

MATERIAL SAFETY DATA SHEET

SECTION 1 – CHEMICAL PRODUCT(S) AND COMPANY IDENTIFICATION

Manufacturer Name: **Worthington Biochemical Corporation**
 Address: **730 Vassar Ave**
Lakewood, NJ 08701 USA

For Information Call: **1.732.942.1660**
Date Prepared: March, 1986
Date Revised: January, 2007
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Quick Identifier(In-plant Common Name): **Protein(s)/Enzyme(s)**

Chemical Name: **Enzyme/Protein** Chemical Family: **Proteins** Formula: **Complex Polypeptides**
 Common Name/Trade Name: **See List Below**(Used on label) CAS Number: **[As Listed]**

<u>Common Name/Trade Name(Used on label)</u>	<u>Source</u>	<u>CAS Number</u>	<u>EC Number</u>
Actin	(rabbit muscle)	N/A	N/A
Adenosine Deaminase	(calf spleen)	[9026-93-1]	3.5.4.4
Agarase, β	(<i>Pseudomonas atlantica</i>)	[37288-57-6]	3.2.1.81
Albumin	(bovine)	[9048-46-8]	N/A
Alcohol Dehydrogenase	(yeast)	[9031-72-5]	1.1.1.1
Aldolase	(rabbit muscle)	[9024-52-6]	4.1.2.13
D-Amino Acid Oxidase	(hog kidney)	[9000-88-8]	1.4.3.3
L-Amino Acid Oxidase	(<i>Crotalus adamanteus</i> venom)	[9000-89-9]	1.4.3.2
α-Amylase	(porcine pancreas)	[9000-85-5]	3.2.1.1
β-Amylase	(sweet potato)	[9000-91-3]	3.2.1.2
Arginase	(bovine liver)	[9000-96-8]	3.5.3.1
L-Asparaginase	(<i>E. coli</i>)	[9015-68-3]	3.5.1.1
Aspartate Aminotransferase	(porcine heart)	[9000-97-9]	2.6.1.1
Avidin	(egg white)	[1405-69-2]	N/A
Carbonic Anhydrase	(bovine erythrocytes)	[9001-03-0]	4.2.1.1
Carboxypeptidase A	(bovine pancreas)	[11075-17-5]	3.4.17.1
Carboxypeptidase B	(bovine pancreas)	[9025-24-5]	3.4.17.2
Carboxypeptidase Y	(yeast)	[9046-67-7]	3.4.16.1
α-Casein	(bovine milk)	[9000-71-9]	N/A
Catalase	(bovine liver)	[9001-05-2]	1.11.1.6
Cell Isolation Optimization System	(see components)	N/A	N/A
Cellulase	(<i>T. viride/reesei</i>)	[9012-54-8]	3.2.1.4
Cholesterol Esterase	(porcine pancreas)	[9026-00-0]	3.1.1.13
Cholinesterase, Acetyl	(<i>E. electricus</i>)	[9000-81-1]	3.1.1.7
Cholinesterase, Butyryl	(horse serum)	[9001-08-5]	3.1.1.8
Chymopapain	(papaya latex)	[9001-09-6]	3.4.22.2
Chymotrypsin	(bovine pancreas)	[9004-07-3]	3.4.21.1
Chymotrypsinogen A	(bovine pancreas)	[9035-75-0]	N/A
Clostridiopeptidase A	(<i>Cl. histolyticum</i>)	[9001-12-1]	3.4.24.3
Clostripain	(<i>Cl. histolyticum</i>)	[9028-00-6]	3.4.22.8
Collagen	(bovine achilles tendon)	[9007-34-5]	N/A
Collagen	(soluble calf skin)	[9007-34-5]	N/A
Collagenase	(<i>Cl. histolyticum</i>)	[9001-12-1]	3.4.24.3
Concanavalin A	(Jack bean)	[11028-71-0]	N/A
Creatine Kinase	(rabbit muscle)	[9001-15-4]	2.7.3.2
Cytochrome C Oxidase	(bovine heart)	N/A	1.5.3.1
Deoxyribonuclease I	(bovine pancreas)	[9003-98-9]	3.1.21.1
Deoxyribonuclease II	(porcine spleen)	[9025-64-3]	3.1.22.1
Deoxyribonucleic Acid	(calf thymus)	[9007-49-2]	N/A
Deoxyribonucleic Acid	(<i>Cl. perfringens</i>)	[9007-49-2]	N/A
Deoxyribonucleic Acid	(<i>E. coli</i>)	[9007-49-2]	N/A
Deoxyribonucleic Acid	(Salmon testes)	[9007-49-2]	N/A

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Deoxyribonucleic Acid, Activated	(calf thymus)	[9007-49-2]	N/A
Deoxyribonucleic Acid-Celluloses	(calf thymus)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Lambda	(<i>E. coli</i>)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Lambda, BstE II	(λ DNA)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Lambda, EcoR I	(λ DNA)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Lambda, Hind III	(λ DNA)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Lambda, gt10	(λ DNA)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Lambda, gt11	(λ DNA)	[9007-49-2]	N/A
Deoxyribonucleic Acid, Phage M-13	(KO7/ <i>E. coli</i> JV 30)	[9007-49-2]	N/A
Deoxyribonucleic Acid, T7	(Bacteriophage T7, <i>E. coli</i>)	[9007-49-2]	N/A
Dextranase	(<i>Penicillium sp.</i>)	[9025-70-1]	3.2.1.11
Diaphorase	(<i>Cl. kluyveri</i>)	[9001-18-7]	1.6.99.1
DNA Ligase, T4	(<i>E. coli</i> lysogenic NM989)	[9015-85-4]	6.5.1.1
DNA Polymerase	(<i>E. coli</i> CM5199)	[9012-90-2]	2.7.7.7
DNA Polymerase, Klenow	(<i>E. coli</i> CM5199)	[9012-90-2]	2.7.7.7
DNA Polymerase, Klenow, Exo-Free	(<i>E. coli</i> CJ 375)	[9012-90-2]	2.7.7.7
DNA Polymerase, T4	(<i>E. coli</i> T4 gene 43)	[9012-90-2]	2.7.7.7
DNA Polymerase, T4, Exo-Free	(<i>E. coli</i> T4 gene 43 modified)	[9012-90-2]	2.7.7.7
DNA Polymerase, T7	(<i>E. coli</i> T7 gene 5/thioredoxin)	[9012-90-2]	2.7.7.7
Elastase	(porcine pancreas)	[9004-06-2]	3.4.21.36
Elastin	(bovine ligamentum nuchae)	[9007-58-3]	N/A
Endonuclease V, T4	(<i>E. coli</i> gene denV)	N/A	N/A
<i>E•RASE™</i> RNase A/T1 Blend	(see components)	N/A	N/A
Galactose Oxidase	(<i>D. dendroides</i>)	[9028-79-9]	1.1.3.4
Galactosyltransferase	(bovine milk)	[9031-68-9]	2.4.1.22
β -Galactosidase	(<i>E. coli</i>)	[9031-11-2]	3.2.1.23
Glucose Oxidase	(<i>A. niger</i>)	[9001-37-0]	1.1.3.4
Glucose-6-Phosphate Dehydrogenase	(<i>L. mesenteroides</i>)	[9001-40-5]	1.1.1.49
β -Glucosidase	(almonds)	[9001-22-3]	3.2.1.21
α -Glucosidase	(yeast)	[9001-42-7]	3.2.1.20
β -Glucuronidase	(bovine liver)	[9001-45-0]	3.2.1.31
Glutamate Decarboxylase	(<i>E. coli</i>)	[9024-58-2]	4.1.1.15
Glutamic Oxaloacetic Transaminase	(porcine heart)	[9000-97-9]	2.6.1.1
Glyceraldehyde-3-Phosphate Dehydrogenase	(rabbit muscle)	[9001-50-7]	1.2.1.12
Glycerol Dehydrogenase	(<i>E. aerogenes</i>)	[9028-14-2]	1.1.1.6
Glycerol Kinase	(<i>E. coli</i>)	[9030-66-4]	2.7.1.30
Hemoglobin	(bovine erythrocytes)	[9008-02-0]	N/A
Hepatocyte Isolation System	(see components)	N/A	N/A
Hexokinase	(yeast)	[9001-51-8]	2.7.1.1
Histones	(calf thymus)	[37244-51-2]	N/A
Hyaluronic Acid	(bovine vitreous humor)	[9004-61-9]	N/A
Hyaluronidase	(bovine testes)	[37326-33-3]	3.2.1.35
Hydroxysteroid Dehydrogenase	(<i>P. testosteroni</i>)	[9028-56-2/9015-81-0]	1.1.1.51
α -Lactalbumin	(bovine milk)	[9013-90-5]	N/A
L-Lactate Dehydrogenase	(baker's yeast)	[9001-60-9]	1.1.2.3
Lactate Dehydrogenase	(bovine heart)	[9001-60-9]	1.1.1.27
Lactate Dehydrogenase	(rabbit muscle)	[9001-60-9]	1.1.1.27
Lactoperoxidase	(bovine milk)	[9003-99-0]	1.11.1.8
Leucine Aminopeptidase	(porcine kidney)	[9001-61-0]	3.4.11.1
Lipase	(porcine pancreas)	[9001-62-1]	3.1.1.3
Luciferase	(<i>P. fischerii</i>)	[9014-00-0]	1.14.14.3
Lysozyme	(egg white)	[12650-88-3]	3.2.1.17
Malate Dehydrogenase	(porcine heart)	[9067-93-0]	1.1.1.37
Maltase	(yeast)	[9001-42-7]	3.2.1.20
Maltodextrin Phosphorylase	(<i>E. coli</i>)	N/A	N/A
<i>Micrococcus lysodeikticus</i> cells	(<i>M. lysodeikticus</i>)	N/A	N/A
Mucin	(bovine submaxillary gland)	[84195-52-8]	N/A
NADase	(<i>N. crassa</i>)	[9032-65-9]	3.2.2.5

SECTION 1 – CHEMICAL PRODUCT(S) AND COMPANY IDENTIFICATION(con't)			
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Neonatal Cardiomyocyte Isolation System	(see components)	N/A	N/A
Neuraminidase	(<i>Cl. perfringens</i>)	[9001-67-6]	3.2.1.18
Neutral Protease (Dispase)	(<i>B. polymyxa</i>)	[9001-92-7]	3.4.24.28
Nick Translation Kit	(see components)	N/A	N/A
Nitrate Reductase	(<i>E. coli</i>)	[9029-42-9]	1.9.6.1
Nuclease, Micrococcal (S7)	(<i>S. aureus</i>)	[9013-53-0]	3.1.31.1
Nuclease, SI	(<i>A. oryzae</i>)	[37288-25-8]	3.1.30.1
Nucleohistone	(calf thymus)	[37244-51-2]	N/A
Oligo (dT)-Cellulose	(oligo (dT))	N/A	N/A
Ovalbumin	(egg white)	[9006-59-1]	N/A
Papain	(papaya latex)	[9001-73-4]	3.4.22.2
Papain Dissociation System	(see components)	N/A	N/A
Papain, Mercuri-	(papaya latex)	[9001-73-4]	3.4.22.2
Pectinase	(<i>A. niger</i>)	[9032-75-1]	4.2.2.10
Pepsin	(porcine stomach)	[9001-75-6]	3.4.23.1
Pepsinogen	(porcine stomach)	[9001-75-6]	N/A
Peroxidase	(horseradish roots)	[9003-99-0]	1.11.1.7
Phage DNA, M13	(Phage M-13-KO7 <i>E. coli</i> JV30)	[9007-49-2]	N/A
Phosphatase, Acid	(wheat germ)	[9001-77-8]	3.1.3.2
Phosphatase, Alkaline	(calf intestine)	[9001-78-9]	3.1.3.1
Phosphatase, Alkaline	(chicken intestine)	[9001-78-9]	3.1.3.1
Phosphatase, Alkaline	(<i>E. coli</i>)	[9001-78-9]	3.1.3.1
Phosphodiesterase I	(<i>Crotalus adamanteus</i> venom)	[9025-82-5]	3.1.4.1
Phosphodiesterase II	(bovine spleen)	[9068-54-6]	3.1.4.18
Phosphoenolpyruvate Carboxylase	(<i>E. coli</i>)	[9067-77-0]	4.1.1.31
Phosphoglucomutase	(rabbit muscle)	[9001-81-4]	5.4.2.2
Phospholipase A2	(<i>Crotalus adamanteus</i> venom)	[9001-84-7]	3.1.1.4
Phospholipase C	(<i>Cl. perfringens</i>)	[9001-86-9]	3.1.4.3
Plasma Amine Oxidase	(bovine plasma)	[9001-53-0]	1.4.3.6
Plasmid DNA, pBR322	(<i>E. coli</i> RLM430)	[9007-49-2]	N/A
Plasmid DNA, pT7-0 UD	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pT7-1	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pT7-2	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pT7-7	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pT7-SC	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pT7-SCII	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pTZ18U	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pTZ19U	(<i>E. coli</i> DH5- α)	[9007-49-2]	N/A
Plasmid DNA, pUC 18	(<i>E. coli</i> DHP5- α)	[9007-49-2]	N/A
Plasmid DNA, pUC 19	(<i>E. coli</i> DHP5- α)	[9007-49-2]	N/A
Plasmid DNA, pUC 118	(<i>E. coli</i> DHP5- α)	[9007-49-2]	N/A
Plasmid DNA, pUC 119	(<i>E. coli</i> DHP5- α)	[9007-49-2]	N/A
Pokeweed Antiviral Protein	(<i>Phytolacca americana</i> (pokeweed))	[63231-57-2]	N/A
Polynucleotide Kinase, T4	(<i>E. coli</i> T4)	[37211-65-7]	2.7.1.78
Polyphenol Oxidase(Tyrosinase)	(mushroom)	[9002-10-2]	1.14.18.1
Protease, Neutral (Dispase)	(<i>B. polymyxa</i>)	[9001-92-7]	3.4.24.28
Protease, V8	(<i>S. aureus</i>)	[66676-43-5]	3.4.21.19
Proteinase K	(<i>T. album</i>)	[39450-01-6]	3.4.21.14
Pyruvate Kinase	(rabbit muscle)	[9001-59-6]	2.7.1.40
Random Primers	N/A	N/A	N/A
Reverse Transcriptase, HIV, Recombinant	(<i>E. coli</i> plasmid pRC-RT)	[9068-38-6]	2.7.7.49
Ribonucleic Acid	(baker's yeast)	[63231-63-0]	N/A
Ribonucleic Acid, Core	(brewer's yeast)	[63231-63-0]	N/A
Ribonucleic Acid, Q β Phage	(Phage Q β)	[63231-63-0]	N/A
Ribonuclease A	(bovine pancreas)	[9001-99-4]	3.1.27.5
Ribonuclease B	(bovine pancreas)	[9001-99-4]	3.1.27.5

SECTION 1 – CHEMICAL PRODUCT(S) AND COMPANY IDENTIFICATION (cont'd)

RNA Polymerase	(E. coli 4-13)	[9014-24-8]	2.7.7.6
RNA Polymerase, T7	(E. coli T7 gene)	[9014-24-8]	2.7.7.6
(Hydroxy) Steroid Dehydrogenase	(P. testosteroni)	[9028-56-2/9015-81-0]	1.1.1.51
Superoxide Dismutase	(bovine erythrocytes)	[9054-89-1]	1.15.1.1
Thymidine Phosphorylase	(E. coli)	[9030-23-3]	2.4.2.4
Trypsin	(bovine pancreas)	[9002-07-7]	3.4.21.4
Trypsinogen	(bovine pancreas)	[9002-07-7]	N/A
Trypsin Inhibitor	(bovine pancreas)	[9035-81-8]	N/A
Trypsin Inhibitor	(lima bean)	[9035-81-8]	N/A
Trypsin Inhibitor	(ovomucoid)	[9035-81-8]	N/A
Trypsin Inhibitor	(soybean)	[9035-81-8]	N/A
Tyrosine Decarboxylase	(Str. faecalis)	[9002-09-9]	4.1.1.25
Urease	(Jack bean)	[9002-13-5]	3.5.1.5
Uricase	(C. utilis)	[9002-12-4]	1.7.3.3
Uricase	(porcine liver)	[9002-12-4]	1.7.3.3
Xanthine Oxidase	(bovine milk)	[9002-17-9]	1.2.3.2

SECTION 2 - COMPOSITION AND INFORMATION ON INGREDIENTS**Ingredient Name(s):** Refer to Section 1**CAS Number(s):** Refer to Section 1**Principal Hazardous Component(s):** N/A**Chemical & common name(s):** Enzymes, Proteins**Biologic Activity:** Varies(%)**EC Number(s):** Refer to Section 1**Exposure Limit(s):** Not Established(Enzymes/Proteins may cause allergic reactions in certain sensitive individuals)**SECTION 3 – HAZARDS IDENTIFICATION****Threshold Limit Value:** None Known or Reported**Signs and Symptoms of Exposure:**

1. Acute Overexposure: May cause skin, eye or respiratory irritation upon contact
2. Chronic Overexposure: Allergic reactions may develop in certain sensitive individuals

Medical Conditions Generally Aggravated by Exposure: Allergy-prone and asthmatic individuals should be particularly cautious with enzymes and other materials of biologic origin**Chemical Listed as Carcinogen or Potential Carcinogen:** No**National Toxicology Program:** No**I.A.R.C. Monographs:** No**OSHA:** No**OSHA Permissible Exposure Limit:** N/A**ACGIH Threshold Limit Value:** N/A**Other Exposure Limit Use:** N/A**SECTION 4 – FIRST AID MEASURES****Emergency and First Aid Procedures** (Enzymes/Proteins may cause allergic reactions in certain sensitive individuals):

1. **Inhalation:** Remove person from source then obtain necessary medical attention
2. **Eyes:** Check for contact lenses and remove if present. Flush thoroughly with water while opening eyelids. If symptoms such as redness and irritation persist, obtain medical attention.
3. **Skin:** Remove contaminated clothing. Wash material from skin with soap and water and rinse thoroughly with clean water. Obtain medical attention as needed or if irritation develops. Clean contaminated clothing before reuse.
4. **Ingestion:** May be harmful if swallowed. Obtain medical attention as needed.

SECTION 5 – FIRE & EXPLOSION HAZARDS**Special Fire Fighting Procedures:** None **Auto-Ignition Temperature:** N/A**Flash Point:** N/A**Flammable Limits in Air (% by Volume):** N/A**Extinguisher Media:** N/A**Unusual Fire and Explosion Hazards:** None**Stability:** Degradation products are not hazardous

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Precautions to be Taken in Handling and Storage: Wear appropriate protective equipment

Other Precautions: None

Steps to be Taken in Case Material is Released or Spilled: Wear approved respirator and protective gloves. Vacuum or collect powdered spill into appropriate waste container for disposal. Avoid physical contact and dust during removal. Use normal clean-up procedures for liquid spillage and wash thoroughly with water. Wash contaminated clothing before reuse.

Waste Disposal Method: Dispose of waste in accordance with all applicable Federal, State and local regulations.
Refer to Section 13.

SECTION 7 – HANDLING & STORAGE

Storage: Refer to specific product label for storage conditions. Lyophilized proteins will absorb moisture under high humidity and/or moisture conditions. Keep containers tightly closed when not in use and store in a cool, dry area according to label conditions. Long-term storage temperatures should not exceed 25°C for maximum stability.

Handling: Minimize dust and/or aerosol generation during use. Dry powders can build static electricity caused by excessive handling. Wear appropriate protective equipment as per Section 8.

SECTION 8 – EXPOSURE CONTROLS & PERSONAL PROTECTION

Respiratory Protection (Specify Type): A protective dust mask is advisable to avoid breathing particulates when a powdered form of the product is being handled. Wear an approved respirator.

Mechanical (General): Vent Fan **Ventilation:** Advisable **Local Exhaust:** As Required **Special:** None

Protective Gloves: Wear gloves to prevent skin contact **Eye Protection:** Either safety glasses or goggles should be worn

Other Protective Clothing or Equipment: Sensitive individuals should wear dust masks/respirators, protective gloves, eye protection, lab coat, apron or other protective clothing to minimize contact.

SECTION 9 – PHYSICAL & CHEMICAL PROPERTIES

Appearance and Odor: Powders - White to tan, typical enzyme odor
Liquids - White to brown, typical enzyme odor

Solubility in Water: Powders-Appreciable
Liquids readily miscible in water

Boiling Point: Decomposes

Specific Gravity(H₂O=1): Varies

Vapor Pressure (mmHg): N/A

Percent Volatile by Volume: N/A

Vapor Density(Air=1): N/A

Evaporation Rate: N/A

SECTION 10 – STABILITY & REACTIVITY

Hazardous Decomposition Products: None Known

Hazardous Polymerization: Will Not Occur

Incompatibility(Materials to Avoid): None Known

SECTION 11 – TOXICOLOGICAL INFORMATION

Refer to Section 3 for health effects information. The toxicological properties of this material have not been fully investigated. Always follow Good Laboratory and Industrial Hygiene Practices and wear proper personal protective equipment when handling chemicals. May cause irritation and/or allergic reaction(s).

Routes of Exposure: Inhalation, ingestion, skin and eye contact.
Carcinogenicity: Unknown

LD50: No oral LD50 is available
Mutagenic/Teratogenic Effects: Unknown

SECTION 12 – ECOLOGICAL INFORMATION

No data available. No environmental hazard is known.

SECTION 13 – DISPOSAL CONSIDERATIONS

Dispose of waste in accordance with all applicable Federal, State and local regulations. Chemical residues are generally classified as special waste and, as such, the transportation, storage, treatment and disposal of this waste material must be conducted in compliance with all applicable Federal, State and local regulations. Rinse empty containers thoroughly before disposal and/or recycling.

SECTION 14 – TRANSPORT INFORMATION

Department of Transportation Requirements:	Proper Shipping Name: Not Regulated
	Hazard Class: N/A
	Packaging group: N/A
	Reportable Quantity: N/A
	Labels Required: N/A

International Transportation Regulations: Not Regulated

UN/NA Code: N/A

SECTION 15 – REGULATORY INFORMATION

US Federal Regulations: Material(s) listed are exempt from the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory when supplied for research and development purposes or used under the supervision of a technically qualified individual as defined by 40CFR720.3. The health risks have not been fully determined.

State Regulations: Based upon available information, material(s) listed are not known to be regulated by any state or listed on the New Jersey Right To Know Hazardous Substance List.

International Regulations: EC: Harmful; R42/43, May cause sensitization by inhalation and skin contact.
S36, Wear suitable protective clothing.

SECTION 16 – OTHER USEFUL INFORMATION

Disclaimer

The information contained in this MSDS relates only to the material(s) designated and does not relate to use(s) in combination with any other material, process(es) and/or chemical reaction(s). Worthington Biochemical, Inc. provides this information in good faith, from sources believed to be accurate, however, assumes no liability for its accuracy or completeness.

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