubation chamber
H meter	Analytical balance

eagents

ylene	100% Ethanol
5% Ethanol	Absolute methanol
0% Hydrogen	Deionized water
peroxide	Neutral buffered formalin

odium azide

odium phosphate dibasic, anhydrous, Fisher Scientific #S3741

otassium phosphate monobasic, anhydrous, Fisher Scientific #P284-500

odium chloride, Fisher Scientific #S671-3

onimmune goat serum, JRH BioSciences #12-03177P

epsin, proteolytic enzyme, Sigma Chemical Co. #P7012 10X

utomation buffer, Biomeda Corporation #M30

Bovine serum albumin (BSA), Sigma Chemical Co. #A7638

abbit anti-*Helicobacter pylori*, Dako Corporation #B471

iotin-labeled goat anti-rabbit IgG (H&L), 1.5 mg, Vector Laboratories #BA1000

lorseradish peroxidase (HRPO) labeled streptavidin, Jackson Immuno Research Laboratories #016-030-084

rizma Base, Sigma Chemical Co. #T1503

rizma HCl, Sigma Chemical Co. #T3253 3,3'-Diaminobenzidine tetrahydrochloride (DAB), Sigma Chemical Co. #D5637

lematoxylin, modified Harris, Fisher Scientific #SH26-4D

mmonium hydroxide

ydrochloric acid (concentrated)

M Sodium hydroxide

pH 7.0 and 2.0 buffer standards

pH electrode storage solution, Fisher Scientific #SE40-1

Reagent Preparation

1.875% Hydrogen Peroxide in Methanol

Add 3 mL of 30% H_2O_2 to 45 mL of methanol (1:16 ratio). Wear gloves and eye protection when using 30% H_2O_2. Prepare fresh and use within 1 hour. Hydrogen peroxide is used to block endogenous peroxidase activity that is found in neutrophils and red blood cells.

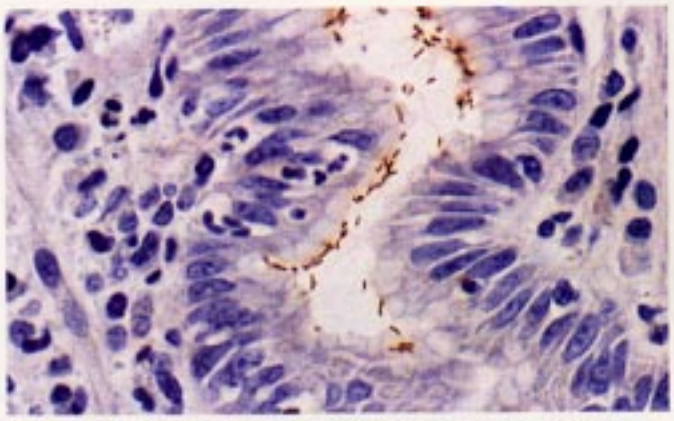

Fig 1. — Gastric biopsy demonstrating *Helicobacter pylori* bacterium. × 240.

Phosphate Buffered Saline (PBS), 0.01M, pH 7.2

PBS is used as a buffer wash solution where required during immunostaining protocols. PBS is also used as the base for preparation of nonimmune blocking serum and BSA antibody diluent. Dissolve the following reagents in 700 mL distilled or deionized water and QS to 1000 mL.' Check and adjust pH to pH 7.2 if necessary. Increase the measurements as needed for larger volumes of PBS. Preweighed, combined packets of sodium phosphate dibasic, potassium phosphate monobasic, and sodium chloride can also be prepared in advance then dissolved for later use.

1.48 g sodium phosphate dibasic, anhydrous
0.43 g potassium phosphate monobasic, anhydrous
7.2 g sodium chloride

5% Blocking Serum

To 95 mL of PBS add 5 mL of nonimmune goat serum. Add 100 mg of sodium azide. Use it as needed. The solution has a 4-month shelf life when stored at 4°C. Serum protein blocks are used to neutralize positively charged tissue elements prior to the application of primary antibodies. However, some protocols use this reagent prior to the application of the secondary antibody. Traditionally, nonimmune serum of the secondary antibody host animal species is the serum used in this step.

1% Bovine Serum Albumin (BSA), Antibody Diluent

BSA, an inert protein carrier and antibody stabilizer, is a common diluent for primary and secondary antibodies used in immunohistochemistry. To 100 mL of PBS add 1 g of BSA. Allow BSA to gently dissolve into solution. Add 50 mg of sodium azide (0.05%). Use as needed. If desired, 1% BSA can be aliquoted and frozen for future use. When prepared or thawed, BSA has a 4-month shelf life when stored at 4°C.

0.25% Pepsin, Proteolytic Enzyme

Stable formula of David J. Brigati, MD

To 89 mL of distilled or deionized H_2O add 10 mL of 10X Automation buffer. Adjust pH to 2.0 with concentrated hydrochloric acid, QS to 100 mL with distilled H_2O. Add 0.25 g pepsin and allow to gently dissolve into the solution. NOTE: it is very important to add the pepsin LAST. Use as needed. Pepsin has a 6 to 8 month expiration date stored at 4°C.[89]

Primary Antibody

Rabbit anti-*Helicobacter pylori* diluted 1:50 in 1% BSA. Our experience shows the shelf life of this diluted antibody is 2 months or greater when stored at 4°C.

Secondary Antibody

Biotinylated goat anti-rabbit IgG (H&L) diluted 1:300 (5 µg/mL) in 1% BSA. Place in a dropper bottle and use as needed. Shelf life is 4 months when stored at 4°C.

Streptavidin, Horseradish Peroxidase Labeled

Upon receiving horseradish peroxidase (HRPO) labeled streptavidin, 1.0 mg stock, reconstitute with 1 mL of distilled water (as specified by the manufacturer), aliquot desired volumes (example: 25 µL) in polypropylene microcentrifuge tubes and freeze at -70°C or lower. To prepare working stock, thaw 25 µL of stock streptavidin and dilute in 20 mL of 0.05 M Tris buffer. This 1:800 dilution gives you a working concentration of 1.25 µg/mL. Place in a dropper bottle and use as needed. The diluted reagent is stable for 5 days when stored at 4°C.

0.05 M Tris Buffer, pH 7.6 at 25°C

In 900 mL of distilled H_2O, dissolve 6.06 g Trizma HCl and 1.39 g of Trizma Base. QS to 1000 mL. Check and adjust pH to pH 7.6 if necessary.[90]

0.6% Hydrogen Peroxide

To 98 mL of distilled H_2O, add 2 mL of 30% H_2O_2. Wear gloves and eye protection when using 30% H_2O_2. Use as needed. The solution has a 4-month shelf life when stored at 4°C . This reagent will be used when preparing the working DAB solution.

3,3'-Diaminobenzidine Tetrahydrochloride (DAB)

In the presence of H_2O_2, horseradish peroxidase bound to the antigen-antibody complex catalyzes the conversion of DAB, an electron-dense chromogen, to a stable, brown-colored end product.

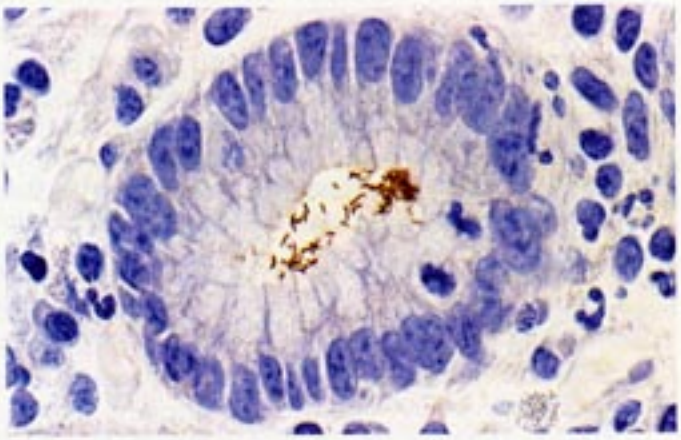

Fig 2. — Gastric biopsy demonstrating *Helicobacter pylori* bacterium, × 300.

DAB Stock Preparation:

In 50 mL of 0.05 M Tris Buffer, dissolve 1.0 g 3,3' Diaminobenzidine powder. Filter and aliquot desired amounts in 1.5 and 5.0 mL polypropylene microcentrifuge tubes. The solution keeps indefinitely when frozen at -70°C. Thawing aliquots in a 38° to 40°C water bath will dissolve any precipitate. Once thawed, use within 2 to 3 hours.

Working DAB:

Dissolve DAB stock aliquot in the appropriate volume of 0.05 M Tris buffer and add the appropriate amount of 0.6% H_2O_2.

Stock Volumes	+	*0.6% H_2O_2*	*QS to: (0.5 mg/mL)*
1.25 mL (25 mg)	+	0.75 mL	50 mL
2.5 mL (50 mg)	+	1.5 mL	100 mL

NOTE: DAB is a suspected carcinogen. Use a hood, wear gloves, eye protection, and mask when handling DAB powder. Gloves should be worn when using DAB stock liquid.

According to Lunne and Sansone,[11] DAB can be rendered harmless by treating with potassium permanganate and sulfuric acid. The solution is decolorized with ascorbic acid and the pH adjusted to neutral by mixing sodium bicarbonate. This procedure allows the laboratory to safely dispose of decontaminated DAB waste by pouring down the drain.

Ammoniacal Water

In 500 mL of distilled H_2O add 1 mL of ammonium hydroxide. Use and discard.

Procedure

1. Cut tissue sections at 4 microns. Float tissue sections onto a clean water bath free of protein adhesives. Place sections on positive charged glass slides. Stand slides on end to allow water to drain into a paper towel. Heat for 15 minutes at 65° to 70°C or allow slides to air-dry overnight then heat on a 60°C hot plate for 10 seconds.
2. Deparaffinize slides with three changes of xylene, 5 minutes each. Clear slides through three changes of absolute alcohol. From the last absolute alcohol, proceed to step 3.
3. Block endogenous peroxidase activity for 8 minutes with 1.875% H_2O_2 in methanol. Hydrate to distilled H_2O.
4. Post-fix slides for 5 minutes in 10% neutral buffered formalin. Rinse/wash slides with multiple changes of distilled H_2O for 2 to 3 minutes.
5. Unmask/digest antigenic sites on formalin-fixed tissue sections with 0.25% pepsin for 12 minutes at 40°C.
6. Rinse pepsin from slides with PBS. Wash slides with three changes of PBS, 1 to 2 minutes each.
7. Incubate sections with 5% normal goat serum for 10 minutes at 40°C.
8. Drain and wipe excess serum from slide; apply rabbit anti-*Helicobacter pylori* primary antibody. Incubate slides in a humidity-controlled incubation chamber for 45 minutes at 40°C.
9. Rinse and wash slides with PBS, three washes, 2 minutes each. Add 1 mL of 1% BSA/PBS per 50 mL of PBS to the last PBS wash to prevent tissue sections from drying during application of step 10 reagent.
10. Drain and wipe excess PBS from slide and apply diluted biotinylated goat anti-rabbit IgG secondary antibody. Incubate for 20 minutes at 40°C.
11. Rinse and wash slides with PBS, three washes, 2 minutes each. Add 1 mL of 1% BSA/PBS per 50 mL of PBS to the last PBS wash to prevent tissue sections from drying during application of step 12 reagent.
12. Drain and wipe excess PBS from slide and apply diluted HRPO labeled streptavidin detection reagent. Incubate sections for 20 minutes at 37° to 40°C.
13. Rinse and wash slides with PBS, three washes, 2 minutes each.
14. Develop sections with working DAB solution for 3 minutes.
15. Wash slides with tap H_2O for 3 minutes.
16. Counterstain with hematoxylin for 5 to 10 seconds, wash with tap H_2O for 3 minutes, "blue" sections in ammoniacal water for 10 seconds, and wash with tap H_2O for 3 minutes.
17. Dehydrate slides through graded and absolute ethanol, clear in xylene, and coverslip with a permanent mounting medium.

Results

Helicobacter pylori .....Brown
Nuclei .....Blue

Acknowledgments

A special thank-you is extended to David N. Howell, MD, PhD for reviewing this article. A sincere debt of gratitude is noted to Mr. W. Lee Temple, HT (ASCP), David L. Stacey, MD, and Raphael K. Graves, MD, for showing me the profession of histotechnology.

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Meet "Mack"

Welcome to Harold "Mack" McKinney who joined Sakura in October 1996. A 1994 graduate of Texas Christian University in Ft. Worth, Mack is the most recent addition to the Sakura sales force. In his free time, Mack enjoys wake boarding and snow boarding — depending on the season and where he's at.

Welcome aboard!

Scientific Days: Histopathology Seminars — Scheduled for Cleveland, April 5, 1997

It's always a good idea to stay a step ahead, and here's the perfect opportunity to make the first move. Sakura has teamed up with Richard-Allan Scientific in contracting Lab Management Consultants, St. Louis, Missouri, a leading provider of continuing education for health care professionals, to conduct a series of CE programs across the country. The program presents a formal seminar in the various disciplines of histopathology theory and technique. The full-day conference will provide the participants an opportunity to hear some of the most noted speakers in the field of Histopathology discuss different aspects of topics that include:

- Histochemistry of Fixation and Processing (Jerry Fredenburgh)
- Quality Assurance in Routine H&E and Special Stain Technique (Dr. Freida Carson)
- Carcinogenic Dyes and Reagents (Maureen Doran)
- Microtomy/Cryotomy Technique and Ergonomics (Jan Minshew)
- Hazardous Waste Disposal (Michael LaFriniere)

In addition, we will also address the group with a presentation on the Practical Aspects of Lab Automation.

Participants will have an opportunity to view direct technical presentations on routine and advanced instrumentation, showing the physical dynamics of how lab equipment is specifically designed to be fully integrated with properly applied theory and technique.

With the assistance of corporate sponsors such as Sakura Finetek U.S.A., Lab Management Consultants will provide, in a relaxed yet informative setting, such speakers as Dr. Freida Carson, President, National Society for Histotechnology — as well as a host of others.

The April 5 seminar will be held at the:

Cleveland South Hilton Inn
6200 Quarry Lane
(I-77 and Rockside Road)
Independence, Ohio

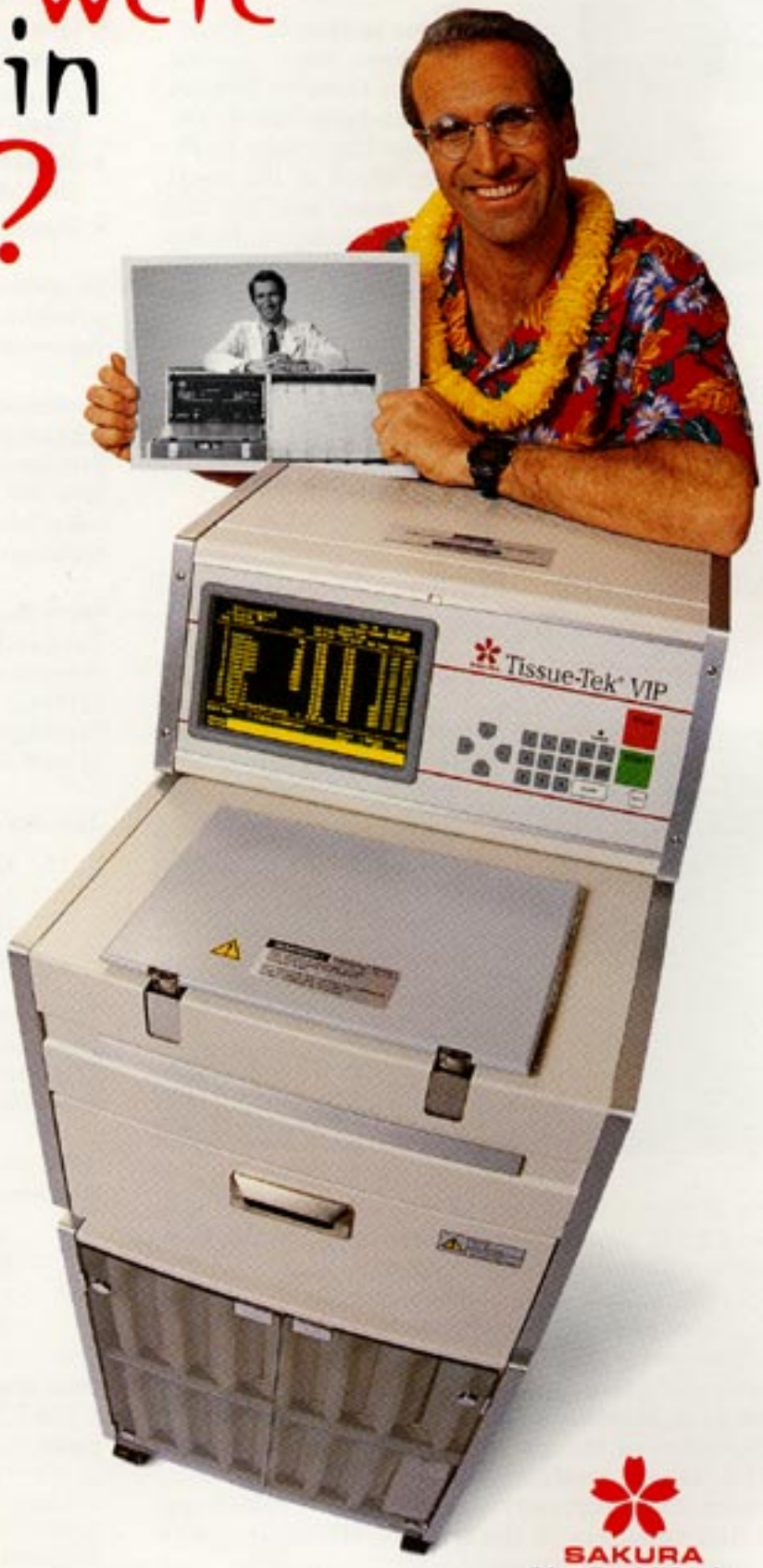
The program officially starts at 9 am on April 5, 1997, and includes breaks, lunch, and a reception. The cost is $49. Additional programs are scheduled for Dallas (June) and Chicago (August).

Take advantage of this and other upcoming local seminars. For more information contact:

Skip Brown, Director
Education and Training
Lab Management Consultants
314-535-0578

You may also contact Mary Ann Martinez at 1-800-725-8723 ext. 233 to register. Hope to see you there.

Where were you in 1981?



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Answers to Questions in Search of an Answer:

We wish to offer some possible insight into the question posed by Terri DeCarli in the September issue of ***Histo-Logic*** (Vol. XXVI, No. 2) regarding staining inconsistencies encountered when carrying out the Warthin-Starry stain.

We would agree that the source of the problem is not in tissue processing or sectioning. It has been our experience that the solutions used in the Warthin-Starry should be fresh (no more than 4 weeks old). Additionally, we would recommend using the zinc formalin substitute for uranyl nitrate as described in our recent publication (*J Histotechnol.* 1996;19:135).

Also, if coated slides are being used, it may be possible that the coating is uneven, which may lead to uneven staining. A more likely explanation would be that, if using a microwave technique, uneven heating inside the coplin jar may be the cause. A simple remedy would be to take the coplin jar out of the microwave halfway through the time, stir the solution, then put the coplin jar back into the microwave to finish the timed step. This would even out the temperature of the solution inside the coplin jar.

Finally, silver precipitate on the slides may be caused by incomplete acid cleaning of all appropriate glassware, including plastic coplin jars used in the microwave. The glassware should be rinsed thoroughly with distilled water after the acid cleaning. Also, triple distilled acidulated water, with a pH of 3.5, should be used for all rinses, as well as for making up all solutions.

We feel that if you follow the procedures described above, your problems will be solved.

Sincerely,

Clifford M. Chapman, Technical Director
Lorelei S. Margeson, Senior Histotechnologist
Pathology Services
Cambridge, MA

A Laboratory Procedure for the Histological Examination of Mohs Specimens

Marie Tudisco, HT (ASCP)
Verona, NJ

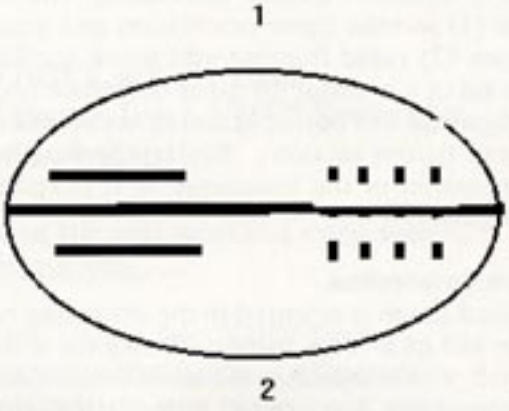
The histological procedure for processing Mohs specimens is a fairly simple procedure which utilizes three basic steps in routine histopathology. These steps can be easily employed in the physician's office laboratory to assure quality processing. The three steps are (1) specific tissue orientation and grossing techniques, (2) rapid freezing and tissue sectioning with the aid of a cryostat for quick diagnosis, and (3) the application of routine staining techniques for permanent frozen sections. This article details the implementation of the technique as it pertains to Mohs surgery.

Specimen Orientation
The excised tissue is oriented in the operating room with the aid of a map, usually drawn on a blank index card, which indicates the anatomical location of the wound site. The excised lesion is placed on a gauze pad or paper towel. A representative drawing of the lesion is also indicated on the map corresponding proportionately to the wound site. The anatomical position of the patient is further represented by an arrow or by marking the superior portion of the lesion with 2% aqueous Gentian Violet. Any scoring of the lesion should also be indicated on the map.

In all probability, the original specimen will need to be dissected into smaller pieces for tissue processing and numbered accordingly. Therefore, it is crucial that care is taken not to dislodge the specimen from its position on the gauze pad while transporting to the laboratory. This will ensure the accuracy of pinpoint diagnosis.

Receiving the Specimen
The specimen is received in the laboratory in its fresh state immediately following surgery. Tap water is used to keep the tissue moist during grossing. An ordinary squirt bottle serves this purpose. For short-term or overnight storage, tissue may be kept in the cryostat and thawed before grossing. Short-term storage in a domestic refrigerator at 4°C is permissible, providing the tissue is wrapped in gauze soaked with saline. Long-term storage of unfixed tissue will require a deep-freeze temperature of -60°C.[1] However, some cellular distortion is to be expected.

Grossing
The specimen is cut into the desired number of pieces. Each piece is numbered and dyed. The cut interior portions of the lesion are dyed using black india ink and 10% Merbromin Solution. The skin edge margins are not dyed since the epidermis will act as a point of orientation under microscopic examination. The dyes are indicated on the map. A solid line represents red and an interrupted line represents black. The following diagram illustrates how the map may look after marking.[2]



Excess fibrous and fatty tissue is debulked from the surface of the specimen using a scalpel blade and undermining scissors. The skin edge is loosened with the scalpel and remains intact during the debulking process. The tissue should be no more than 4 to 5 mm thick. This should result in a flat cutting surface when the tissue is inverted. A flat surface is necessary to obtain a complete section, minimizing the need to cut further into the block.

Embedding and Sectioning
An open top cold chamber cryostat is used for the rapid frozen section technique. The numbered and dyed specimens are individually embedded in OCT compound on metal object holders inside the cryostat. Each tissue specimen is inverted and floated onto the OCT compound before it solidifies. A flat surface is obtained with the aid of a heat extractor over the disc for quick freezing. For satisfactory results, the temperature of the cryostat should be set to -20°C. The optimal temperature for cutting fat is -30°C. (Note: When working with fat, it may be necessary to immerse the frozen disc into liquid nitrogen for 3 to 5 seconds. A cryo spray gun filled with liquid nitrogen better facilitates the freezing process.)

The objective is to get the very first sections when cutting the specimen on the cryostat.

Cutting deeper into the block may lead to a false diagnosis. The end result should provide for examination of both the lateral and deep margins simultaneously. Sections should be cut at 3 to 4 µm. Thicker sections of 6 µm are acceptable for fatty tissues.[3]

The "warm slide" (room temperature) method is used to transfer cut sections from the knife edge to the slide.[4] Tissue containing cartilage will only affix to slides treated with an adhesive. Commercially prepared slide adhesives are available and should be kept on hand for such situations.

After sections are obtained from the tissue block, the slides are immediately immersed into the fixative and are ready to undergo staining. 10% Buffered Neutral Formalin (BNF) is the preferred fixative.

Staining and Coverslipping
Two preferred methods of staining are the H&E procedure and the Toluidine Blue procedure. Both methods can be used as a permanent stain, postfixed, dehydrated, and cleared with a permanent resin mount.

When applied as a progressive stain, the slides are left in hematoxylin long enough to stain the nuclei blue. When applied as a regressive stain, the tissue is overstained and then differentiated in a dilute acid alcohol solution to remove the excess stain. The nuclear stain is intensified by using a blueing agent, such as tap water that has been slightly alkalinized with ammonia or lithium carbonate. Dehydration is accomplished by successive changes of graded alcohols and clearing in several changes of xylene.

H&E Staining Procedure
1. Immerse slides in 10% BNF for 3 minutes. Rinse in tap water.
2. Wash slides in 70% ethyl alcohol for 10 dips. Rinse in tap water.
3. Stain sections in filtered Harris' Hematoxylin for 1 minute. Wash in tap water rinse.
4. Differentiate quickly (three dips) in 1% acid alcohol (optional). Wash in tap water rinse.
5. Blue sections in Scott's tap water substitute for five dips. Wash in tap water rinse.
6. Counterstain in 0.25% alcoholic eosin for five dips. Wash in tap water rinse.

7. Dehydrate in two changes of 95% ethyl alcohol for five dips each.

8. Dehydrate in two changes of 100% ethyl alcohol for five dips each.

9. Clear in two changes of xylene. Coverslip with a synthetic mounting medium.

Results:
Nuclei .....Blue
Cytoplasm .....Pink

Toluidine Blue Staining Procedure
1. Fix sections in 100% ethyl alcohol for 3 minutes.
2. Stain in 0.5% alcoholic Toluidine Blue stain for 5 to 10 minutes.
3. Wash sections in tap water rinse for 30 seconds.
4. Dehydrate in two changes of 95% ethyl alcohol for 10 dips each.
5. Dehydrate in two changes of 100% ethyl alcohol for 10 dips each.
6. Clear in two changes of xylene and coverslip using synthetic mounting media.

Results:
Mast cell granules .....Brilliant red to purple
Acid mucopolysaccharides .....Red to pink
Nuclei .....Shades of blue
Erythrocytes .....Green to yellow

Presentation
The slides are labeled and presented for microscopic diagnosis on slide trays with the map of the specimen. Residual tumors are marked on the map using a red pencil and the entire process is repeated until a negative result is achieved. After review, the slides are left on the trays to dry thoroughly prior to permanent storage.

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MANAGEMENT CORNER:

Managed Care and Quality Patient Care: Where are we?

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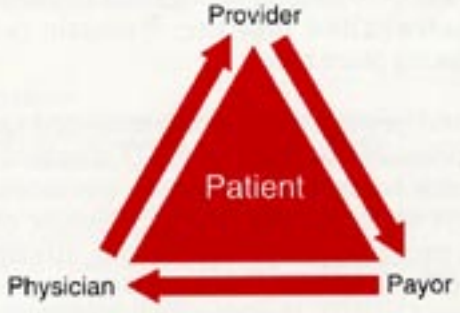
The health care system is composed of a complex triangle of providers, physicians, and payors, with the patient in the middle. A patient is seen by a physician, who refers the patient to a provider or acts as the provider himself, and that care is financed by the payor. The payor determines what care will be covered, and contracts, either with the patient or the provider, to pay for the care. Neither the patient nor the provider has historically been concerned with the costs of the care, resulting in payor involvement in the process to control how, when, and where health care will be administered. This concern over cost has evolved as the major force behind health care reform and the movement toward managed care as the primary solution to the "health care crisis."

To fully understand the health care reform movement, one must first understand the components of the current health care system. The top point of the health care triangle is the provider, and at the center of the provider system is the hospital.



It is a highly regulated, bureaucratic organization that is facing major changes as the emphasis in health care changes from inpatient to outpatient service, a direct result of advances in technology and increased hospital efficiency in the delivery of patient care.[1] However, the hospital is still the central health care facility for disease intervention and emergency treatment.

The second point of the health care triangle is the physician. Physicians wear many hats within the health care system. The physician is the link between the patient and the other components of the system, since it is the physician that initiates all processes associated with patient care. Physicians serve as the medical staff for the hospital, without which the hospital could not function. Since physicians have been trained to work independently, they are having to struggle with the changes caused by the growth of managed care plans and third-party payors dictating how the physician can administer health care to their patient base.

The third, and currently most vocal, point of the health care triangle is the payor. The payor writes the check that pays for patient health care, and may be the government, third-party insurance agencies, an HMO, or an employer. In the past there was hardly ever a question as to the payment to the provider or physician for the services provided to the patient. Hospitals were able to expand and compete with other hospitals by building new facilities and investing in new technologies. Since they were reimbursed for their costs, more was better as it related to patient treatments.

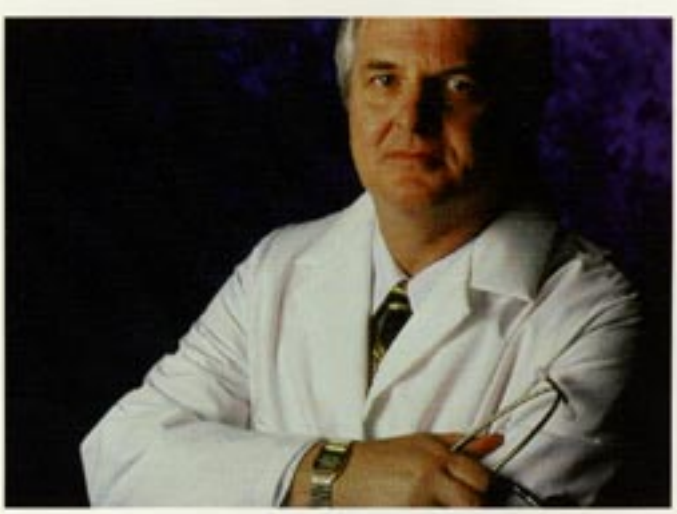
Since the introduction of Medicare in 1965, there has been an effort to control costs. The government created the DRG (Diagnosis Related Grouping) reimbursement system that dictated the reimbursement to hospitals and other providers for Medicare patients. The providers, in turn, shifted the loss of revenue to non-Medicare patients, causing other payors to initiate controls by contracting with employers and providers to control health care costs. This has snowballed into the dramatic reform initiatives taking place today.

Hospitals and providers have implemented quality assurance programs to meet JCAHO standards and have been able to correlate quality care with reduced hospital stays and lower cost of care. Because of this, health care providers have been making attempts to use TQM (Total Quality Management) and CQI (Continuous Quality Improvement) as potential cost-cutting tools. Government, third-party payors, and major companies are scrutinizing health care quality, especially as it relates to health care costs, while, at the same time, health care organizations are trying to adapt nonhealth-care industry standards to focus available resources on quality to increase market share.[2] Still, the driving force behind health care reform has been controlling costs and not quality improvement.

Instead of developing DRGs to place a cost cap on a patient treatment, the government enacts clinical care guidelines to improve the treatment the patient receives.

If Quality Were the Issue...

Imagine, if you will, a very different scenario. Instead of developing DRGs to place a cost cap on a patient treatment, the government enacts clinical care guidelines to improve the treatment the patient receives. Hospitals and providers are reimbursed the full cost of implementing the treatment. Variations from the guidelines would also be fully reimbursed provided the provider can document improved patient outcomes. The CFO and CIO develop an information system strategic plan that incorporates a clinical data repository within the system. The financial system is updated to capture patient care costs for each treatment. Caremaps and critical pathways are developed that take full advantage of pertinent technology and efficiencies, and are automated to facilitate data capture for the repository. The data repository is shared with the community health information network that has been formed to better coordinate patient care between all the health care providers. The hospital, by nature of its vast medical records department, has become the "keeper of the data" and coordinates the electronic medical record within the community and across the national network.



Because of the greatly improved quality of health care provided, there has been a drastic reduction in medical malpractice cases, resulting in lower insurance expenses for physicians. This, in turn, has allowed physicians to invest in new information technologies that link their practices to the community health network and to medical information databases. In addition, they have developed alert networks to notify patients of annual checkups and immunizations. Medical school curriculum has evolved to include standard treatment protocols, based on the clinical guidelines established by practicing physicians. Interns and residents are able to spend less time memorizing data readily available on the medical network and learn how to "listen" to the patients.

Attention to customer service and higher quality more often results in reduced costs.

The prospect of such a system is not totally a pipedream. Health care organizations, in an attempt to transform the business of health care, have started to use TQM and CQI techniques. The techniques have been successful in other business environments to reduce waste and improve a company's bottom line and competitive edge. However, it has not been as easy to recognize the benefits of quality, or to even measure quality, in the health care arena. Service and quality often have little relationship to expenditures and are more often the result of management and staff focus on the issue.[3] What this means is that spending more money does not always result in better service or higher quality. In fact, the opposite is often the case. Attention to customer service and higher quality more often results in reduced costs. "Any time an unnecessary test is avoided or a more relevant one is applied, the patient, the hospital, the physician, and even the insurance companies benefit from lower costs."[4]

Hospitals are putting greater emphasis on utilization review as a mechanism for controlling costs. Effective utilization should reduce the LOS (length of stay) of the patient and, thus, reduce the associated hospital expenses. This effectiveness is influenced by the diagnostic and treatment decisions of the physician.[5] Length of stay and hospital expenses can be reduced when the physician uses current literature and information because he can eliminate unnecessary tests, select more appropriate diagnoses, and suggest alternative treatments. Clinical practice management has resulted in cost savings of over $2 million for one Tennessee hospital.[6] In addition, medical staff attitudes and ordering patterns are significantly better.

There is a trend toward collaboration between hospitals, physicians, and insurers to create an integrated medical delivery system.[1] This integrated system would help break down the political barriers between the players and could lead to significant cost reductions by implementing standard protocols for the treatment of patients. Whether this collaboration will come in time is unsure. The emphasis on reducing costs, without an equal emphasis on quality, has already placed many health organizations in jeopardy. We are still years away from a computerized patient medical record, mainly because there is no consensus on what constitutes a complete record. Caremaps and critical pathways are being developed and used, but few are computerized or readily available for the masses. And there is almost no health care organization, aside from small medical practices or specialty facilities, that can tell you the cost of the medical care they provide.

The structure and management of health care organizations must take steps to realize the new paradigm in health care. There must be a shift from trying to make the existing "disease oriented" organization fit the managed care, quality-driven model to remaking the entire organization to be quality-driven managed care that takes care of all the health needs of their community.

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Risk Sharing — The New Relationship Between Providers and Suppliers

etings, negotiations, and compromise create the risk-sharing environment for mutual benefit.

f you ask any health care provider what their umber one concern or cause of frustration is, you ill probably hear the answer, "reducing costs." This ill continue to be a top priority as payors continue refuse to pay as much for health care as they have the past. This has created market trends such as ecreased hospital occupancy, increased network rmation and consolidation, and departments such the OR being viewed as cost centers as opposed to venue generators. Fortunately (or unfortunately), here is still a lot of waste to be taken out of the stem. Additionally, costs can be significantly educed without negatively impacting quality. ccording to the health care advisory board, the verage cost per staffed bed is $325,000. This could be duced to about $187,000 without impacting quality. his is supported by other studies, such as the one elow that indicates that managed care may actually sult in improved quality.

npact of Managed Care on US Markets — Peat larwick Study — 1996

The presence of managed care has not resulted in higher mortality rates or complication rates. In fact, risk-adjusted mortality rates in high managed care markets are 5.25% below the national average.

Discretionary hospital costs are lower in high managed care markets. Hospital costs in high managed care markets are approximately 19% below hospital costs in low managed care markets.

Case severity of patients admitted to hospitals is highest in high managed care markets yet, as noted above, risk-adjusted mortality rates for these markets are 5.25% below the national average.

Patient stays are significantly shorter in high managed care markets, 6.32% less than the national *average*.

Not only are providers adversely affected by cost pressures, but so are suppliers. In order for suppliers to survive in today's managed care market, it is critical that they help their customers prosper and become more cost effective. As a result, both suppliers and providers have the same goal of permanently taking costs out of the health care system. There are several means by which this can be accomplished. Some will benefit the provider (ie, supplier price reductions), some benefit the supplier (increased market share), and some may prove beneficial to both organizations (ie, risk sharing).

What is risk sharing? Simply stated, risk sharing is an innovative financial arrangement which reduces health care supply and service costs by aligning incentives between provider and supplier. Allegiance Healthcare Corporation, McGaw Park, IL, has developed its Shared Risk/Shared Reward program based on this concept. This program is designed to substantially reduce health care supply and service costs through standardization and utilization management and the alignment of financial incentives between Allegiance and the provider.

As mentioned above, aligned incentives are key. Historically, providers and suppliers often have been at odds with each other because they have had conflicting goals or incentives. Suppliers succeed by selling as much as possible, while providers are focused on purchasing the necessary amount of supplies to get the job done and keep their costs in line. Aligning incentives means suppliers and providers are both better off if costs are reduced to the appropriate level, and quality is maintained. It is a win-win relationship.

Once incentives are aligned, the objective is to drive out costs to generate savings to share. This is done by increasing the amount of product standardization and reducing the utilization of products that are not needed. To accomplish this goal and maximize savings opportunities, Allegiance provides an integrated offering comprised of the following components:

- ***Resource Utilization Management and Clinical Expertise.*** Allegiance provides each Shared Risk/Shared Reward customer one clinician for a 2-year time period at no cost in order to facilitate the development of procedural protocols. The clinician and the provider have access to Allegiance's national procedural supply cost database (PROtocols) of best-demonstrated practices. Costs are further reduced by substituting lower cost, clinically acceptable products and eliminating unnecessary product utilization. Throughout the process, the hospital's physicians and clinical staff determine what products are necessary to maintain or improve the quality of patient care. Additional services provided by Allegiance, such as Healthcare Consulting Services, focus on reducing labor and total system costs.
- ***Account Management/Field Sales Teams*** are coordinated resources with market knowledge, focused on implementing cost reduction programs.
- ***Allegiance's Procedure Based Delivery System (PBDS) Program*** which packages sterile and nonsterile supplies by surgical procedure is utilized, resulting in product standardization, logistics savings, and increased compliance to the supply protocol.
- ***Extensive Supplier Relationships*** enable Allegiance to provide a market-leading product portfolio that offers the best value to the provider.

As you can imagine, there are several benefits to a risk-sharing agreement. To begin with, the majority of hospitals have seen their operating costs increase year after year after year, despite many cost reduction efforts. Forming a risk-sharing partnership with another party immediately reduces their risk because of the alignment of incentives — they have a partner who is accountable to help them drive results. In addition, the supplier brings several resources and a wealth of expertise to the partnership, which the provider may not be able to obtain on their own. Additionally, a supplier who is sharing risk with a provider is disinclined to increase prices or sell unnecessary products. In fact, the supplier has more at risk than just the cost of supply expenses increasing: they are risking their entire business with the customer. This is because a provider who does not see results from its risk-sharing partnership may decide to take all of its product business to a competitor.

Benefits (provider) of risk sharing
- Risk is shared with another organization
- Aligned financial incentives
- Access to resources (often at no additional expense)
- Increased efficiency
- Data-driven, consensus-oriented approach
- Less variation in practice due to standardization
- Provider resources focused on providing care

One of the many appeals of a risk-sharing agreement is that it is suitable for all types of providers, from single hospitals to integrated health care networks (IHNs). In addition, these agreements can, and are, being negotiated and implemented all over the country, from states that have a great deal of managed care activity to those areas with almost no managed care.

The bottom line is that risk sharing works for any provider who is interested in changing the way they operate to dramatically reduce their costs. Cost reduction is the common denominator. We believe that risk-sharing agreements will have a dramatic impact on the health care industry. Health care administrators will become increasingly interested in standardizing procedures and will have less tolerance for variation. The focus on outcomes will continue to increase to ensure that cost reduction efforts are not at the expense of quality patient care. Providers will begin to expect that their suppliers go at risk with them as cost pressures continue to increase. Suppliers will willingly enter into these partnerships as they look for ways to obtain a bigger piece of a shrinking market.

Risk sharing is a long-term and effective means of attacking the cost problems affecting both providers and suppliers by ensuring that incentives are properly aligned and that permanent behavior changes occur. This is evident by the results which are being generated at the accounts with which Allegiance has a Shared Risk/Shared Return Agreement. On average, these customers have realized a 20% supply cost reduction per procedure and a 40% reduction in line items used. This has led to over $7 million in excess costs being taken out of the health care system.

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