

Product Insert

PEPTONE YEAST EXTRACT BROTH BASED MEDIA

Products

AS-821	Peptone Yeast Extract Broth (PY)	10 tubes / pkg
AS-834	Peptone Yeast Extract Broth with Adonitol (PY ADONITOL)	10 tubes / pkg
AS-836	Peptone Yeast Extract Broth with Amygdalin (PY AMYGDALIN)	10 tubes / pkg
AS-824	Peptone Yeast Extract Broth with Arabinose (PY ARABINOSE)	10 tubes / pkg
AS-835	Peptone Yeast Extract Broth with Arginine (PY ARGININE)	10 tubes / pkg
AS-837	Peptone Yeast Extract Broth with Cellobiose (PY CELLOBIOSE)	10 tubes / pkg
AS-838	Peptone Yeast Extract Broth with Dulcitol (PY DULCITOL)	10 tubes / pkg
AS-839	Peptone Yeast Extract Broth with Erythritol (PY ERYTHRITOL)	10 tubes / pkg
AS-833	Peptone Yeast Extract Broth with Esculin (PY ESCULIN)	10 tubes / pkg
AS-840	Peptone Yeast Extract Broth with Fructose (PY FRUCTOSE)	10 tubes / pkg
AS-841	Peptone Yeast Extract Broth with Galactose (PY GALACTOSE)	10 tubes / pkg
AS-822	Peptone Yeast Extract Broth with Glucose (PYG)	10 tubes / pkg
AS-857	Peptone Yeast Extract Broth with Glucose & Bile (PYG BILE)	10 tubes / pkg
AS-858	Peptone Yeast Extract Broth with Glucose & Formate/Fumarate (PYG FF)	10 tubes / pkg
AS-860	Peptone Yeast Extract Broth with Glucose & Gelatin (PYG GELATIN)	10 tubes / pkg
AS-825	Peptone Yeast Extract Broth with Glucose & Tween 80 (PYG TWEEN)	10 tubes / pkg
AS-842	Peptone Yeast Extract Broth with Glycerol (PY GLYCEROL)	10 tubes / pkg
AS-843	Peptone Yeast Extract Broth with Glycogen (PY GLYCOGEN)	10 tubes / pkg
AS-844	Peptone Yeast Extract Broth with Inositol (PY INOSITOL)	10 tubes / pkg
AS-845	Peptone Yeast Extract Broth with Inulin (PY INULIN)	10 tubes / pkg
AS-846	Peptone Yeast Extract Broth with Lactate (PY LACTATE)	10 tubes / pkg
AS-826	Peptone Yeast Extract Broth with Lactose (PY LACTOSE)	10 tubes / pkg
AS-847	Peptone Yeast Extract Broth with Maltose (PY MALTOSE)	10 tubes / pkg
AS-848	Peptone Yeast Extract Broth with Mannitol (PY MANNITOL)	10 tubes / pkg
AS-849	Peptone Yeast Extract Broth with Mannose (PY MANNOSE)	10 tubes / pkg
AS-850	Peptone Yeast Extract Broth with Melezitose (PY MELEZITOSE)	10 tubes / pkg
AS-851	Peptone Yeast Extract Broth with Melibiose (PY MELIBIOSE)	10 tubes / pkg
AS-853	Peptone Yeast Extract Broth with Raffinose (PY RAFFINOSE)	10 tubes / pkg
AS-827	Peptone Yeast Extract Broth with Rhamnose (PY RHAMNOSE)	10 tubes / pkg
AS-854	Peptone Yeast Extract Broth with Ribose (PY RIBOSE)	10 tubes / pkg
AS-828	Peptone Yeast Extract Broth with Salicin (PY SALICIN)	10 tubes / pkg
AS-855	Peptone Yeast Extract Broth with Sorbitol (PY SORBITOL)	10 tubes / pkg
AS-829	Peptone Yeast Extract Broth with Starch (PY STARCH)	10 tubes / pkg
AS-830	Peptone Yeast Extract Broth with Sucrose (PY SUCROSE)	10 tubes / pkg
AS-831	Peptone Yeast Extract Broth with Trehalose (PY TREHALOSE)	10 tubes / pkg
AS-859	Peptone Yeast Extract Broth with Xylan (PY XYLAN)	10 tubes / pkg
AS-832	Peptone Yeast Extract Broth with Xylose (PY XYLOSE)	10 tubes / pkg

Intended Use

Peptone Yeast Extract Broth Based Media are enriched nonselective broth media used in the growth and partial identification of anaerobic bacteria based on their specific biochemical features.

Summary

Peptone Yeast Extract Broth Based Media are enriched nonselective media that are supplemented with hemin and vitamin K₁ to facilitate the recovery of the more fastidious organisms such as *Prevotella* spp, *Porphyromonas* spp, and the *Bacteroides fragilis* group. Resazurin is added as a redox indicator. PRAS (pre-reduced anaerobically sterilized) biochemicals are the “gold standard” for biochemical testing and characterization of anaerobes. With the addition of a specific biochemical, the Peptone Yeast Extract Broth Based Media are used to determine whether anaerobic bacteria will utilize the biochemical or if growth is stimulated or inhibited. PY and PYG are nonselective broth media originally formulated by the VPI group for use in

chromatographic analysis of metabolic products from the fermentation of glucose. This chromatographic analysis is useful in the identification of clinically important anaerobic bacteria. This media is prepared, dispensed, and packaged under oxygen-free conditions to prevent the formation of oxidized products prior to use.

Formulation*

Peptone Yeast Extract Broth Basal Medium

Pancreatic Digest of Casein	20.00	g
Yeast Extract	10.00	g
L-Cysteine Hydrochloride	0.50	g
Hemin (0.1% solution)	5.00	mL
Vitamin K ₁ (1.0% solution)	0.10	mL
Resazurin (0.025% solution)	4.00	mL
Calcium Chloride	0.008	g
Magnesium Sulfate	0.016	g
Potassium Phosphate Monobasic	0.04	g
Potassium Phosphate Dibasic	0.04	g
Sodium Chloride	0.08	g
Sodium Bicarbonate	0.32	g
DI Water	1.00	L

The following components have been added per liter to the basal medium to form the following products:

PY ADONITOL	Adonitol	5.00	g
PY AMYGDALIN	Amygdalin	5.00	g
PY ARABINOSE	Arabinose	5.00	g
PY ARGININE	Arginine	3.00	g
PYG BILE	Oxgall	20.00	g
	Glucose	10.00	g
PY CELLOBIOSE	Cellobiose	10.00	g
PY DULCITOL	Dulcitol	10.00	g
PY ERYTHRITOL	Erythritol	5.00	g
PY ESCULIN	Esculin	5.00	g
PYG	Glucose	10.00	g
PY FRUCTOSE	Fructose	10.00	g
PYG FF	Formate	1.80	g
	Fumarate	1.80	g
	Glucose	10.00	g
PY GALACTOSE	Galactose	10.00	g
PYG GELATIN	Gelatin	120.00	g
	Glucose	10.00	g
PY GLYCEROL	Glycerol	8.00	mL
PY GLYCOGEN	Glycogen	5.00	g
PY INOSITOL	Inositol	10.00	g
PY INULIN	Inulin	10.00	g
PY LACTATE	Lactic Acid	7.00	mL
PY LACTOSE	Lactose	10.00	g
PY MALTOSE	Maltose	10.00	g
PY MANNITOL	Mannitol	10.00	g
PY MANNOSE	Mannose	10.00	g
PY MELEZITOSE	Melezitose	5.00	g
PY MELIBIOSE	Melibiose	5.00	g
PY RAFFINOSE	Raffinose	10.00	g
PY RHAMNOSE	Rhamnose	10.00	g
PY RIBOSE	Ribose	5.00	g
PY SALICIN	Salicin	10.00	g
PY SORBITOL	Sorbitol	10.00	g
PY STARCH	Starch	10.00	g

PY SUCROSE	Sucrose	10.00	g
PY TREHALOSE	Trehalose	5.00	g
PYG TWEEN	Tween 80	0.25	mL
	Glucose	10.00	g
PY XYLAN	Xylan	10.00	g
PY XYLOSE	Xylose	10.00	g

Final pH: 7.2 ± 0.3 at 25° C

Final volume: 7.0 mL ± 0.7 mL

Final volume: 10.0 mL ± 1.0 mL for AS-825 PYG TWEEN, AS-846 PY LACTATE, and AS-858 PYG FF

Final volume: 5.0 mL ± 0.5 mL for AS-860 PYG GELATIN

*Approximate formula. Adjusted and/or supplemented as required to meet performance criteria.

Precautions

For *IN VITRO DIAGNOSTIC USE* only. Utilize approved biohazard precautions and aseptic technique when using this product. This product is for use by properly trained and qualified personnel only. Sterilize all biohazard waste prior to disposal.

Storage and Shelf Life

Storage: Upon receipt, store at room temperature in original package until used. Avoid overheating or freezing. Do not use media if there are signs of deterioration (discoloration due to oxidation of media) or contamination. The expiration date applies to the product in its original packaging and stored as directed. Do not use product past the expiration date shown on the label.

Shelf Life: 1 year from date of manufacture.

Procedure

Specimen Collection: Specimens for anaerobic culture should be protected from oxygen during collection, transportation, and processing. Consult appropriate references for detailed instructions concerning collection and transportation of anaerobes.

Methods for Use: Inoculate Peptone Yeast Extract Broth Based Media directly with a pure culture of the organism. These media are supplied with a screw cap fitted with a hungate-style septum, which allows for the direct injection of inoculum using a syringe. Decontaminate the rubber septa with alcohol and pierce with a needle; slowly inject the inoculum into the medium. Inoculated tubes should be immediately placed into an anaerobic atmosphere and incubated at 35 - 37°C for 24 - 48 hours. Extended periods of incubation may be required to recover slow growing anaerobes. Detailed instructions for processing anaerobic cultures can be found in the listed references.

Materials Required, But Not Provided

Standard microbiological supplies and equipment such as loops, saline blanks, slides, staining supplies, microscope, incinerator / autoclave, incubators, anaerobic chamber / anaerobic jars, disinfectant, other culture media, and serological / biochemical reagents.

Interpretation of Results

If used properly, fermentation is indicated when the pH of the inoculated media is lowered after incubation. Uninoculated Peptone Yeast Extract Broth Based Media should show only trace amounts, if any, of volatile and nonvolatile fatty acids when tested with gas liquid chromatography. PYG cultures of appropriate control strains, such as *Bacteroides fragilis*, *Fusobacterium necrophorum*, and *Clostridium perfringens*, should have characteristic metabolic products when tested with gas chromatography. Peptone Yeast Extract Broth Based Media should support good growth of anaerobes isolated from clinical specimens.

pH Measurements: Once sufficient growth has been observed, the pH can be read directly from the culture tube using a pH meter and a long thin combination electrode. Thoroughly rinse the electrode with distilled water into a container containing disinfectant after reading each strain. Disinfect the electrode before returning it to the storage solution.

Interpretation of pH: A pH value of 5.5 to 6.0 is considered a weak acid production response, while a value of 5.5 or less is a strong acid production response. A pH above 6.0 is considered no acid production.

Esculin Hydrolysis Detection (AS-833 PY ESCULIN): Add 2 to 3 drops of a 1% solution of ferric ammonium citrate (Esculin Reagent; AS-713) to an inoculated tube of PY ESCULIN with sufficient bacterial growth. Observe for a color change. If development of a black or dark brown complex occurs, confirm reaction by checking for fluorescence under UV light. Intact esculin fluoresces blue-white under 366 nm light, while hydrolyzed esculin does not.

Starch Hydrolysis Detection (AS-829 PY STARCH): Add 2 to 3 drops of a 1:5 dilution of Gram's Iodine to an inoculated tube of PY STARCH with sufficient growth. No color change indicates hydrolysis of starch by the organism. The formation of blue/black color indicates that starch is present.,

Gelatin Hydrolysis Detection (AS-860 PYG GELATIN): Place a 24 – 72-hour culture with an uninoculated control tube, in a 2 – 8 °C environment. The uninoculated control tube will solidify, and, if the inoculated tube does not solidify, then the gelatin has been hydrolyzed. Solidification of the inoculated tube results in no gelatin hydrolysis.

Growth in Bile Determination (AS-857 PYG BILE): Turbidity in the medium is compared to that of PYG (AS-822) to determine if the organism is inhibited or stimulated by bile.

Limitations

Peptone Yeast Extract Broth Based Media will not provide complete information for identification of bacterial isolates. Additional test procedures and media are required for complete identification. Consult reference materials for additional information.

Quality Control

The following organisms are routinely used at Anaerobe Systems for quality assurance performance testing for basic growth of Peptone Yeast Extract Broth Based Media.

Organism Tested	ATCC #	Results	Time
<i>Bacteroides vulgatus</i>	8482	Growth	24 hrs
<i>Bacteroides fragilis</i>	25285	Growth	24 hrs
<i>Prevotella melaninogenica</i>	25845	Growth*	24 – 48 hrs
<i>Fusobacterium necrophorum</i>	25286	Growth*	24 – 48 hrs
<i>Fusobacterium nucleatum</i>	25586	Growth*	24 – 48 hrs
<i>Clostridium perfringens</i>	13124	Growth	24 hrs
<i>Peptostreptococcus anaerobius</i>	27337	Growth*	24 hrs
<i>Clostridium novyi</i> , Type A (PY, PYG, and PYG TWEEN only)	7659	Growth [†]	48 – 72 hrs
<i>Cutibacterium acnes</i> (PY, PY ADONITOL, PYG, and PY GLYCEROL only)	6919	Growth [†]	24 – 48 hrs
<i>Campylobacter ureolyticus</i> (PYG FF only)	33387	Growth [†]	24 – 48 hrs
<i>Staphylococcus aureus</i> (PY and PYG only)	25923	Growth [†]	24 hrs
<i>Peptoniphilus asaccharolyticus</i> (PY FRUCTOSE, PYG GELATIN, PYG BILE, PYG, PYG FF, and PYG TWEEN only)	29743	Growth*	24 – 48 hrs
<i>Veillonella parvula</i> (PY LACTATE only)	10790	Growth [†]	24 – 48 hrs

*No growth in PYG BILE

[†] Not tested for growth in bile

Biochemical Utilization: The following additional organisms are routinely used for each biochemical utilization at Anaerobe Systems and are determined based on pH with the production of acid. A strong acid will result in a pH of 5.5 or below, weak acid in a pH of 5.5 – 6.0, and no acid production in a pH of 6.0 or above.

Product	Organism Tested	ATCC#	Pos. pH/hy	Organism Tested	ATCC#	Neg. pH/hy
PY ADONITOL	Klebsiella pneumoniae	49472	+	Bacteroides fragilis	25285	-
PY AMYGDALIN	Bifidobacterium adolescentis	15703	+	Bacteroides vulgatus	8482	-
				Fusobacterium necrophorum	25286	-
PY ARABINOSE	Bacteroides vulgatus	8482	+	Bacteroides fragilis	25285	-
PY ARGININE	Eggerthella lenta	43055	Growth stimulated compared to PY			
PYG BILE	Bacteroides vulgatus	8482	Growth	Peptoniphilus asaccharolyticus	29743	NG
	Bacteroides fragilis	25285	Growth	Fusobacterium necrophorum	25286	NG
PY CELLOBIOSE	Bifidobacterium breve	15700	+	Peptostreptococcus anaerobius	27337	-
	Clostridium perfringens	13124	+	Fusobacterium necrophorum	25286	-
PY DULCITOL	Kluyvera intermedia	700722	+	Bacteroides fragilis	25285	-
PY ERYTHRITOL	Eubacterium limosum	10825	+	Bacteroides vulgatus	8482	-
PY ESCULIN	Bacteroides fragilis	25285	(/+)	Peptostreptococcus anaerobius	27337	(/-)
				Fusobacterium necrophorum	25286	(/-)
PY FRUCTOSE	Bacteroides fragilis	25285	+	Peptoniphilus asaccharolyticus	29743	-
	Bacteroides vulgatus	8482	+	Porphyromonas levii	29147	-
PY GALACTOSE	Bacteroides fragilis	25285	+	Fusobacterium necrophorum	25286	-
	Bacteroides vulgatus	8482	+			
PYG GELATIN	Clostridium perfringens	13124	(+ /+)	Bifidobacterium longum	15707	(NT /-)
	Prevotella melaninogenica	25845	(NT /+)	Peptoniphilus asaccharolyticus	29743	(- /-)
PYG	Bacteroides fragilis	25285	+	Peptoniphilus asaccharolyticus	29743	-
				Fusobacterium necrophorum	25286	-*
PY GLYCEROL	Cutibacterium acnes	6919	+	Bacteroides fragilis	25285	-
PY GLYCOGEN	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
PY INOSITOL	Clostridium perfringens	13124	+	Peptostreptococcus anaerobius	27337	-
				Fusobacterium nucleatum	25586	-
PY INULIN	Bifidobacterium adolescentis	15703	+	Peptostreptococcus anaerobius	27337	-
PY LACTOSE	Clostridium perfringens	13124	+	Fusobacterium necrophorum	25286	-
	Bacteroides fragilis	25285	+	Fusobacterium nucleatum	25586	-
PY MALTOSE	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
	Bacteroides fragilis	25285	+	Fusobacterium nucleatum	25586	-
PY MANNITOL	Clostridium tertium	19405	+	Fusobacterium necrophorum	25286	-
				Clostridium perfringens	13124	-
PY MANNOSE	Clostridium perfringens	13124	+	Fusobacterium nucleatum	25586	-
	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
PY MELEZITOSE	Bifidobacterium longum	15707	+	Peptostreptococcus anaerobius	27337	-
	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
PY MELIBIOSE	Bifidobacterium longum	15707	+	Peptostreptococcus anaerobius	27337	-
PY RAFFINOSE	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
	Bacteroides fragilis	25285	+	Fusobacterium nucleatum	25586	-

PY RHAMNOSE	Bacteroides vulgatus	8482	+	Peptostreptococcus anaerobius	27337	-
PY RIBOSE	Bifidobacterium longum	15707	+	Bacteroides fragilis	25285	-
				Fusobacterium necrophorum	25286	-
PY SALICIN	Bifidobacterium adolescentis	15703	+	Peptostreptococcus anaerobius	27337	-
	Bacteroides ovatus	8483	+	Fusobacterium necrophorum	25286	-
PY SORBITOL	Bifidobacterium adolescentis	15703	+	Peptostreptococcus anaerobius	27337	-
PY STARCH	Clostridium perfringens	13124	(+ / +)	Fusobacterium necrophorum	25286	(- / -)
	Bacteroides fragilis	25285	(+ / +)	Peptostreptococcus anaerobius	27337	(- / -)
PY SUCROSE	Clostridium perfringens	13124	+	Peptostreptococcus anaerobius	27337	-
	Bacteroides fragilis	25285	+	Fusobacterium necrophorum	25286	-
PY TREHALOSE	Bacteroides ovatus	8483	+	Peptostreptococcus anaerobius	27337	-
				Fusobacterium necrophorum	25286	-
PY XYLAN	Bacteroides ovatus	8483	+	Bacteroides fragilis	25285	-
PY XYLOSE	Bifidobacterium longum	15707	+	Fusobacterium nucleatum	25586	-
	Bacteroides fragilis	25285	+	Fusobacterium necrophorum	25286	-

NG = No Growth NT = Not Tested hy = Hydrolysis * = Weak Acid Production

User Quality Control: The final determination to the extent and quantity of user laboratory quality control must be determined by the end user.

If sterility testing is to be performed on this product, a representative sample of the lot(s) should be incubated anaerobically and aerobically for 48 – 96 hours.

If the nutritive capacity of this media is to be tested for performance, it is recommended that the following ATCC organisms be evaluated for growth. Carbohydrate/biochemical utilization is then determined by pH analysis.

Product	Organism Tested	ATCC#	Pos. pH/hy	Organism Tested	ATCC#	Neg. pH/hy
PY	Bacteroides fragilis	25285	Growth			
	Fusobacterium necrophorum	25286	Growth			
PY ADONITOL	Klebsiella pneumoniae	49472	+	Bacteroides fragilis	25285	-
PY AMYGDALIN	Bifidobacterium adolescentis	15703	+	Bacteroides vulgatus	8482	-
PY ARABINOSE	Bacteroides vulgatus	8482	+	Bacteroides fragilis	25285	-
PY ARGININE	Eggerthella lenta	43055	Growth stimulated compared to PY			
PYG BILE	Bacteroides vulgatus	8482	Growth	Peptoniphilus asaccharolyticus	29743	NG
PY CELLOBIOSE	Bifidobacterium breve	15700	+	Peptostreptococcus anaerobius	27337	-
PY DULCITOL	Kluyvera intermedia	700722	+	Bacteroides fragilis	25285	-
PY ERYTHRITOL	Eubacterium limosum	10825	+	Bacteroides vulgatus	8482	-
PY ESCULIN	Bacteroides fragilis	25285	(/ +)	Peptostreptococcus anaerobius	27337	(/ -)
PY FRUCTOSE	Bacteroides fragilis	25285	+	Peptoniphilus asaccharolyticus	29743	-
PY GALACTOSE	Bacteroides fragilis	25285	+	Fusobacterium necrophorum	25286	-
PYG	Bacteroides fragilis	25285	+	Peptoniphilus asaccharolyticus	29743	-
PYG FF	Campylobacter ureolyticus	33387	Growth stimulated compared to PYG			
PYG GELATIN	Clostridium perfringens	13124	(+ / +)	Bifidobacterium longum	15707	(NT / -)
PYG TWEEN	Clostridium novyi	6919	Growth stimulated compared to PYG			
PY GLYCEROL	Propionibacterium acnes	6919	+	Bacteroides fragilis	25285	-
PY GLYCOGEN	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-

PY INOSITOL	Clostridium perfringens	13124	+	Peptostreptococcus anaerobius	27337	-
PY INULIN	Bifidobacterium adolescentis	15703	+	Peptostreptococcus anaerobius	27337	-
PY LACTOSE	Clostridium perfringens	13124	+	Fusobacterium necrophorum	25286	-
PY MALTOSE	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
PY MANNITOL	Clostridium tertium	19405	+	Fusobacterium necrophorum	25286	-
PY MANNOSE	Clostridium perfringens	13124	+	Fusobacterium nucleatum	25586	-
PY MELEZITOSE	Bifidobacterium longum	15707	+	Peptostreptococcus anaerobius	27337	-
PY MELIBIOSE	Bifidobacterium longum	15707	+	Peptostreptococcus anaerobius	27337	-
PY RAFFINOSE	Bacteroides vulgatus	8482	+	Fusobacterium necrophorum	25286	-
PY RHAMNOSE	Bacteroides vulgatus	8482	+	Peptostreptococcus anaerobius	27337	-
PY RIBOSE	Bifidobacterium longum	15707	+	Bacteroides fragilis	25285	-
PY SALICIN	Bifidobacterium adolescentis	15703	+	Peptostreptococcus anaerobius	27337	-
PY SORBITOL	Bifidobacterium adolescentis	15703	+	Peptostreptococcus anaerobius	27337	-
PY STARCH	Clostridium perfringens	13124	(+/-)	Fusobacterium necrophorum	25286	(-/-)
PY SUCROSE	Clostridium perfringens	13124	+	Peptostreptococcus anaerobius	27337	-
PY TREHALOSE	Bacteroides ovatus	8483	+	Peptostreptococcus anaerobius	27337	-
PY XYLAN	Bacteroides ovatus	8483	+	Bacteroides fragilis	25285	-
PY XYLOSE	Bifidobacterium longum	15707	+	Fusobacterium nucleatum	25586	-

NG = No Growth NT = Not Tested

Physical Appearance: Peptone Yeast Extract Broth Based Media should appear as a clear golden-yellow to clear golden-brown liquid. PY XYLAN is turbid. PYG GELATIN can be a semi-solid at cooler temperatures.

References

1. Dowell, V. R., Jr., G. L. Lombard, F. S. Thompson and A. Y. Armfield. 1977. *Media for the Isolation, Characterization and Identification of Obligately Anaerobic Bacteria*. USDHHS, CDC. Atlanta, GA 30333.
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3. Holdeman, L. V., F. P. Cato and W. E. C. Moore. 1987. *Anaerobe Laboratory Manual*. Virginia Polytechnic Institute and State University. Blacksburg, VA 24061
4. Jousimeis-Somer, H. R., Summanen, P., Citron, D. M., Baron, E. J., Wexler, H. M. and S. M. Finegold. 2002. *Wadsworth – KYL Anaerobic Bacteriology Manual*. Star Publishing Co., Belmont, CA 94002.
5. CLSI. *Quality Control for Commercially Prepared Microbiological Culture Media; Approved Standard- Third Edition*. (2004). CLSI document M22-A3. CLSI, 940 West Valley Road, Suite 1400, Wayne, PA 19087-1898.
6. Sherlock Microbial Identification System (MIS). Operating Manual, Version 6. MIDI, Inc. Newark, DE 19713.