PolyFacts BioSciences

News | Views | Insights *from* ...

Polysciences, Inc.
Chemistry beyond the ordinary

Vol. 1 | No. 1

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Glycoproteins

New Glycoprotein Detection Kit from Polysciences, Inc.

Glycoproteins are macromolecules composed of a protein and a carbohydrate or oligosaccharide. Additions of sugars can occur at asparagine sites and are called N-Glycosylation or at serine or threonine and are called O-Glycosylation. A Monosaccharide that is common in glycoproteins is glucose.

While these proteins are common in nature, they are relatively rare in bacteria. They occur in cells and show a phenomenon called "microheterogeneity" meaning that a variety of structurally different carbohydrate units can be found at even a single attachment site. Ovalbumin contains one glycosylated amino acid but over a dozen different oligosaccharides. Soluble glycoproteins show a high viscosity such as seen in egg whites.

Sugar groups assist in protein folding (usually found in the Endoplasmic reticulum) and improve the stability of the glycoprotein. Glycoproteins are essential to the immune system, especially in mammals. Some glycoproteins are present in blood group antigens, hormones (such as Thyroid Stimulating Hormone) and Erythropoietin (EPO) a major component to red cell production.

The absences of glycoproteins can lead to major diseases classified as "Glycogen Storage Diseases" which encompass over 40 diseases such as Mannosidosis, Mucolipidosis and Sialidosis. Specific glycoproteins have been identified in many diseases. Some mucin glycoproteins are associated with asthma and lung health, some with Cystic Fibrosis and others are

continues, see Glycoproteins pg. 4

(MRSA) Methicillin-resistant Staphylococcus Aureus

Rapid Screening for this Devastating Invasive Disease

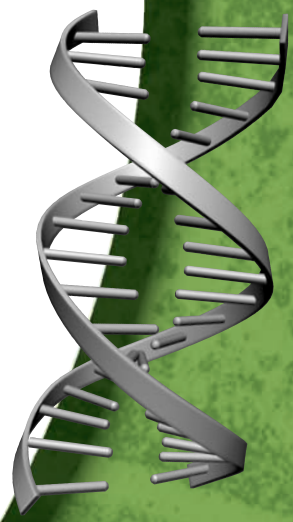
The human health threat posed by bacteria has not diminished as recent headlines on *E. Coli* outbreaks in fresh produce and necrotic bacterial infections to the skin have indicated.

Yet another growing threat is the presence of antibiotic resistant strains such as the methicillin-resistant *Staphylococcus Aureus* (MRSA). In the recent August 17 edition of *The New England Journal of Medicine*, research scientists identified it as the leading cause of skin and soft tissue infections in U.S. hospital and clinic emergency rooms.

The Medical Laboratory Observer (September 2006) quoted Dr. Moran's (University of California) finding that 59% of skin infections are due to MRSA bacteria. Of equal concern is the fact that genetic mutations in the bacterium "can combine antimicrobial resistance with transmissibility and virulence." The Center for Disease Control (CDC) has issued recommendations on transmission prevention, see:
www.cdc.gov/ncidod/dhqp/ar_mrsa_healthcareFS.html

According to Reuters, up to 53 million people worldwide may be carrying this deadly MRSA strain and a total of 2 billion people (25-30% of the global population) have some form of the bacterium *Staphylococcus Aureus*. Further evolution to more resistant strains is the challenge presented to hospital staff and clinicians for rapid and accurate diagnosis.

continues, see MRSA pg. 4



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JB-4® & JB-4 Plus® Advantages

Leading High Performance Plastic Embedding Kits

Plastic embedding has long been recognized as a superior method for obtaining greater morphological detail in tissue sections.

Polysciences, Inc. has been an innovator and manufacturer of polymeric resins and plastic embedding kits, including the well know acrylics (e.g. methyl methacrylate and glycol methacrylates) for more than 40 years.

JB-4® Embedding Kit *(Cat. #00226)* is an exothermic, polymerizable embedding media excellent for non-decalcified bone. The exothermic reaction can be controlled by using refrigeration at 4° C or curing over an ice tray to minimize microfoam incorporation and tissue distortion. This kit can offer both research and clinical physicians an excellent tool to study structural detail in bone and hematological disorders without affecting the tissue by fixation. Bone marrow biopsies and Osteomyelitis are two such instances where plastic embedding has distinct advantages.

Polysciences JB-4® Embedding Kits

Description	Cat. #	Size
JB-4® Embedding Kit	00226	1 kit
JB-4 Plus® Embedding Kit	18570	1 kit
JB-4® Mini Embedding Kit	22507	1 kit

JB-4 Plus® Embedding Kit *(Cat. #18570)* offers equal morphological detail with the distinct advantages of being water-soluble. Increased water compatibility is achieved with hydrophilic monomers in JB-4® and JB-4 Plus® which allows more complete penetration into tissue sections where water may remain after the dehydration protocol. This clear polymer embedding material has shown excellent definition in ophthalmic tissues.

Both kit systems contain glycol methacrylate which leads to very durable, crosslinked resins so it is impossible to remove these polymerized components from cut sections. However some staining methods can penetrate the resins but may lead to a distinctly faded appearance to some stains.

While we think of embedding in relation to human or animal tissues, our customers use these resins in multiple applications and are always finding new and creative uses for all of our plastic embedding kits. New applications continue to emerge including the embedding of inorganic materials (e.g. gypsum, concrete materials, foundry cores) which allows them to be analyzed or sectioned more easily.

These photomicrographs of Horseshoe Crab and Paddlefish, are embedded in JB-4® plastic resin and sectioned ultra thin, see below. Note the excellent clarity and morphological detail obtained with our JB-4® resin kits. *PF*

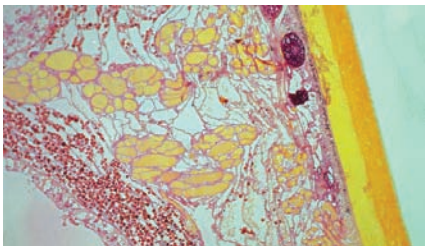


Figure 1. *Horseshoe Crab section, through the body wall including the shell and follicles within the ovary. Periodic Acid Schiff's stain with Metanil Yellow counterstain.*

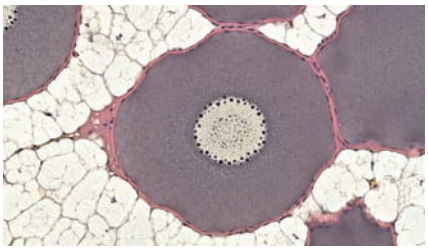


Figure 2. *Paddlefish follicles within the ovary. Weigerts Hematoxylin nuclear stain with Metanil Yellow counterstain.*

Images courtesy of Ms. Helen Wimer of the NIH/Smithsonian Institution's National Museum of Natural History's Vertebrate Zoology Department.

Technical Data Sheets Online

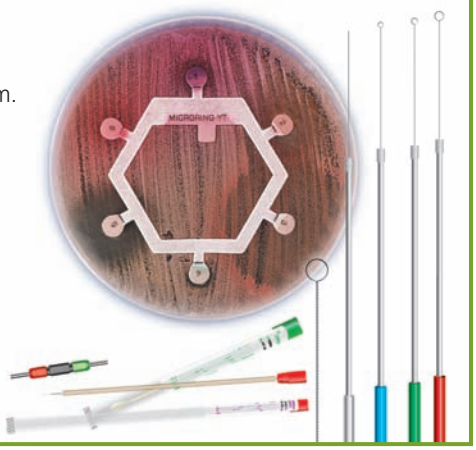
JB-4® Embedding Kit, TDS #123; www.polysciences.com/shop/assets/datasheets/123.pdf
JB-4 Plus® Embedding Kit, TDS #393; www.polysciences.com/shop/assets/datasheets/393.pdf
JB-4® Mini Embedding Kit, TDS #494; www.polysciences.com/shop/assets/datasheets/494.pdf

New Microbiology Product Line

Full Range of Products for Use in Clinical, Research and Academic Labs!

- Inoculation Loops - wide range of plastic disposable and durable Nichrome® wire.
- Microbiology Buffers
- Microbiology Dyes and Stains - specialized staining reagents in ready-to-use solution form.
- Microbiology Stain Kits - easy-to-use kit format.
- Microloop® Calibration Gauges
- Microloop® Holders - insulated brass holders.
- Microring® Bacterial Detectors - rapid test method that utilizes specific growth factors to identify different microorganisms.
- Parasitology Fixatives - ready-to-use and environmentally friendly.
- Rapid Bacterial Test Strips - 8 new rapid bacterial detection strip kits.
- Transwabs® - safe and efficient transport of aerobic and anaerobic bacterial samples.

To learn more about our Microbiology product line, please visit: www.polysciences.com



U.S. & Canada: (800) 523-2575 / (215) 343-6484 Fax: (800) 343-3291 / (215) 343-0214 email: info@polysciences.com

Biodegradable Polymers

Diblock and Triblock Copolymers of Ethylene Glycol (EG) and Lactic Acid (LA) or Glycolic Acid (GA)

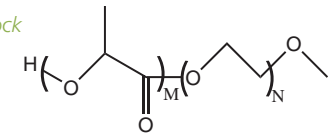
The advent of new bio-engineering materials with biodegradable properties is of great interest to the pharmaceutical (drug delivery), tissue engineering (scaffolds) and controlled release (implant) markets.

Among those new polymers with the greatest potential to be modified for specific properties are the diblock and triblock copolymers of ethylene glycol (EG) and lactic acid (LA) or glycolic acid (GA).

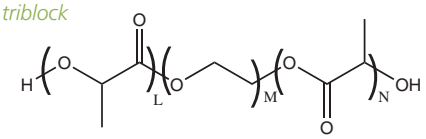
Polymers of these compositions are formed by "condensation reactions" of blocks of EG, LA and/or GA molecules leading to polyesters which have labile carbon-oxygen linkages under specific pH conditions. This offers the advantage of controlled biodegradability avoiding surgical removal of the device after the biomedical mission has been achieved.

In polymer science, these relatively low molecular weight materials are referred to as oligomers with continuous segments (i.e. blocks) of the same organic molecule (either ethylene glycol or lactic acid).

diblock



triblock



By stringing together blocks of ethylene glycol and attaching them chemically to lactic or glycolic acids, the correct balance of hydrophilic (water loving) and hydrophobic (water resisting) properties can be achieved. This is important for control over the rate of degradation at physiological pH which influences the release of transported molecules (pharmaceuticals) and also to control thermally reversible release properties (via sol-gel transition at specific temperatures).

An additional advantage of these materials is the low toxicity properties of the water soluble poly(ethylene glycol) which will form on hydrolysis during biodegradation. Low molecular weight PEG by-products have been shown to be excreted without significant bio-retention in the kidney. By arranging the segments and controlling the molecular weight of individual blocks and polymer branching, biochemists have been able to achieve a startling array of discrete polymer forms including micro/nano particles, micellar forms, hydrogels and *in vivo* injectable forms. PF

Polysciences, Inc. offers a wide range of diblock and triblock copolymers of ethylene glycol and lactic acid. We also offer custom synthesis capabilities for specific compositions involving more complex combinations and control over the individual "blocks".

To view our on-line listing of available materials, visit www.polysciences.com

Numerous technical papers on polymers of ethylene glycol and lactic acid exist, including select references cited here.

Tissue Engineering-Scaffolds

Moran, Pazzano and Bonassar (Center for Tissue Engineering, University of Massachusetts Medical School, Worcester, Mass), *"Characterization of Polylactic acid-Polyglycolic acid composites for Cartilage Tissue Engineering"*, Tissue Engineering, Vol 9, No.1, pgs.63-70, (**Feb. 2003**)

Cannizzaro etc. al. (School of Pharmaceutical Sciences, University of Nottingham),*"Synthesis and Characterization of a Degradable Poly(lactic acid)-Poly(ethylene glycol) copolymer with Biotinylated End Groups"*, Biomacromolecules, 2(2), 575-580 (**2001**)

Drug Delivery-Controlled Release

Bae, Lee and Kim, *"Biodegradable block copolymers as injectable drug delivery systems"*, Nature, No. 388, 860-862 (**1997**)
Jeong, Kim, Bae, *"Thermosensitive sol-gel reversible hydrogels"*, Adv. Drug Delivery Rev., No.54, 37-51 (**2002**)

Chaubal, *Polylactides/glycolides-excipients for injectable drug delivery and beyond*, Drug Delivery Technology, No. 2, 34-36 (**2002**)

Protein Transport

Zhu, Mallery,, Schwendeman, *"Stabilization of proteins encapsulated in injectable poly(lactide-co-glycolide)"*, Nature Biotechnology, no. 18, 52-56 (**2000**)

Kissel, Li, Unger, *"ABA-triblock copolymers from biodegradable polyester A-blocks and hydrophilic (ethylene oxide) B-blocks as candidate for in-situ forming hydrogel delivery systems for proteins"*, Delivery Review, No. 54, 99-134 (**2002**)

For initial range-finding work, Polysciences, Inc. offers a Biodegradable Polymers Kit - *Cat.# 18401*

Kit contains 5g of each:

Poly(glycolic acid)	MW 33,000	i.v 1.0-2.0
Poly(dl-lactic acid)	MW 20,000	i.v ~0.4
Poly(l-lactide-co-glycolide)	MW 5,000	i.v ~0.2
Poly(l-lactic acid)	MW 100,000	i.v ~1.5

Diblock Polymers

Description	Cat. #	Size
PEG(350)-b-PLA(300)	24375	1g
PEG(1000)-b-PLA(750)	24378	1g
PEG(1000)-b-PLA(5000)	24381	1g
PEG(5000)-b-PLA(1000)	24386	1g
PEG(5000)-b-PLA(5000)	24389	1g

Triblock Polymers

Description	Cat. #	Size
PLA(1000)-b-PEG(1000)-b-PLA(1000)	24500	1g
PLA(2000)-b-PEG(1000)-b-PLA(2000)	24501	1g
PLA(5000)-b-PEG(1000)-b-PLA(5000)	24502	1g
PLA(1000)-b-PEG(4000)-b-PLA(1000)	24503	1g
PLA(1000)-b-PEG(10000)-b-PLA(1000)	24509	1g

Glycoproteins

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linked to colon and bowel disorders. Glycoproteins are associated with muscular and neurodegenerative disorders, such as Alzheimer's and Muscular Dystrophy.

Viruses, bacteria and parasites take advantage of cell surface carbohydrates associated with glycoproteins, using them to gain access to enter a cell. For example, rhinoviruses use I-Cam to gain entry, while parvovirus B19 uses an erythrocyte specific antigen (P antigen) to infect red cells. Helicobacter Pylori uses a Lewis blood group antigen on the surface of gastric mucinous cells to gain access.

Glycoproteins play an integral part in both our health and well being and in the discovery of disease states and how those diseases will be treated. Glycoproteins and their carbohydrate links are being investigated as drug delivery systems to treat and cure disease. *PF*

Polysciences is pleased to announce a new stain kit for glycoprotein detection. GlycoGel Stain Kit *(Cat. #24693)*

Technical Data Sheet Online GlycoGel Stain Kit, TDS #738; www.polysciences.com/shop/assets/datasheets/738.pdf

20% Off GlycoGel Stain Kit!

New GlycoGel Stain Kit

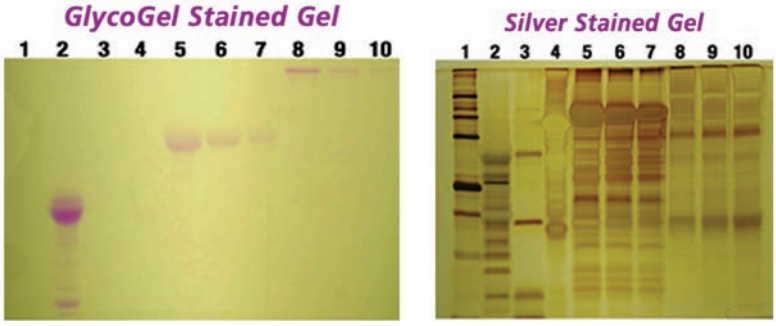
Fast, Selective Staining for Glycoprotein in PAGE Gels!

Detection is performed by modified (PAS) Periodic Acid Schiff chemistry. This method is very selective and has a sensitivity limit of approximately 25-100 nanograms/band.

- Detect glycoprotein on SDS-PAGE gels
- Glycoproteins are detected as magenta bands with a colorless background
- Ready-to-Use Kit stains 10 gels

Description	Cat. #	Size
GlycoGel Stain Kit	24693	1 kit

To order, call or fax your local Polysciences office, and mention promotion code GLYCO1106. Web orders require promotion code GLYCO1106 added to the "comments" field during final purchase approval.



Lane 1: NA, Lane 2: (+) CTRL Horseradish Peroxidase, Lane 3: NA, Lane 4: NA, Lane 5: 20µg Apo-Transferrin, Lane 6: 10µg Apo-Transferrin, Lane 7: 5µg Apo-Transferrin, Lane 8: 20µg Fibronectin, Lane 9: 10µg Fibronectin, Lane 10: 5µg Fibronectin

Offer valid through January 26, 2007 on orders placed by phone, fax or web. Discount off local list price. To take advantage of this offer mention promotional code GLYCO1106. When ordering via the web, place promotional code GLYCO1106 in the "comments" field during final purchase approval. Web orders will not show discount at the time of purchase. Discount will be applied to the order and appear on invoice. Offer can not be combined with any other discount or promotion on same products.

(MRSA) Methicillin-resistant Staphylococcus Aureus

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Conventional screening techniques (e.g. media culture, latex agglutination and PCR) may lack bacterial specificity and can be costly and time consuming.

Rapid diagnostic screening serves as the first line of defense and assists physicians with early detection. Polysciences, Inc. offers a range of rapid bacterial detection strips, including one for MRSA. In a simple protocol, inoculated agar plates are streaked with suspect organisms and the methicillin sensitivity test strip is placed at right angles to the streaks.

After 24 hours, resistant strains will grow right up to the strip (or to within about 10 mm) while methicillin sensitive organisms will not grow up to the test strip. Approximately 6 separate streaks per plate may be tested.

Rapid screening, particularly with multiple Hospital Associated MRSA (HA-MRSA) events, can provide critical time to address the threat. *PF*

Description	Cat. #	Size
MRSA Strips	24643	1 unit (50 strips)

CE-marked and conforms to: European In Vitro Devices Directive, In Vitro Diagnostic Medical Devices Directive (98/79/EC), 1998, Official Journal of European Communities, L331/1

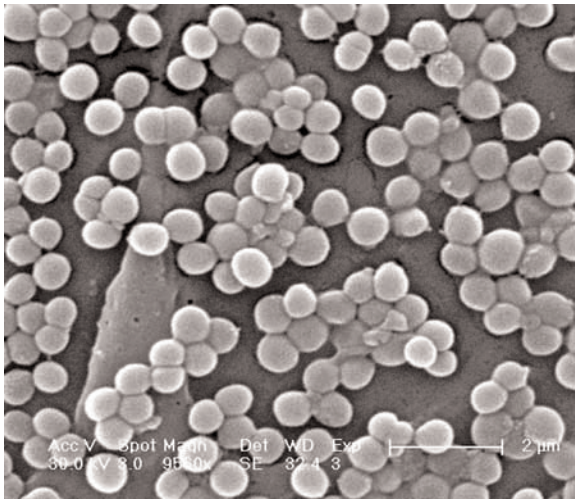

Photo: Janice Carr / CDC

Scanning electron micrograph (SEM) depicting numerous clumps of methicillin-resistant Staphylococcus aureus bacteria, commonly known as MRSA. *Magnified 9560x*

For more information on Polysciences' full line of rapid bacterial test strips, visit: www.Polysciences.com

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