

Table S1. Proteomics of Nematoda

Helminths (Nematoda)	Stage	Excretory- Secretory / Somatic	Proteomics Method	Finding proteins	References
<i>Ascaris suum</i>	L3-egg L3-lung L4	ES	Gel electrophoresis, LC/MS/MS analysis.	L3-egg: Myosin-4, Paramyosin, Tropomyosin, 14-3-3-like protein, Serpin-like protein, Histone. L3-lung: Maltase-glucoamylase, Sucrase- isomaltase, Cuticle collagen, 14- 3-3-like protein, C-type lectin, Aspartic protease. L4: Fructose-bisphosphate aldolase, Fumarate reductase, Glutathione S-transferase, Maltase- glucoamylase, 14-3-3-like protein, C-type lectin, Aspartic protease.	Wang, T., et al. 2013 [54]
<i>Ancylostoma caninum</i>	Adult	ES	SDS-PAGE & OFFGEL electrophoresis.	C-type lectins β -galactoside-specific S-type galectins Proteases Aspartic Metalloproteases Hyaluronidases Lysozyme-like proteins Transthyretin-like proteins	Mulvenna, J., et al. 2009 [76]
<i>Gnathostoma spinigerum</i>	L3	Somatic	Two-dimensional gel electrophoresis, LC-MS/MS analysis, Western Blotting.	Actin Myosin Enolase Heat shock proteins Chaperone proteins Peroxiredoxin Galactoside-binding lectin Galectin	Janwan, P., et al. 2015 [102]
<i>Haemonchus contortus</i>	Adult	ES	Two-dimensional gel electrophoresis, Mass spectrometry.	cathepsin B-like cysteine proteases (CBLs), AC-4, HMCP1, HMCP2, GCP7, Metalloproteases: MEP1, MEP1B, MEP2, Serine proteases	Yatsuda, A P., et al. 2006 [83]
<i>Heligmosomoides polygyrus</i>	Adult	ES	One dimensional gel electrophoresis, LC-MS/MS analysis.	Vitellogenins Retinol Fatty acid binding proteins Globins V5/Tpx-1-related family of proteins Cysteine protease inhibitors G-type lectins Peroxiredoxin Glutathione S-transferase	Moreno et al., 2011 [45]
<i>Nippostrongylus brasiliensis</i>	L3 L4 Adult	ES	Two-dimensional gel electrophoresis, LC-MS/MS analysis.	In all three stages: Venom allergen metallopeptidases Globin Myoglobin Nucleoside-diphosphate-kinase Peroxiredoxin	Sotillo, J., et al. 2014 [73]

				Enolase Cathepsin-D Fructose-bisphosphate-aldolase Ancylostoma secreted protein	
<i>Strongyloides ratti</i>	Infective Larvae Free-living Stages Parasitic Females	ES	One-dimensional gel electrophoresis, Mass Spectrometric analysis, quantitative RT-PCR analysis.	In all three stages: Heat-shock proteins (HSP 17) Galectins Enzymes Fatty acid binding protein Peptidase family Myosin	Soblik, H., et al. 2011 [103]
<i>Toxocara canis</i>	Larvae(L3)	ES(TES)	one dimensional gel electrophoresis, LC-MS/MS analysis.	Collectin-12 Actin-like protein Exonuclease Cathepsin Troponin T Heat shock protein 70 Glycoproteins Mucins	Sperotto, RL., et al. 2017 [60]
<i>Toxocara canis</i>	Larvae (L2)	ES (TES)	Two-dimensional gel electrophoresis, western blotting assay.	33.1 KDa protein is largely equivalent to TES-32 or CTL-1 (C-type lectin 1) Unknown protein (49.4 kDa)	D.T. Vo., et al. 2018 [104]
<i>Toxocara canis</i>	Larvae (L3)	Somatic & ES (TES)	SDS-PAGE, LC/MS/MS analysis.	Heat shock proteins Actin Troponin Exonuclease Cathepsin	Marcia B., et al. 2018 [59]
<i>Toxocara cati</i>	Adult female	Somatic	Two-dimensional gel electrophoresis, western blotting assay, LC/MS/MS analysis	2,3-bisphosphoglycerate-independent phosphoglycerate mutase. Cysteine proteases Enolase Galectin Heat shock protein 70 Myosin-3 Malate dehydrogenase OV-17 antigen OV-16 antigen Tubulin beta chain Troponin I 2	Soleymani., et al. 2021 [69]
<i>Trichinella britovi</i> & <i>Trichinella T8</i>	L1	Somatic	Two-dimensional gel electrophoresis, MALDI-TOF/TOF analysis, Western blotting	Enolase Actin Serine proteinase P49 antigen ORF 9.10 Trichinella	Dea-Ayuela, M., et al. 2005 [105]
<i>Trichinella spiralis</i>	L1	ES	Two-dimensional electrophoresis & Western Blotting, MALDI-TOF-mass spectrometry & liquid chromatography tandem mass spectrometry (LC-MS/MS)	secreted nucleoside diphosphate kinase, Tyvelose-bearing ES glycoproteins: 45 kDa antigen glycoprotein p43 The TspSP-1 serine protease. ORF 17.20 protein and ORF 11.30 protein	Robinson, M W., et al. 2005 [106]
<i>Trichostrongylus colubriformis</i>	L3		Two-dimensional gel electrophoresis, Western blotting	Aspartyl protease inhibitor enolase Chaperone proteins Galectin Glycolytic enzymes Kinase Phosphatase	Kiela, M., et al. 2007 [88]

Structural muscle proteins:
-Myosin, Paramyosin, Calponin

Table S2. Proteomics of Trematoda.

Helminths (Trematoda)	Stage	Excretory-Secretory / Somatic	Proteomics Method	Finding proteins	References
<i>Dicrocoelium dendriticum</i>	Adult	ES & Somatic(TG)	Two-dimensional & LC-MS/MS analysis and Western Blotting	TG: Dihydrolipoamide dehydrogenase, Enolase, Mitochondrial malate dehydrogenase, Glutathione S-transferase. ES: Aldehyde dehydrogenase, 30 kDa glycoprotein, Retinal dehydrogenase.	Martínez-Ibeas, A.M., et al. 2013 [128]
<i>Dicrocoelium dendriticum</i>	Adult	ES & Surface Somatic	miRNAs analysis & Proteomic analysis	Enolase Heat shock proteins Citrate synthase Glucose phosphate isomerase Malate dehydrogenase	Bernal, D., et al. 2014 [130]
<i>Echinostoma caproni</i>	Adult	ES	Two-Dimensional Electrophoresis, Mass spectrometry & Western Blotting	Glutathione S-transferase Hydroxyacylglutathione hydrolase Thiopurine S-transferase Enolase Leucine aminopeptidase Malate dehydrogenase	Cortés, A., et al. 2016 [146]
<i>Fasciola hepatica</i>	Infective larvae, Immature flukes & Adult	ES	One dimensional SDS-PAGE & LC-MS/MS analysis	-Adult: cathepsin L, cathepsin B, asparaginyl endopeptidase cysteine proteases, trypsin-like serine proteases, carboxypeptidases. -Infective larvae, Immature flukes: Proteases such as FhCL3 & cathepsin B	Robinson, M W., et al. 2009 [115]
<i>Schistosoma japonicum</i>	Adult	ES	LC-MS/MS analysis	heat shock proteins 14-3-3 Aminopeptidase Enolase glyceraldehyde-3-phosphate dehydrogenase	Cao, X., et al. 2016 [141]
<i>Schistosoma japonicum</i>	cercariae	somatic	comparative normal cercariae and ultraviolet-irradiated attenuated cercariae & mass spectrometry	Actin glyceraldehydes-3-phosphage dehydrogenase 14-3-3 protein Heat shock protein families (HSP 70)	Yang, L I., et al. 2009 [140]

Table S3. Proteomics of Cestoda

Helminths (Cestoda)	Stage	Excretory-Secretory / Somatic	Proteomics Method	Finding proteins	References
<i>Echinococcus granulosus</i>	Metacestode (Hydatid cyst)	ES: Hydatid cyst fluid	Two-dimensional gel electrophoresis, Mass spectrometry analyses.	Protoscolaxes: Calreticulin, Enolase, P-29, 14-3-3c, EgTPx, GST, Tropomyosin, HSP20, HSP70, Grp78, Putative MVP protein, fructosebisphosphate Aldolase, EgMDH, citrate synthase. Hydatid cyst fluid: Actin, Citrate synthase, Polyubiquitin, Thioredoxin peroxidase, Cystatin B, Antigen B, Antigen 5 (AgB8/1), Thioredoxin peroxidase.	Monteiro, M K., et al. 2010 [164]
<i>Echinococcus granulosus</i>	Metacestode (Hydatid cyst)	ES: Hydatid cyst fluid	Two-dimensional gel electrophoresis, MALDI-TOF-MS analysis.	Actins Tropomyosin Paramyosin Thioredoxin Reductase Antigen P-29 Cyclophilin Heat shock proteins 20 & 70	Chemale, G., et al. 2003 [210]
<i>Echinococcus multilocularis</i>	Metacestode (Alveolar cyst)	ES: Cyst fluid	H95 and G8065 isolated & LC-MS/MS analysis.	protease inhibitors chaperones proteolytic enzymes enolase Heat shock proteins	Monteiro, M K., et al. 2017 [211]
<i>Hymenolepis diminuta</i>	Cysticercoid & Adult	Somatic	One-Dimensional gel electrophoresis, LC-MS/MS analysis.	Cysticercoid: Major egg antigen, 14-3-3 protein, Actin, Malate dehydrogenase (decarboxylating) NAD binding, Collagen. Adult: enolase, HSP60, HSP70, Para myosin, protein disulfide isomerase, Titin, Tropomyosin, Pyruvate kinase.	Sulima,A., et al. 2018 [205]
<i>Taenia Hydatigena</i>	Metacestode (<i>Cysticercus tenuicollis</i>)	Somatic -Scolex (CS) -The cyst without scolex (CWS)	One-Dimensional gel electrophoresis, LC-MS/MS analysis, Western blotting	In both CS & CWS: Paramyosin Myosin heavy chain Enolase Fructose 1,6 bisphosphate aldolase Spectrin alpha chain Collagen alpha 1(V) chain Heat shock 70 kDa protein 4 Spectrin beta chain brain 3 Filamin Phosphoglycerate kinase 1 14-3-3 protein Phosphoglycerate mutase	Cai, M., et al. 2021 [196]
<i>Taenia Hydatigena</i>	Metacestode	ES: Cyst fluid	Mass spectrometry LC-MS/MS analysis	Amino acid synthesis Glutamate dehydrogenase	Zheng, Y. et al. 2017

	(<i>Cysticercus tenuicollis</i>)			Anti-oxidative ATP synthase Enolase	[197]
<i>Taenia taeniaeformis</i> (<i>Hydatigera taeniaeformis</i>)	Metacestode (<i>cysticercus fasciolaris</i>)	Somatic	Cloning, Expression, Purification, & Serological Evaluation of the Recombinant Proteins, LC-MS/MS Analysis, Western Blotting.	Actin Cation transport ATPase Glucan phosphorylase Fructose-1,6-bisphosphate aldolase Enolase Myosin heavy chain Paramyosin Filamin-A Heat shock protein 70 & 60 Peroxiredoxin Cyclophilin Trypsin-like protein 14-3-3 protein Annexin A8 Serine/threonine-protein phosphatase Antigen B Immunogenic protein Ts76 Elongation factor 2	Guo, X., et al. 2020 [198]
<i>Taenia solium</i>	Metacestode (<i>Cysticercus cellulosae</i>)	ES: Cyst fluid	One-Dimensional gel Electrophoresis (1-DE), LC-MS/MS	Glucan phosphorylase Fructose-bisphosphate aldolase Enolase Serine phosphatase 14-3-3 protein Filamin	Victor,B., et al. 2012 [181]

Table S4. Function of proteins found in helminths

Protein funding	Molecular function	Helminthes
Actin protein	ATP binding	<i>Anisakis simplex</i> <i>Ascaris suum</i> <i>Echinococcus granulosus</i> <i>Gnathostoma spinigerum</i> <i>Hymenolepis diminuta</i> <i>Schistosoma japonicum</i> <i>Taenia taeniaeformis</i> <i>Toxocara canis</i> <i>Toxocara cati</i> <i>Trichinella britovi</i> <i>Trichinella T8</i> <i>Trichostrongylus colubriformis</i>
Alanine aminotransferase	Pyridoxal phosphate binding and transaminase activity	<i>Toxocara canis</i> <i>Toxocara cati</i>
Aldehyde dehydrogenase	Oxidizes aldehydes to carboxylic acids	<i>Hymenolepis diminuta</i> <i>Schistosoma japonicum</i>
Amino acid synthesis	Set of biochemical processes (metabolic pathways) by which the amino acids are produced	<i>Taenia Hydatigena</i>
Amino peptidases	Catalyze the cleavage of amino acids from the amino terminus of protein	<i>Schistosoma japonicum</i>

Aspartate aminotransferase	Transaminase activity	<i>Toxocara canis</i> <i>Toxocara cati</i>
Aspartic protease	Break down peptide bonds	<i>Ascaris suum</i> <i>Fasciola hepatica</i>
Acetyl-coenzyme A synthetase	Motor activity	<i>Toxocara canis</i> <i>Toxocara cati</i>
ATP synthase subunit beta	Motor activity	<i>Ascaris suum</i> <i>Taenia Hydatigena</i> <i>Toxocara canis</i> <i>Toxocara cati</i>
Antigen B	Predicted by SignalP to have an amino-terminal secretion signal peptide	<i>Echinococcus granulosus</i> <i>Taenia taeniaeformis</i>
Antigen 5	Predicted by SignalP to have an amino-terminal secretion signal peptide	<i>Echinococcus granulosus</i>
ADP, ATP carrier protein	Motor activity	<i>Toxocara canis</i> <i>Toxocara cati</i>
Aldehyde dehydrogenase, mitochondrial	Unknown	<i>Toxocara canis</i> <i>Toxocara cati</i>
Calcium-transporting ATPase	Motor activity	<i>Toxocara canis</i> <i>Toxocara cati</i>
Calreticulin	Chaperoning and regulation of Ca (2+) homoeostasis	<i>Echinococcus granulosus</i>
Carboxypeptidases	Hydrolysis of peptide amide bonds	<i>Fasciola hepatica</i>
Chaperone proteins	Resistance to proteolysis	<i>Echinococcus multilocularis</i> <i>Gnathostoma spinigerum</i> <i>Trichostrongylus colubriformis</i>
Cysteine proteases	Larvae activation & Intestinal wall penetration	<i>Fasciola hepatica</i> <i>Haemonchus contortus</i>
Citrate synthase	Energy generation	<i>Echinococcus granulosus</i>
Collagen	Structural protein	<i>Hymenolepis diminuta</i> <i>Taenia Hydatigena</i>
Enolase	Phosphopyruvate hydratase activity	<i>Ascaris suum</i> <i>Dicrocoelium dendriticum</i> <i>Echinococcus granulosus</i> <i>Echinococcus multilocularis</i> <i>Echinostoma caproni</i> <i>Gnathostoma spinigerum</i> <i>Nippostrongylus brasiliensis</i> <i>Schistosoma japonicum</i> <i>Taenia Hydatigena</i> <i>Taenia taeniaeformis</i> <i>Taenia solium</i> <i>Toxocara canis</i> <i>Toxocara cati</i>

		<i>Trichinella britovi</i> <i>Trichinella T8</i>
Exonuclease	Unknown	<i>Toxocara canis</i>
Fatty acid binding proteins	Motor activity	<i>Heligmosomoides polygyrus</i> <i>Strongyloides ratti</i>
Fructose-1,6-bisphosphatase isozyme 2	Gluconeogenesis	<i>Ascaris.suum</i> <i>Taenia solium</i> <i>Toxocara.canis</i> <i>Toxocara.cati</i>
Fumarate reductase	Energy production	<i>Ascaris.suum</i>
Galectin	Carbohydrate binding	<i>Ancylostoma caninum</i> <i>Gnathostoma spinigerum</i> <i>Strongyloides ratti</i> <i>Trichostrongylus colubriformis</i> <i>Toxocara.canis</i> <i>Toxocara.cati</i>
Globins	Unknown	<i>Heligmosomoides polygyrus</i> <i>Nippostrongylus brasiliensis</i>
Glutamate dehydrogenase, mitochondrial	Oxidoreductase activity, acting on the CH-NH2 group of donors, NAD or NADP as acceptor, cellular amino acid metabolic process	<i>Toxocara.canis</i> <i>Toxocara.cati</i> <i>Taenia Hydatigena</i>
Glucose-6-phosphate isomerase	Glucose-6-phosphate isomerase activity	<i>Dicrocoelium dendriticum</i> <i>Toxocara.canis</i> <i>Toxocara.cati</i>
Glutathione	Immune modulator of host response	<i>Dicrocoelium dendriticum</i> <i>Echinostoma caproni</i>
Glyceraldehyde-3-phosphate dehydrogenase	phosphorylating activity, NADP binding	<i>Schistosoma japonicum</i> <i>Toxocara canis</i> <i>Toxocara cati</i>
Glycoprotein	Control host-immune responses	<i>Dicrocoelium dendriticum</i> <i>Trichinella spiralis</i>
Glycolytic enzymes	immune modulatory	<i>Trichostrongylus colubriformis</i>
Heat shock protein 70	ATP binding	<i>Ancylostoma caninum</i> <i>Anisakis pegreffii</i> <i>Dicrocoelium dendriticum</i> <i>Dracunculus medinensis</i> <i>Echinococcus granulosus</i> <i>Gnathostoma spinigerum</i> <i>Schistosoma japonicum</i> <i>Strongyloides ratti</i> <i>Taenia Hydatigena</i> <i>Taenia taeniaeformis</i> <i>Toxocara.cati</i>
Hsp70-like protein, variant 2	ATP binding	<i>Dracunculus medinensis</i> <i>Loa loa</i> <i>Toxocara canis</i>

		<i>Toxocara cati</i>
Heat shock protein, 10 kDa mitochondrial	ATP binding	<i>Toxocara canis</i> <i>Toxocara cati</i>
Heat shock protein (HSP 20)	ATP binding	<i>Echinococcus granulosus</i> <i>Echinococcus multilocularis</i>
Heat shock protein (HSP 60)	ATP binding	<i>Taenia taeniaeformis</i>
Lectins including: -three C-type lectins -three β -galactoside-specific S-type galectins	Carbohydrate-binding proteins	<i>Ancylostoma caninum</i>
Lysozyme-like proteins	Enzymatic activity	<i>Ancylostoma caninum</i>
Malate dehydrogenase	Protect against oxidative stress	<i>Dicrocoelium dendriticum</i> <i>Echinostoma caproni</i> <i>Hymenolepis diminuta</i> <i>Toxocara canis</i> <i>Toxocara cati</i>
Metalloproteases: MEP1, MEP1B, MEP2	Molting and Development of nematodes	<i>Haemonchus contortus</i> <i>Nippostrongylus brasiliensis</i>
Myosin	ATP binding, motor activity	<i>Echinococcus granulosus</i> <i>Gnathostoma spinigerum</i> <i>Strongyloides ratti</i> <i>Heat shock protein (HSP 20)</i> <i>Toxocara canis</i> <i>Toxocara cati</i> <i>Trichostrongylus colubriformis</i>
NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial	Motor activity	<i>Hymenolepis diminuta</i> <i>Toxocara canis</i> <i>Toxocara cati</i>
ORF protein	Immune modulatory	<i>Trichinella spiralis</i> <i>Trichinella britovi</i> <i>Trichinella T8</i>
OV-16 & OV-17 antigen	pathogenicity or parasitic cycle (molting)	<i>Toxocara canis</i> <i>Toxocara cati</i>
Para myosin	Structural protein but also as an immunomodulatory agent	<i>Echinococcus granulosus</i> <i>Taenia Hydatigena</i> <i>Taenia taeniaeformis</i> <i>Trichostrongylus colubriformis</i>
proteolytic enzymes: -Cathepsin L -cathepsin B	Migration and the suppression of host immune responses	<i>Fasciola hepatica</i> <i>Haemonchus contortus</i> <i>Nippostrongylus brasiliensis</i> <i>Toxocara canis</i>
Protein disulfide	Embryonic development	<i>Hymenolepis diminuta</i>
Pyruvate kinase	Motor activity	<i>Hymenolepis diminuta</i>

Retinal dehydrogenase	Plays a critical role in immune function infection is poorly understood	<i>Dicrocoelium dendriticum</i> <i>Schistosoma mansoni</i>
Serine proteinase	Development and nutrition	<i>Taenia taeniaeformis</i> <i>Taenia solium</i> <i>Trichinella britovi</i> <i>Trichinella T8</i>
Sodium/potassium- transporting ATPase subunit alpha	Unknown function	<i>Toxocara canis</i> <i>Toxocara cati</i>
TES 32 (33.1 KDa)	proteolysis activity	<i>Toxocara canis</i>
Titin	ATP binding, protein kinase activity	<i>Hymenolepis diminuta</i>
Troponin I 2	Regulation of muscle contraction	<i>Toxocara canis</i> <i>Toxocara cati</i>
Tropomyosin	Induced IL-10 expression (decreased immunological responses)	<i>Ascaris suum</i> <i>Hymenolepis diminuta</i>
Triosephosphate isomerase	Phosphatase activity	<i>Toxocara canis</i> <i>Toxocara cati</i>
Trypsin	Development and nutrition,	<i>Fasciola hepatica</i> <i>Taenia taeniaeformis</i>
Thioredoxin peroxidase	Protection against the oxygen radicals (defense against host immune cell attack)	<i>Echinococcus granulosus</i> <i>Taenia taeniaeformis</i>
Vitellogenins	Developing embryo	<i>Heligmosomoides polygyrus</i>
14-3-3-like protein	Intracellular signalling	<i>Ascaris suum</i> <i>Dirofilaria immitis</i> <i>Hymenolepis diminuta</i> <i>Schistosoma japonicum</i> <i>Onchocerca ochengi</i> <i>Taenia Hydatigena</i> <i>Taenia solium</i> <i>Taenia taeniaeformis</i> <i>Toxocara cati</i>
2,3-bisphosphoglycerate- independent phosphoglycerate mutase	Phosphoglycerate mutase activity	<i>Toxocara canis</i> <i>Toxocara cati</i>