

Chapter 7

References

- Abbas, A.K., Lichtman, A.H., and Pillai, S. (2014). Basic immunology: functions and disorders of the immune system (Philadelphia, PA: Elsevier/Saunders).
- Abdulla, M.-H., Lim, K.-C., McKerrow, J.H., and Caffrey, C.R. (2011). Proteomic Identification of IPSE/alpha-1 as a Major Hepatotoxin Secreted by *Schistosoma mansoni* Eggs. *PLoS Neglected Tropical Diseases* 5, e1368.
- Afonso, V., Champy, R., Mitrovic, D., Collin, P., and Lomri, A. (2007). Reactive oxygen species and superoxide dismutases: role in joint diseases. *Joint Bone Spine* 74, 324–329.
- Ahier, A., Khayath, N., Vicogne, J., and Dissous, C. (2008). Insulin receptors and glucose uptake in the human parasite *Schistosoma mansoni*. *Parasite* (Paris, France) 15, 573–9.
- Aken, B.L., Ayling, S., Barrell, D., Clarke, L., Curwen, V., Fairley, S., Fernandez Banet, J., Billis, K., García Girón, C., Hourlier, T., et al. (2016). The Ensembl gene annotation system. *Database 2016*, baw093.
- Alba-Domínguez, M., López-Lera, A., Garrido, S., Nozal, P., González-Granado, I., Melero, J., Soler-Palacín, P., Cámera, C., and López-Trascasa, M. (2012). Complement factor I deficiency: a not so rare immune defect. Characterization of new mutations and the first large gene deletion. *Orphanet Journal of Rare Diseases* 7, 42.
- Alexa, A., and Rahnenfuhrer, J. (2016). topGO: Enrichment Analysis for Gene Ontology.
- Almeida, G.T., Amaral, M.S., Beckedorff, F.C.F., Kitajima, J.P., DeMarco, R., and Verjovski-Almeida, S. (2012). Exploring the *Schistosoma mansoni* adult male transcriptome using RNA-seq. *Experimental Parasitology* 132, 22–31.
- Alrefaei, Y.N., Okatcha, T.I., Skinner, D.E., and Brindley, P.J. (2011). Progress with schistosome transgenesis. *Mem Inst Oswaldo Cruz* 106, 785–793.
- Anders, S., Pyl, P.T., and Huber, W. (2015). HTSeq-a Python framework to work with high-throughput sequencing data. *Bioinformatics* 31, 166–169.
- Anderson, L., Amaral, M.S., Beckedorff, F., Silva, L.F., Dazzani, B., Oliveira, K.C., Almeida, G.T., Gomes, M.R., Pires, D.S., Setubal, J.C., et al. (2015). *Schistosoma mansoni* Egg, Adult Male and Female Comparative Gene Expression Analysis and Identification of Novel Genes by RNA-Seq. *PLoS Neglected Tropical Diseases* 9, 1–26.

Angeli, V., Faveeuw, C., Delerive, P., Fontaine, J., Barriera, Y., Franchimont, N., Staels, B., Capron, M., and Trottein, F. (2001). *Schistosoma mansoni* induces the synthesis of IL-6 in pulmonary microvascular endothelial cells: role of IL-6 in the control of lung eosinophilia during infection. European Journal of Immunology 31, 2751–61.

Angstadt, C.N. (1997). Purine and Pyrimidine Metabolism. Available: <http://library.med.utah.edu/NetBiochem/pupyr/pp.htm> (Accessed 13 June 2017).

Artero, R.D., Castanon, I., and Baylies, M.K. (2001). The immunoglobulin-like protein Hibris functions as a dose-dependent regulator of myoblast fusion and is differentially controlled by Ras and Notch signaling. Development 128, 4251–4264.

Artis, D., and Pearce, E.J. (2013). Special issue: translatability of helminth therapy. Int. J. Parasitol. 43, 189.

Asch, H.L., and Read, C.P. (1975). Membrane transport in *Schistosoma mansoni*: Transport of amino acids by adult males. Experimental Parasitology 38, 123–135.

ATCC (2014). Adding antibiotics or antimycotics to cell culture medium-79. Available: <https://www.lgcstandards-atcc.org/support/faqs/216ac/Adding%20antibiotics%20or%20antimycotics%20to%20cell%20culture%20medium-79.aspx> (Accessed 13 June 2017).

ATCC (2015). Heat-inactivating serum-68. Available: https://www.lgcstandards-atcc.org/Global/FAQs/C/E/Heat-inactivating%20serum-68.aspx?geo_country=gb (Accessed 13 June 2017)

Attallah, A.M., Abdul-Aal, G.M., Urritia-Shaw, A., Murrell, K.D., Fleisher, T.A., and Vannier, W.E. (1987). Parasitic modulation of host immune mechanisms in schistosomiasis. International Archives of Allergy and Applied Immunology 84, 1–9.

Bahe, S., Stierhof, Y.-D., Wilkinson, C.J., Leiss, F., and Nigg, E.A. (2005). Rootletin forms centriole-associated filaments and functions in centrosome cohesion. J. Cell Biol. 171, 27–33.

Basch, P.F. (1981). Cultivation of *Schistosoma mansoni* in vitro. I. Establishment of cultures from cercariae and development until pairing. The Journal of Parasitology 67, 179–85.

Basch, P.F. (1991). Schistosomes: development, reproduction, and host relations (New York: Oxford University Press).

Basch, P.F., and Humbert, R. (1981). Cultivation of *Schistosoma mansoni* in vitro. III. implantation of cultured worms into mouse mesenteric veins. The Journal of Parasitology 67, 191–5.

Beall, M.J., and Pearce, E.J. (2001). Human transforming growth factor-beta activates a receptor serine/threonine kinase from the intravascular parasite *Schistosoma mansoni*. J. Biol. Chem. 276, 31613–31619.

- Benjamini, Y., Drai, D., Elmer, G., Kafkafi, N., and Golani, I. (2001). Controlling the false discovery rate in behavior genetics research. *Behav. Brain Res.* *125*, 279–284.
- Bentley, A.G., Carlisle, A.S., and Phillips, S.M. (1981). Ultrastructural analysis of the cellular response to *Schistosoma mansoni*: initial and challenge infections in the rat. *The American Journal of Tropical Medicine and Hygiene* *30*, 102–12.
- Berman, H.M., Westbrook, J., Feng, Z., Gilliland, G., Bhat, T.N., Weissig, H., Shindyalov, I.N., and Bourne, P.E. (2000). The Protein Data Bank. *Nucleic Acids Res.* *28*, 235–242.
- Berriman, M., Haas, B.J., LoVerde, P.T., Wilson, R.A., Dillon, G.P., Cerqueira, G.C., Mashiyama, S.T., Al-Lazikani, B., Andrade, L.F., Ashton, P.D., et al. (2009). The genome of the blood fluke *Schistosoma mansoni*. *Nature* *460*, 352–8.
- Berry, A., Moné, H., Iriart, X., Mouahid, G., Aboo, O., Boissier, J., Filliaux, J., Cassaing, S., Debuisson, C., Valentin, A., et al. (2014). Schistosomiasis Haematobium, Corsica, France. *Emerging Infectious Diseases* *20*, 1595–1597.
- Bickle, Q.D. (2009). Radiation-attenuated schistosome vaccination – a brief historical perspective. *Parasitology* *136*, 1621–1632.
- Biomedical Research Institute (2016). Collection of lung *Schistosoma mansoni* schistosomules. Available: <http://www.afbr-bri.com/schistosomiasis/standard-operating-procedures/collection-of-lung-schistosoma-mansoni-schistosomules> (Accessed 13 June 2017).
- Blank, R.B., Lamb, E.W., Tocheva, A.S., Crow, E.T., Lim, K.C., McKerrow, J.H., and Davies, S.J. (2006). The Common γ Chain Cytokines Interleukin (IL)-2 and IL-7 Indirectly Modulate Blood Fluke Development via Effects on CD4⁺ T Cells. *The Journal of Infectious Diseases* *194*, 1609–1616.
- Bloch, E.H. (1980). In vivo microscopy of schistosomiasis. II. Migration of *Schistosoma mansoni* in the lungs, liver, and intestine. *American Journal of Tropical Medicine and Hygiene* *29*, 62–70.
- Bochkov, V.N., Kadl, A., Huber, J., Gruber, F., Binder, B.R., and Leitinger, N. (2002). Protective role of phospholipid oxidation products in endotoxin-induced tissue damage. *Nature* *419*, 77–81.
- Boissier, J., Moné, H., Mitta, G., Bargues, M.D., Molyneux, D., and Mas-Coma, S. (2015). Schistosomiasis reaches Europe. *The Lancet Infectious Diseases* *15*, 757–758.
- Braschi, S., and Wilson, R.A. (2006). Proteins exposed at the adult schistosome surface revealed by biotinylation. *Molecular & Cellular Proteomics : MCP* *5*, 347–56.
- Braschi, S., Curwen, R.S., Ashton, P.D., Verjovski-Almeida, S., and Wilson, A. (2006a). The tegument surface membranes of the human blood parasite *Schistosoma mansoni*: a proteomic analysis after differential extraction. *Proteomics* *6*, 1471–82.

- Braschi, S., Castro-Borges, W., and Wilson, R.A. (2006b). Proteomic analysis of the schistosome tegument and its surface membranes. *Memórias Do Instituto Oswaldo Cruz* *101*, 205–212.
- Bray, N.L., Pimentel, H., Melsted, P., and Pachter, L. (2016). Near-optimal probabilistic RNA-seq quantification. *Nature Biotechnology* *34*, 525–527.
- Breuer, K., Foroushani, A.K., Laird, M.R., Chen, C., Sribnaia, A., Lo, R., Winsor, G.L., Hancock, R.E.W., Brinkman, F.S.L., and Lynn, D.J. (2013). InnateDB: Systems biology of innate immunity and beyond - Recent updates and continuing curation. *Nucleic Acids Research* *41*, 1228–1233.
- Bruhn, H. (2005). A short guided tour through functional and structural features of saposin-like proteins. *Biochem. J.* *389*, 249–257.
- Buck, A.H., Coakley, G., Simbari, F., McSorley, H.J., Quintana, J.F., Le Bihan, T., Kumar, S., Abreu-Goodger, C., Lear, M., Harcus, Y., et al. (2014). Exosomes secreted by nematode parasites transfer small RNAs to mammalian cells and modulate innate immunity. *Nature Communications* *5*, 5488.
- Burke, M.L., McGarvey, L., McSorley, H.J., Bielefeldt-Ohmann, H., McManus, D.P., and Gobert, G.N. (2011). Migrating *Schistosoma japonicum* schistosomula induce an innate immune response and wound healing in the murine lung. *Molecular Immunology* *49*, 191–200.
- Burrin, D.G., and Stoll, B. (2009). Metabolic fate and function of dietary glutamate in the gut. *American Journal of Clinical Nutrition* *90*, 850S–856S.
- Cabezas-Cruz, A., Valdés, J.J., Lancelot, J., and Pierce, R.J. (2015). Fast evolutionary rates associated with functional loss in class I glucose transporters of *Schistosoma mansoni*. *BMC Genomics* *16*, 1–18.
- Cai, P., Gobert, G.N., You, H., and McManus, D.P. (2016). The Tao survivorship of schistosomes: implications for schistosomiasis control. *International Journal for Parasitology* *46*, 453–463.
- Campos, T.D.L., Young, N.D., Korhonen, P.K., Hall, R.S., Mangiola, S., Lonie, A., and Gasser, R.B. (2014). Identification of G protein-coupled receptors in *Schistosoma haematobium* and *S. mansoni* by comparative genomics. *Parasites & Vectors* *7*, 242.
- Cao, X., Fu, Z., Zhang, M., Han, Y., Han, Q., Lu, K., Li, H., Zhu, C., Hong, Y., and Lin, J. (2015). Excretory/secretory proteome of 14-day schistosomula, *Schistosoma japonicum*. *Journal of Proteomics*.
- Cao, X., Fu, Z., Zhang, M., Han, Y., Han, H., Han, Q., Lu, K., Hong, Y., and Lin, J. (2016). iTRAQ-based comparative proteomic analysis of excretory-secretory proteins of schistosomula and adult worms of *Schistosoma japonicum*. *Journal of Proteomics* *138*, 30–39.
- Capron, M., Torpier, G., and Capron, A. (1979). In vitro killing of *S. mansoni* schistosomula by eosinophils from infected rats: role of cytophilic antibodies. *J. Immunol.* *123*, 2220–2230.

- Carlos, B.T.M., and Harlan, J.M. (1994). Leukocyte-Endothelia1 Adhesion Molecules. *Blood* *84*, 2068–2101.
- Carvalho, W.S., Lopes, C.T., Juliano, L., Coelho, P.M., Cunha-Melo, J.R., Beraldo, W.T., and Pesquero, J.L. (1998). Purification and partial characterization of kininogenase activity from *Schistosoma mansoni* adult worms. *Parasitology* *117* (Pt 4), 311–319.
- Carver, T., Berriman, M., Tivey, A., Patel, C., Böhme, U., Barrell, B.G., Parkhill, J., and Rajandream, M.-A. (2008). Artemis and ACT: viewing, annotating and comparing sequences stored in a relational database. *Bioinformatics* *24*, 2672–2676.
- Carver, T., Böhme, U., Otto, T.D., Parkhill, J., and Berriman, M. (2010). BamView: viewing mapped read alignment data in the context of the reference sequence. *Bioinformatics* *26*, 676–677.
- de Castro, E., Sigrist, C.J.A., Gattiker, A., Bulliard, V., Langendijk-Genevaux, P.S., Gasteiger, E., Bairoch, A., and Hulo, N. (2006). ScanProsite: detection of PROSITE signature matches and ProRule-associated functional and structural residues in proteins. *Nucleic Acids Res.* *34*, W362–365.
- Castro-Borges, W., Simpson, D.M., Dowle, A., Curwen, R.S., Thomas-Oates, J., Beynon, R.J., and Wilson, R.A. (2011a). Abundance of tegument surface proteins in the human blood fluke *Schistosoma mansoni* determined by QconCAT proteomics. *Journal of Proteomics* *74*, 1519–33.
- Castro-Borges, W., Dowle, A., Curwen, R.S., Thomas-Oates, J., and Wilson, R.A. (2011b). Enzymatic shaving of the tegument surface of live schistosomes for proteomic analysis: a rational approach to select vaccine candidates. *PLoS Neglected Tropical Diseases* *5*, e993.
- Cederbaum, A.I. (2012). Alcohol Metabolism. *Clinics in Liver Disease* *16*, 667–685.
- Centers for Disease Control and Prevention (2012). Schistosomiasis - Biology. Available: <https://www.cdc.gov/parasites/schistosomiasis/biology.html> (Accessed 13 June 2017).
- Chabasse, D., Bertrand, G., Leroux, J.P., Gauthey, N., and Hocquet, P. (1985). [Developmental bilharziasis caused by *Schistosoma mansoni* discovered 37 years after infestation]. *Bull Soc Pathol Exot Filiales* *78*, 643–647.
- Chai, M., McManus, D.P., McInnes, R., Moertel, L., Tran, M., Loukas, A., Jonesa, M.K., and Gobert, G.N. (2006). Transcriptome profiling of lung schistosomula, in vitro cultured schistosomula and adult *Schistosoma japonicum*. *Cellular and Molecular Life Sciences* *63*, 919–929.
- Chaisson, K.E., and Hallem, E.A. (2012). Chemosensory behaviors of parasites. *Trends in Parasitology* *28*, 427–436.
- Chalmers, I.W., McArdle, A.J., Coulson, R.M., Wagner, M. a, Schmid, R., Hirai, H., and Hoffmann, K.F. (2008). Developmentally regulated expression, alternative

splicing and distinct sub-groupings in members of the *Schistosoma mansoni* venom allergen-like (SmVAL) gene family. BMC Genomics 9, 89.

Chase, D. (2007). Biogenic amine neurotransmitters in *C. elegans*. WormBook. Available: http://www.wormbook.org/chapters/www_monoamines/monoamines.html (Accessed 13 June 2017).

Cheever, A.W. (1968). A quantitative post-mortem study of Schistosomiasis mansoni in man. American Journal of Tropical Medicine and Hygiene 17, 38–64.

Chigurupati, S., Arumugam, T.V., Son, T.G., Lathia, J.D., Jameel, S., Mughal, M.R., Tang, S.-C., Jo, D.-G., Camandola, S., Giunta, M., et al. (2007). Involvement of Notch Signaling in Wound Healing. PLoS ONE 2, e1167.

Cioli, D., Pica-Mattoccia, L., Basso, A., and Guidi, A. (2014). Schistosomiasis control: praziquantel forever? Molecular and Biochemical Parasitology 195, 23–29.

Clegg, J.A. (1965a). In vitro cultivation of *Schistosoma mansoni*. Experimental Parasitology 16, 133–147.

Clegg, J.A. (1965b). In Vitro Cultivation of *Schistosoma mansoni*. Experimental Parasitology 16, 133–147.

Clegg, J.A., and Smithers, S.R. (1971). Acquisition of human antigens by *Schistosoma mansoni* during cultivation in vitro. Nature 232, 653–654.

Clegg, J.A., and Smithers, S.R. (1972). The effects of immune rhesus monkey serum on schistosomula of *Schistosoma mansoni* during cultivation in vitro. International Journal for Parasitology 2, 79–98.

Clegg, J.A., Smithers, S.R., and Terry, R.J. (1970). “Host” antigens associated with schistosomes: observations on their attachment and their nature. Parasitology 61, 87–94.

Clemens, L.E., and Basch, P.F. (1989a). *Schistosoma mansoni*: Effect of Transferrin and Growth Factors on Development of Schistosomula In vitro. The Journal of Parasitology 75, 417.

Clemens, L.E., and Basch, P.F. (1989b). *Schistosoma mansoni*: effect of transferrin and growth factors on development of schistosomula in vitro. J. Parasitol. 75, 417–421.

Cline, M.S., Smoot, M., Cerami, E., Kuchinsky, A., Landys, N., Workman, C., Christmas, R., Avila-Campilo, I., Creech, M., Gross, B., et al. (2007). Integration of biological networks and gene expression data using Cytoscape. Nat Protoc 2, 2366–2382.

Colley, D.G., Bustinduy, A.L., Secor, W.E., and King, C.H. (2014). Human schistosomiasis. The Lancet 383, 2253–2264.

Collins, J.J., Hou, X., Romanova, E.V., Lambrus, B.G., Miller, C.M., Saberi, A., Sweedler, J.V., and Newmark, P.A. (2010). Genome-Wide Analyses Reveal a Role

for Peptide Hormones in Planarian Germline Development. PLoS Biology 8, e1000509.

Collins, J.J., King, R.S., Cogswell, A., Williams, D.L., and Newmark, P.A. (2011). An Atlas for *Schistosoma mansoni* Organs and Life-Cycle Stages Using Cell Type-Specific Markers and Confocal Microscopy. PLoS Negl Trop Dis 5, e1009.

Collins, J.J., Wang, B., Lambrus, B.G., Tharp, M.E., Iyer, H., and Newmark, P.A. (2013). Adult somatic stem cells in the human parasite *Schistosoma mansoni*. Nature 494, 476–9.

Conceição, M.J., Lenzi, H.L., and Coura, J.R. (2008). Human study and experimental behavior of *Schistosoma mansoni* isolates from patients with different clinical forms of schistosomiasis. Acta Tropica 108, 98–103.

Cook, R.M., Carvalho-Queiroz, C., Wilding, G., and LoVerde, P.T. (2004). Nucleic acid vaccination with *Schistosoma mansoni* antioxidant enzyme cytosolic superoxide dismutase and the structural protein filamin confers protection against the adult worm stage. Infect. Immun. 72, 6112–6124.

Crabtree, J.E., and Wilson, R.A. (1980). *Schistosoma mansoni*: a scanning electron microscope study of the developing schistosomulum. Parasitology 81, 553–64.

Crabtree, J.E., and Wilson, R.A. (1986a). *Schistosoma mansoni*: an ultrastructural examination of pulmonary migration. Parasitology 92 (Pt 2), 111–120.

Crabtree, J.E., and Wilson, R.A. (1986b). The role of pulmonary cellular reactions in the resistance of vaccinated mice to *Schistosoma mansoni*. Parasite Immunology 8, 265–285.

Crellin, T., Walker, M., Lamberton, P.H.L., Kabatereine, N.B., Tukahebwa, E.M., Cotton, J.A., and Webster, J.P. (2016). Reduced Efficacy of Praziquantel Against *Schistosoma mansoni* Is Associated With Multiple Rounds of Mass Drug Administration. Clinical Infectious Diseases 63, 9.

Croese, J., Giacomin, P., Navarro, S., Clouston, A., McCann, L., Dougall, A., Ferreira, I., Susianto, A., O'Rourke, P., Howlett, M., et al. (2015). Experimental hookworm infection and gluten microchallenge promote tolerance in celiac disease. J. Allergy Clin. Immunol. 135, 508–516.

Croset, V., Schleyer, M., Arguello, J.R., Gerber, B., and Benton, R. (2016). A molecular and neuronal basis for amino acid sensing in the *Drosophila* larva. Scientific Reports 6, 1.

Da'dara, A., and Skelly, P.J. (2011). Manipulation of vascular function by blood flukes? Blood Reviews 25, 175–179.

Da'dara, A., Krautz-Peterson, G., Faghiri, Z., and Skelly, P.J. (2012). Metabolite movement across the schistosome surface. Journal of Helminthology 86, 141–147.

Da'dara, A.A., Bhardwaj, R., and Skelly, P.J. (2014). Schistosome apyrase SmATPDase1, but not SmATPDase2, hydrolyses exogenous ATP and ADP. *Purinergic Signalling* 10, 573–80.

Da'dara, A.A., Siddons, G., Icaza, M., Wang, Q., and Skelly, P.J. (2016a). How schistosomes alter the human serum proteome. *Molecular and Biochemical Parasitology*.

Da'dara, A.A., de Laforcade, A.M., and Skelly, P.J. (2016b). The impact of schistosomes and schistosomiasis on murine blood coagulation and fibrinolysis as determined by thromboelastography (TEG). *Journal of Thrombosis and Thrombolysis* 41, 671–677.

van Dam, G.J., Seino, J., Rotmans, J.P., Daha, M.R., and Deelder, A.M. (1993). *Schistosoma mansoni* circulating anodic antigen but not circulating cathodic antigen interacts with complement component C1q. *Eur. J. Immunol.* 23, 2807–2812.

Davies, A.J., Hall, J.G., Targett, G.A., and Murray, M. (1980). The biological significance of the immune response with special reference to parasites and cancer. *J. Parasitol.* 66, 705–721.

Davies, S.J., Grogan, J.L., Blank, R.B., Lim, K.C., Locksley, R.M., and McKerrow, J.H. (2001). Modulation of blood fluke development in the liver by hepatic CD4+ lymphocytes. *Science* 294, 1358–1361.

Day, T.A., Maule, A.G., Shaw, C., Halton, D.W., Moore, S., Bennett, J.L., and Pax, R.A. (1994). Platyhelminth FMRFamide-related peptides (FaRPs) contract *Schistosoma mansoni* (Trematoda: Digenea) muscle fibres in vitro. *Parasitology* 109 (Pt 4), 455–459.

Day, T.A., Maule, A.G., Shaw, C., and Pax, R.A. (1997). Structure-activity relationships of FMRFamide-related peptides contracting *Schistosoma mansoni* muscle. *Peptides* 18, 917–921.

Dean, D.A., and Mangold, B.L. (1992). Evidence That both Normal and Immune Elimination of *Schistosoma mansoni* Take Place at the Lung Stage of Migration Prior to Parasite Death. *Am J Trop Med Hyg* 47, 238–248.

Decker, E.L., Nehmann, N., Kampen, E., Eibel, H., Zipfel, P.F., and Skerka, C. (2003). Early growth response proteins (EGR) and nuclear factors of activated T cells (NFAT) form heterodimers and regulate proinflammatory cytokine gene expression. *Nucleic Acids Res.* 31, 911–921.

Delcroix, M., Sajid, M., Caffrey, C.R., Lim, K.-C., Dvorák, J., Hsieh, I., Bahgat, M., Dissous, C., and McKerrow, J.H. (2006). A multienzyme network functions in intestinal protein digestion by a platyhelminth parasite. *J. Biol. Chem.* 281, 39316–39329.

DeMarco, R., Mathieson, W., Manuel, S.J., Dillon, G.P., Curwen, R.S., Ashton, P.D., Ivens, A.C., Berriman, M., Verjovski-Almeida, S., and Wilson, R.A. (2010). Protein variation in blood-dwelling schistosome worms generated by differential splicing of micro-exon gene transcripts. *Genome Research* 20, 1112–21.

- de Moraes, J., Nascimento, C., Miura, L.M.C.V., Leite, J.R.S.A., Nakano, E., and Kawano, T. (2011). Evaluation of the in vitro Activity of Dermaseptin 01, a Cationic Antimicrobial Peptide, against *Schistosoma mansoni*. *Chemistry & Biodiversity* 8, 548–558.
- Deng, J., Gold, D., LoVerde, P.T., and Fishelson, Z. (2003). Inhibition of the complement membrane attack complex by *Schistosoma mansoni* paramyosin. *Infect. Immun.* 71, 6402–6410.
- Dhillon, A.S., Hagan, S., Rath, O., and Kolch, W. (2007). MAP kinase signalling pathways in cancer. *Oncogene* 26, 3279–3290.
- Dillon, G.P., Feltwell, T., Skelton, J., Coulson, P.S., Wilson, R.A., and Ivens, A.C. (2008). Altered patterns of gene expression underlying the enhanced immunogenicity of radiation-attenuated schistosomes. *PLoS Neglected Tropical Diseases* 2, e240.
- Dirks, R.C., and Faiman, M.D. (1982). Free radical formation and lipid peroxidation in rat and mouse cerebral cortex slices exposed to high oxygen pressure. *Brain Research* 248, 355–360.
- Do, N., Zhao, R., Ray, K., Ho, K., Dib, M., Ren, X., Kuzontkoski, P., Terwilliger, E., and Karp, S.J. (2012). BMP4 is a novel paracrine inhibitor of liver regeneration. *AJP: Gastrointestinal and Liver Physiology* 303, G1220–G1227.
- Don, T.A., Bethony, J.M., and Loukas, A. (2008). Saposin-like proteins are expressed in the gastrodermis of *Schistosoma mansoni* and are immunogenic in natural infections. *International Journal of Infectious Diseases* 12, e39–e47.
- Dovey, H.F., McKerrow, J.H., and Wang, C.C. (1984). Purine salvage in *Schistosoma mansoni* schistosomules. *Molecular and Biochemical Parasitology* 11, 157–67.
- Draz, H.M., Ashour, E., Shaker, Y.M., Khattab, H.M., Wu, C.H., and Wu, G.Y. (2008). Host Susceptibility to Schistosomes: Effect of Host Sera on Cell Proliferation of *Schistosoma mansoni* Schistosomula. *Journal of Parasitology* 94, 1249–1252.
- Durr, E., Yu, J., Krasinska, K.M., Carver, L. a, Yates, J.R., Testa, J.E., Oh, P., and Schnitzer, J.E. (2004). Direct proteomic mapping of the lung microvascular endothelial cell surface in vivo and in cell culture. *Nature Biotechnology* 22, 985–992.
- Dynes, J.L., and Steward, O. (2007). Dynamics of bidirectional transport of Arc mRNA in neuronal dendrites. *J. Comp. Neurol.* 500, 433–447.
- El Ridi, R., and Tallima, H. (2009). *Schistosoma mansoni* ex vivo lung-stage larvae excretory-secretory antigens as vaccine candidates against schistosomiasis. *Vaccine* 27, 666–73.
- Esmon, C.T., Xu, J., and Lupu, F. (2011). Innate immunity and coagulation. *Journal of Thrombosis and Haemostasis* 9, 182–188.
- Eveland, L.K., Fried, B., and Cohen, L.M. (1982). *Schistosoma mansoni*: adult worm chemoattraction, with and without barriers. *Experimental Parasitology* 54, 271–6.

Everts, B., Perona-Wright, G., Smits, H.H., Hokke, C.H., van der Ham, A.J., Fitzsimmons, C.M., Doenhoff, M.J., van der Bosch, J., Mohrs, K., Haas, H., et al. (2009). Omega-1, a glycoprotein secreted by *Schistosoma mansoni* eggs, drives Th2 responses. *The Journal of Experimental Medicine* 206, 1673–1680.

Fabregat, A., Sidiropoulos, K., Garapati, P., Gillespie, M., Hausmann, K., Haw, R., Jassal, B., Jupe, S., Korninger, F., McKay, S., et al. (2016). The Reactome pathway Knowledgebase. *Nucleic Acids Res.* 44, D481-487.

Fatima, M., Horta, M.F., and Ramalho-Pinto, F.J. (1991). Role of human decay-accelerating factor in the evasion of *Schistosoma mansoni* from the complement-mediated killing in vitro. *The Journal of Experimental Medicine* 174, 1399–406.

Figueiredo, B.C.-P., Ricci, N.D., de Assis, N.R.G., de Moraes, S.B., Fonseca, C.T., and Oliveira, S.C. (2015). Kicking in the Guts: *Schistosoma mansoni* Digestive Tract Proteins are Potential Candidates for Vaccine Development. *Frontiers in Immunology* 6, 22.

Finn, R.D., Attwood, T.K., Babbitt, P.C., Bateman, A., Bork, P., Bridge, A.J., Chang, H.-Y., Dosztányi, Z., El-Gebali, S., Fraser, M., et al. (2017). InterPro in 2017—beyond protein family and domain annotations. *Nucleic Acids Research* 45, D190–D199.

Fishelson, Z. (1995). Novel mechanisms of immune evasion by *Schistosoma mansoni*. *Mem. Inst. Oswaldo Cruz* 90, 289–292.

Fitzpatrick, J.M., Peak, E., Perally, S., Chalmers, I.W., Barrett, J., Yoshino, T.P., Ivens, A.C., and Hoffmann, K.F. (2009a). Anti-schistosomal intervention targets identified by lifecycle transcriptomic analyses. *PLoS Neglected Tropical Diseases* 3, e543.

Fitzpatrick, J.M., Fuentes, J.M., Chalmers, I.W., Wynn, T.A., Modolell, M., Hoffmann, K.F., and Hesse, M. (2009b). *Schistosoma mansoni* arginase shares functional similarities with human orthologs but depends upon disulphide bridges for enzymatic activity. *Int. J. Parasitol.* 39, 267–279.

Fitzsimmons, C.M., Jones, F.M., Stearn, A., Chalmers, I.W., Hoffmann, K.F., Wawrzyniak, J., Wilson, S., Kabatereine, N.B., and Dunne, D.W. (2012). The *Schistosoma mansoni* tegumental-allergen-like (TAL) protein family: influence of developmental expression on human IgE responses. *PLoS Neglected Tropical Diseases* 6, e1593.

Footz, T.K. (2001). Analysis of the Cat Eye Syndrome Critical Region in Humans and the Region of Conserved Synteny in Mice: A Search for Candidate Genes at or near the Human Chromosome 22 Pericentromere. *Genome Research* 11, 1053–1070.

Ganz, T., and Nemeth, E. (2012). Hepcidin and iron homeostasis. *Biochim. Biophys. Acta* 1823, 1434–1443.

Georgi, J.R., Dean, D.A., and Chandiwanna, S.K. (1982). Quantification of *Schistosoma mansoni* in mouse lungs by radioassay and autoradiography of 75Se-labeled schistosomula. *The Journal of Parasitology* 68, 1092–5.

Georgi, J.R., Wade, S.E., and Dean, D. a. (1986). Attrition and temporal distribution of *Schistosoma mansoni* and *S. haematobium* schistosomula in laboratory mice. *Parasitology* 93, 55.

Ghandour, A.M., and Ibrahim, A.M. (1978). A study of the relationship between the energy contents of *Schistosoma mansoni* cercariae and their death during penetration of mammalian host skin. *J. Helminthol.* 52, 339–342.

Gilkes, D.M., Semenza, G.L., and Wirtz, D. (2014). Hypoxia and the extracellular matrix: drivers of tumour metastasis. *Nature Reviews Cancer* 14, 430–439.

Glanfield, A., McManus, D.P., Anderson, G.J., and Jones, M.K. (2007). Pumping iron: a potential target for novel therapeutics against schistosomes. *Trends in Parasitology* 23, 583–8.

Gobert, G.N., Chai, M., and Mcmanus, D.P. (2007). Biology of schistosome lung-stage schistosomulum. *Parasitology* 134, 453–460.

Gobert, G.N., McManus, D.P., Nawaratna, S., Moertel, L., Mulvenna, J., and Jones, M.K. (2009a). Tissue Specific Profiling of Females of *Schistosoma japonicum* by Integrated Laser Microdissection Microscopy and Microarray Analysis. *PLoS Neglected Tropical Diseases* 3, e469.

Gobert, G.N., Moertel, L., Brindley, P.J., and McManus, D.P. (2009b). Developmental gene expression profiles of the human pathogen *Schistosoma japonicum*. *BMC Genomics* 10.

Gobert, G.N., Tran, M.H., Moertel, L., Mulvenna, J., Jones, M.K., McManus, D.P., and Loukas, A. (2010). Transcriptional changes in *Schistosoma mansoni* during early schistosomula development and in the presence of erythrocytes. *PLoS Neglected Tropical Diseases* 4, e600.

Goldring, O.L., Clegg, J. a, Smithers, S.R., and Terry, R.J. (1976). Acquisition of human blood group antigens by *Schistosoma mansoni*. *Clinical and Experimental Immunology* 26, 181–7.

Gouy, M., Guindon, S., and Gascuel, O. (2010). SeaView Version 4: A Multiplatform Graphical User Interface for Sequence Alignment and Phylogenetic Tree Building. *Molecular Biology and Evolution* 27, 221–224.

Grabe, K., and Haas, W. (2004). Navigation within host tissues: *Schistosoma mansoni* and *Trichobilharzia ocellata* schistosomula respond to chemical gradients. *International Journal for Parasitology* 34, 927–34.

Graham Beards, via Wikimedia Commons (2012). Classical blood coagulation pathway. Available: https://en.wikipedia.org/wiki/File:Classical_blood_coagulation_pathway.png (Accessed 13 June 2017).

Gryseels, B., Polman, K., Clerinx, J., and Kestens, L. (2006). Human schistosomiasis. *Lancet* 368, 1106–18.

- Gustafsson, M.K. (1987). Immunocytochemical demonstration of neuropeptides and serotonin in the nervous systems of adult *Schistosoma mansoni*. Parasitol. Res. 74, 168–174.
- Haas, W., Haberl, B., Kalbe, M., and Kömer, M. (1995). Snail-host-finding by Miracidia and Cercariae: chemical host cues. Parasitology Today 11, 468–472.
- Haas, W., Grabe, K., Geis, C., Pach, T., Stoll, K., Fuchs, M., Haberl, B., and Loy, C. (2002). Recognition and invasion of human skin by *Schistosoma mansoni* cercariae : the key-role of L -arginine. Parasitology 124, 153–167.
- Haeberlein, S., and Haas, W. (2008). Chemical attractants of human skin for swimming *Schistosoma mansoni* cercariae. Parasitology Research 102, 657–62.
- Hai, Y., Edwards, J.E., Van Zandt, M.C., Hoffmann, K.F., and Christianson, D.W. (2014). Crystal structure of *Schistosoma mansoni* arginase, a potential drug target for the treatment of schistosomiasis. Biochemistry 53, 4671–4684.
- Hall, S.L., Braschi, S., Truscott, M., Mathieson, W., Cesari, I.M., and Wilson, R.A. (2011). Insights into blood feeding by schistosomes from a proteomic analysis of worm vomitus. Mol. Biochem. Parasitol. 179, 18–29.
- Hamilton, J.V., Klinkert, M., and Doenhoff, M.J. (1998). Diagnosis of schistosomiasis: antibody detection, with notes on parasitological and antigen detection methods. Parasitology 117 Suppl, S41-57.
- Hams, E., Aviello, G., and Fallon, P.G. (2013). The *Schistosoma* granuloma: friend or foe? Frontiers in Immunology 4, 89.
- Harrison, R.A., and Doenhoff, M.J. (1983). Retarded development of *Schistosoma mansoni* in immunosuppressed mice. Parasitology 86 (Pt 3), 429–438.
- Heinrich, P.C., Castell, J.V., and Andus, T. (1990). Interleukin-6 and the acute phase response. Biochem. J. 265, 621–636.
- Hernandez, D.C., Lim, K.C., McKerrow, J.H., and Davies, S.J. (2004). *Schistosoma mansoni*: sex-specific modulation of parasite growth by host immune signals. Experimental Parasitology 106, 59–61.
- Hess, C., and Kemper, C. (2016). Complement-Mediated Regulation of Metabolism and Basic Cellular Processes. Immunity 45, 240–254.
- Hills, T., Brockie, P.J., and Maricq, A.V. (2004). Dopamine and Glutamate Control Area-Restricted Search Behavior in *Caenorhabditis elegans*. Journal of Neuroscience 24, 1217–1225.
- Hockley, D.J., and McLaren, D.J. (1973). *Schistosoma mansoni*: changes in the outer membrane of the tegument during development from cercariae to adult worm. International Journal for Parasitology 3, 13–25.
- Hoesel, B., and Schmid, J.A. (2013). The complexity of NF-κB signaling in inflammation and cancer. Molecular Cancer 12, 86.

- Hoffmann, K.F., and Dunne, D.W. (2003). Characterization of the *Schistosoma* transcriptome opens up the world of helminth genomics. *Genome Biology* 5, 203.
- Hoffmann, K.F., Davis, E.M., Fischer, E.R., and Wynn, T. a. (2001). The guanine protein coupled receptor rhodopsin is developmentally regulated in the free-living stages of *Schistosoma mansoni*. *Molecular and Biochemical Parasitology* 112, 113–123.
- Hofman, Z., de Maat, S., Hack, C.E., and Maas, C. (2016). Bradykinin: Inflammatory Product of the Coagulation System. *Clinical Reviews in Allergy & Immunology* 51, 152–161.
- Hofmann, J.J., and Iruela-Arispe, M.L. (2007). Notch signaling in blood vessels: Who is talking to whom about what? *Circulation Research* 100, 1556–1568.
- Horta, M.F., Ramalho-Pinto, F.J., and Fatima, M. (1991). Role of human decay-accelerating factor in the evasion of *Schistosoma mansoni* from the complement-mediated killing in vitro. *J. Exp. Med.* 174, 1399–1406.
- Howe, K.L., Bolt, B.J., Cain, S., Chan, J., Chen, W.J., Davis, P., Done, J., Down, T., Gao, S., Grove, C., et al. (2016a). WormBase 2016: expanding to enable helminth genomic research. *Nucleic Acids Research* 44, D774–D780.
- Howe, K.L., Bolt, B.J., Shafie, M., Kersey, P., and Berriman, M. (2016b). WormBase ParaSite – a comprehensive resource for helminth genomics. *Molecular and Biochemical Parasitology*.
- Huyse, T., Webster, B.L., Geldof, S., Stothard, J.R., Diaw, O.T., Polman, K., and Rollinson, D. (2009). Bidirectional introgressive hybridization between a cattle and human schistosome species. *PLoS Pathogens* 5, e1000571.
- Imperia, P.S., Fried, B., and Eveland, L.K. (1980). Pheromonal attraction of *Schistosoma mansoni* females toward males in the absence of worm-tactile behavior. *The Journal of Parasitology* 66, 682–4.
- Inal, J.M. (2004). Parasite interaction with host complement: beyond attack regulation. *Trends in Parasitology* 20, 407–12.
- Incani, R.N., and McLaren, D.J. (1981). Neutrophil-mediated cytotoxicity to schistosomula of *Schistosoma mansoni* in vitro: studies on the kinetics of complement and/or antibody-dependent adherence and killing. *Parasite Immunol.* 3, 107–126.
- Ingenuity® Systems. Available: www.ingenuity.com (Accessed 13 June 2017).
- Ingram, J.R., Rafi, S.B., Eroy-Reveles, A.A., Ray, M., Lambeth, L., Hsieh, I., Ruelas, D., Lim, K.C., Sakanari, J., Craik, C.S., et al. (2012). Investigation of the Proteolytic Functions of an Expanded Cercarial Elastase Gene Family in *Schistosoma mansoni*. *PLoS Neglected Tropical Diseases* 6, e1589.
- Isokpehi, R.D., Mahmud, O., Mbah, A.N., Simmons, S.S., Avelar, L., Rajnarayanan, R.V., Udensi, U.K., Ayensu, W.K., Cohly, H.H., Brown, S.D., et al. (2011).

Developmental Regulation of Genes Encoding Universal Stress Proteins in *Schistosoma mansoni*. *Gene Regul Syst Bio* 5, 61–74.

Israelow, B., Narbus, C.M., Sourisseau, M., and Evans, M.J. (2014). HepG2 cells mount an effective antiviral interferon-lambda based innate immune response to hepatitis C virus infection. *Hepatology* 60, 1170–1179.

Ito, T., Connell, J.M., Kunkel, S.L., and Matsukawa, A. (2012). Notch system in the linkage of innate and adaptive immunity. *Journal of Leukocyte Biology* 92, 59–65.

Janeczko, M.J., Stoll, B., Chang, X., Guan, X., and Burrin, D.G. (2007). Extensive gut metabolism limits the intestinal absorption of excessive supplemental dietary glutamate loads in infant pigs. *The Journal of Nutrition* 137, 2384–2390.

Janeway, C.A. (2001). Immunobiology: the immune system in health and disease. (New York, NY: Garland Publ. [u.a.]).

Jiang, J., Skelly, P.J., Shoemaker, C.B., and Caulfield, J.P. (1996). *Schistosoma mansoni*: the glucose transport protein SGTP4 is present in tegumental multilamellar bodies, discoid bodies, and the surface lipid bilayers. *Exp. Parasitol.* 82, 201–210.

Jolly, E.R., Chin, C.-S., Miller, S., Bahgat, M.M., Lim, K.C., DeRisi, J., and McKerrow, J.H. (2007). Gene expression patterns during adaptation of a helminth parasite to different environmental niches. *Genome Biology* 8, R65.

Jones, M.K., McManus, D.P., Sivadorai, P., Glanfield, A., Moertel, L., Belli, S.I., and Gobert, G.N. (2007). Tracking the fate of iron in early development of human blood flukes. *International Journal of Biochemistry and Cell Biology* 39, 1646–1658.

Käll, L., Krogh, A., and Sonnhammer, E.L.. (2004). A Combined Transmembrane Topology and Signal Peptide Prediction Method. *Journal of Molecular Biology* 338, 1027–1036.

Kamachi, Y., and Kondoh, H. (2013). Sox proteins: regulators of cell fate specification and differentiation. *Development* 140, 4129–4144.

Kanehisa, M., Furumichi, M., Tanabe, M., Sato, Y., and Morishima, K. (2017a). KEGG: new perspectives on genomes, pathways, diseases and drugs. *Nucleic Acids Res.* 45, D353–D361.

Kanehisa, M., Furumichi, M., Tanabe, M., Sato, Y., and Morishima, K. (2017b). KEGG: new perspectives on genomes, pathways, diseases and drugs. *Nucleic Acids Res.* 45, D353–D361.

Keating, J.H., Wilson, R.A., and Skelly, P.J. (2006). No overt cellular inflammation around intravascular schistosomes in vivo. *The Journal of Parasitology* 92, 1365–9.

Keene, W.E., Jeong, K.H., McKerrow, J.H., and Werb, Z. (1983). Degradation of extracellular matrix by larvae of *Schistosoma mansoni*. II. Degradation by newly transformed and developing schistosomula. *Laboratory Investigation; a Journal of Technical Methods and Pathology* 49, 201–7.

- Khayath, N., Vicogne, J., Ahier, A., BenYounes, A., Konrad, C., Trolet, J., Viscogliosi, E., Brehm, K., and Dissous, C. (2007). Diversification of the insulin receptor family in the helminth parasite *Schistosoma mansoni*. *FEBS J.* *274*, 659–676.
- Kim, D., Pertea, G., Trapnell, C., Pimentel, H., Kelley, R., and Salzberg, S.L. (2013). TopHat2: accurate alignment of transcriptomes in the presence of insertions, deletions and gene fusions. *Genome Biology* *14*, R36.
- King, C.H., Olbrych, S.K., Soon, M., Singer, M.E., Carter, J., and Colley, D.G. (2011). Utility of Repeated Praziquantel Dosing in the Treatment of Schistosomiasis in High-Risk Communities in Africa: A Systematic Review. *PLoS Neglected Tropical Diseases* *5*, e1321.
- Kitayama, J., Fuhlbrigge, R.C., Puri, K.D., and Springer, T.A. (1997). P-selectin, L-selectin, and α 4 integrin have distinct roles in eosinophil tethering and arrest on vascular endothelial cells under physiological flow conditions. *J. Immunol.* *159*, 3929–3939.
- Kobayashi-Miura, M., Shioji, K., Hoshino, Y., Masutani, H., Nakamura, H., and Yodoi, J. (2007). Oxygen sensing and redox signaling: the role of thioredoxin in embryonic development and cardiac diseases. *Am. J. Physiol. Heart Circ. Physiol.* *292*, H2040-2050.
- Kolde, R. (2015). pheatmap: Pretty Heatmaps. Available: <https://CRAN.R-project.org/package=pheatmap> (Accessed 13 June 2017).
- Krautz-Peterson, G., Camargo, S., Huggel, K., Verrey, F., Shoemaker, C.B., and Skelly, P.J. (2007). Amino acid transport in schistosomes: Characterization of the permease heavy chain SPRM1hc. *Journal of Biological Chemistry* *282*, 21767–21775.
- Krautz-peterson, G., Simoes, M., Faghiri, Z., Ndegwa, D., Oliveira, G., Shoemaker, C.B., and Skelly, P.J. (2010). Suppressing Glucose Transporter Gene Expression in Schistosomes Impairs Parasite Feeding and Decreases Survival in the Mammalian Host. *PLoS Pathogens* *6*, 6.
- Krogh, A., Larsson, B., von Heijne, G., and Sonnhammer, E.L. (2001). Predicting transmembrane protein topology with a hidden Markov model: application to complete genomes. *J. Mol. Biol.* *305*, 567–580.
- Kumar, N.N., Velic, A., Soliz, J., Shi, Y., Li, K., Wang, S., Weaver, J.L., Sen, J., Abbott, S.B.G., Lazarenko, R.M., et al. (2015). Regulation of breathing by CO₂ requires the proton-activated receptor GPR4 in retrotrapezoid nucleus neurons. *Science* *348*, 1255–1260.
- Kusel, J.R., Al-Adhami, B.H., and Doenhoff, M.J. (2007). The schistosome in the mammalian host: understanding the mechanisms of adaptation. *Parasitology* *134*, 1477–526.
- Kwatia, M. a, Botkin, D.J., and Williams, D.L. (2000). Molecular and enzymatic characterization of *Schistosoma mansoni* thioredoxin peroxidase. *The Journal of Parasitology* *86*, 908–915.

- Lamb, E.W., Walls, C.D., Pesce, J.T., Riner, D.K., Maynard, S.K., Crow, E.T., Wynn, T.A., Schaefer, B.C., and Davies, S.J. (2010). Blood fluke exploitation of non-cognate CD4+ T cell help to facilitate parasite development. *PLoS Pathogens* *6*, e1000892.
- Lawson, J.R., and Wilson, R. A (1980). Metabolic changes associated with the migration of the schistosomulum of *Schistosoma mansoni* in the mammal host. *Parasitology* *81*, 325–36.
- Levy, M.G., and Read, C.P. (1975). Relation of tegumentary phosphohydrolase to purine and pyrimidine transport in *Schistosoma mansoni*. *The Journal of Parasitology* *61*, 648–56.
- Li, S., Miao, T., Sebastian, M., Bhullar, P., Ghaffari, E., Liu, M., Symonds, A.L.J., and Wang, P. (2012). The Transcription Factors Egr2 and Egr3 Are Essential for the Control of Inflammation and Antigen-Induced Proliferation of B and T Cells. *Immunity* *37*, 685–696.
- Li, T., Huang, J., Jiang, Y., Zeng, Y., He, F., Zhang, M.Q., Han, Z., and Zhang, X. (2009). Multi-stage analysis of gene expression and transcription regulation in C57/B6 mouse liver development. *Genomics* *93*, 235–242.
- Li, T., Ziniel, P.D., He, P., Kommer, V.P., Crowther, G.J., He, M., Liu, Q., Van Voorhis, W.C., Williams, D.L., and Wang, M.-W. (2015). High-throughput screening against thioredoxin glutathione reductase identifies novel inhibitors with potential therapeutic value for schistosomiasis. *Infectious Diseases of Poverty* *4*, 1.
- Li, X.H., de Castro-Borges, W., Parker-Manuel, S., Vance, G.M., Demarco, R., Neves, L.X., Evans, G.J.O., and Wilson, R.A. (2013). The schistosome oesophageal gland: initiator of blood processing. *PLoS Neglected Tropical Diseases* *7*, e2337.
- Li, X.H., Stark, M., Vance, G.M., Cao, J.P., and Wilson, R.A. (2014). The anterior esophageal region of *Schistosoma japonicum* is a secretory organ. *Parasites & Vectors* *7*, 565.
- Liang, D., Zhao, M., Wang, T., McManus, D.P., and Cummins, S.F. (2016). GPCR and IR genes in *Schistosoma mansoni* miracidia. *Parasites & Vectors* *9*, 1.
- Lin, Y.-L., and He, S. (2006). Sm22.6 antigen is an inhibitor to human thrombin. *Molecular and Biochemical Parasitology* *147*, 95–100.
- Lodish H, Berk A, Zipursky SL, et al. (2000). Section 20.1: Overview of Extracellular Signaling. In *Molecular Cell Biology*, (New York: W. H. Freeman). Available: <https://www.ncbi.nlm.nih.gov/books/NBK21517/> (Accessed 13 June 2017).
- Loeffler, D., Lundy, S., Singh, K., Gerard, H., Hudson, A., and Boros, D. (2002). Soluble Egg Antigens from *Schistosoma mansoni* Induce Angiogenesis?Related Processes by Up?Regulating Vascular Endothelial Growth Factor in Human Endothelial Cells. *The Journal of Infectious Diseases* *185*, 1650–1656.
- Logan, C.Y., and Nusse, R. (2004). The Wnt signaling pathway in development and disease. *Annu. Rev. Cell Dev. Biol.* *20*, 781–810.

- Logan-Klumpler, F.J., De Silva, N., Boehme, U., Rogers, M.B., Velarde, G., McQuillan, J.A., Carver, T., Aslett, M., Olsen, C., Subramanian, S., et al. (2012). GeneDB—an annotation database for pathogens. *Nucleic Acids Research* *40*, D98–D108.
- Lohoff, M., Giasi, M., Kohler, R., Casper, B., Krammer, P.H., and Li-Weber, M. (2010). Early Growth Response Protein-1 (Egr-1) Is Preferentially Expressed in T Helper Type 2 (Th2) Cells and Is Involved in Acute Transcription of the Th2 Cytokine Interleukin-4. *Journal of Biological Chemistry* *285*, 1643–1652.
- Lomakina, E.B., and Waugh, R.E. (2009). Adhesion between human neutrophils and immobilized endothelial ligand vascular cell adhesion molecule 1: divalent ion effects. *Biophys. J.* *96*, 276–284.
- Lopes, J.L.S., Orcia, D., Araujo, A.P.U., DeMarco, R., and Wallace, B.A. (2013). Folding factors and partners for the intrinsically disordered protein micro-exon gene 14 (MEG-14). *Biophysical Journal* *104*, 2512–20.
- Loukas, A., Jones, M.K., King, L.T., Brindley, P.J., and McManus, D.P. (2001). Receptor for Fc on the surfaces of schistosomes. *Infection and Immunity* *69*, 3646–51.
- Love, M.I., Huber, W., and Anders, S. (2014). Moderated estimation of fold change and dispersion for RNA-seq data with DESeq2. *Genome Biology* *15*, 12.
- LoVerde, P.T., and Chen, L. (1991). Schistosome female reproductive development. *Parasitology Today* *7*, 303–308.
- Lu, D.-B., Wang, T.-P., Rudge, J.W., Donnelly, C.A., Fang, G.-R., and Webster, J.P. (2009). Evolution in a multi-host parasite: Chronobiological circadian rhythm and population genetics of *Schistosoma japonicum* cercariae indicates contrasting definitive host reservoirs by habitat. *International Journal for Parasitology* *39*, 1581–1588.
- Lu, Z., Sessler, F., Holroyd, N., Hahnel, S., Quack, T., Berriman, M., and Grevelding, C.G. (2016). Schistosome sex matters: a deep view into gonad-specific and pairing-dependent transcriptomes reveals a complex gender interplay. *Scientific Reports* *6*.
- MacDonald, K., Kimber, M.J., Day, T. a, and Ribeiro, P. (2015). A constitutively active G protein-coupled acetylcholine receptor regulates motility of larval *Schistosoma mansoni*. *Molecular and Biochemical Parasitology* *202*, 29–37.
- Mann, V.H., Morales, M.E., Rinaldi, G., and Brindley, P.J. (2010). Culture for genetic manipulation of developmental stages of *Schistosoma mansoni*. *Parasitology* *137*, 451–462.
- Marikovsky, M., Levi-Schaffer, F., Arnon, R., and Fishelson, Z. (1986). *Schistosoma mansoni*: Killing of transformed schistosomula by the alternative pathway of human complement. *Experimental Parasitology* *61*, 86–94.

- Marikovsky, M., Parizade, M., Arnon, R., and Fishelson, Z. (1990). Complement regulation on the surface of cultured schistosomula and adult worms of *Schistosoma mansoni*. *Eur. J. Immunol.* *20*, 221–227.
- Markiewski, M.M., Nilsson, B., Nilsson Ekdahl, K., Mollnes, T.E., and Lambris, J.D. (2007). Complement and coagulation: strangers or partners in crime? *Trends in Immunology* *28*, 184–192.
- Martínez, V.G., Hernández-López, C., Valencia, J., Hidalgo, L., Entrena, A., Zapata, A.G., Vicente, A., Sacedón, R., and Varas, A. (2011). The canonical BMP signaling pathway is involved in human monocyte-derived dendritic cell maturation. *Immunology and Cell Biology* *89*, 610–618.
- Martinez-Hernandez, M.G., Baiza-Gutman, L.A., Castillo-Trapala, A., and Armant, D.R. (2011). Regulation of proteinases during mouse peri-implantation development: urokinase-type plasminogen activator expression and cross talk with matrix metalloproteinase 9. *Reproduction* *141*, 227–239.
- Mastin, A., Bickle, Q.D., and Wilson, R.A. (1985). An ultrastructural examination of irradiated, immunizing schistosomula of *Schistosoma mansoni* during their extended stay in the lungs. *Parasitology* *91* (*Pt 1*), 101–110.
- McCreesh, N., Nikulin, G., and Booth, M. (2015). Predicting the effects of climate change on *Schistosoma mansoni* transmission in eastern Africa. *Parasites & Vectors* *8*, 4.
- McKerrow, J.H., and Salter, J. (2002). Invasion of skin by *Schistosoma* cercariae. *Trends in Parasitology* *18*, 193–5.
- McKerrow, J.H., Keene, W.E., Jeong, K.H., and Werb, Z. (1983). Degradation of extracellular matrix by larvae of *Schistosoma mansoni*. I. Degradation by cercariae as a model for initial parasite invasion of host. *Laboratory Investigation; a Journal of Technical Methods and Pathology* *49*, 195–200.
- McLaren, D.J., and Hockley, D.J. (1977). Blood Flukes have a double outer membrane. *Nature* *269*, 147–149.
- McLaren, D.J., and Terry, R.J. (1982). The protective role of acquired host antigens during schistosome maturation. *Parasite Immunology* *4*, 129–148.
- McMahon, S.B., and Monroe, J.G. (1996). The role of early growth response gene 1 (egr-1) in regulation of the immune response. *J. Leukoc. Biol.* *60*, 159–166.
- McVeigh, P., Kimber, M.J., Novozhilova, E., and Day, T.A. (2005). Neuropeptide signalling systems in flatworms. *Parasitology* *131 Suppl*, S41–55.
- McVeigh, P., Mair, G.R., Atkinson, L., Ladurner, P., Zamanian, M., Novozhilova, E., Marks, N.J., Day, T.A., and Maule, A.G. (2009). Discovery of multiple neuropeptide families in the phylum Platyhelminthes. *International Journal for Parasitology* *39*, 1243–1252.

- McVeigh, P., Atkinson, L., Marks, N.J., Mousley, A., Dalzell, J.J., Sluder, A., Hammerland, L., and Maule, A.G. (2012a). Parasite neuropeptide biology: Seeding rational drug target selection? *International Journal for Parasitology: Drugs and Drug Resistance* 2, 76–91.
- McVeigh, P., Atkinson, L., Marks, N.J., Mousley, A., Dalzell, J.J., Sluder, A., Hammerland, L., and Maule, A.G. (2012b). Parasite neuropeptide biology: Seeding rational drug target selection? *International Journal for Parasitology: Drugs and Drug Resistance* 2, 76–91.
- Mebius, M.M., van Genderen, P.J.J., Urbanus, R.T., Tielens, A.G.M., de Groot, P.G., and van Hellemond, J.J. (2013). Interference with the host haemostatic system by schistosomes. *PLoS Pathogens* 9, e1003781.
- Medjeral-Thomas, N., and Pickering, M.C. (2016). The complement factor H-related proteins. *Immunological Reviews* 274, 191–201.
- Mendonça-Silva, D.L., Gardino, P.F., Kubrusly, R.C.C., De Mello, F.G., and Noël, F. (2004). Characterization of a GABAergic neurotransmission in adult *Schistosoma mansoni*. *Parasitology* 129, 137–146.
- Meyer, F., Meyer, H., and Bueding, E. (1970). Lipid metabolism in the parasitic and free-living flatworms, *Schistosoma mansoni* and *Dugesia dorotocephala*. *Biochim. Biophys. Acta* 210, 257–266.
- Mi, H., Huang, X., Muruganujan, A., Tang, H., Mills, C., Kang, D., and Thomas, P.D. (2017). PANTHER version 11: expanded annotation data from Gene Ontology and Reactome pathways, and data analysis tool enhancements. *Nucleic Acids Research* 45, D183–D189.
- Miller, P., and Wilson, R.A. (1978). Migration of the schistosomula of *Schistosoma mansoni* from skin to lungs. *Parasitology* 77, 281–302.
- Miller, P., and Wilson, R.A. (1980). Migration of the schistosomula of *Schistosoma mansoni* from the lungs to the hepatic portal system. *Parasitology* 80, 267–288.
- Mitra, R.M., Gleason, C.A., Edwards, A., Hadfield, J., Downie, J.A., Oldroyd, G.E.D., and Long, S.R. (2004). A Ca²⁺/calmodulin-dependent protein kinase required for symbiotic nodule development: Gene identification by transcript-based cloning. *Proceedings of the National Academy of Sciences* 101, 4701–4705.
- Morgan, H.P., Schmidt, C.Q., Guariento, M., Blaum, B.S., Gillespie, D., Herbert, A.P., Kavanagh, D., Mertens, H.D.T., Svergun, D.I., Johansson, C.M., et al. (2011). Structural basis for engagement by complement factor H of C3b on a self surface. *Nature Structural & Molecular Biology* 18, 463–70.
- Morris, K.M., Aden, D.P., Knowles, B.B., and Colten, H.R. (1982). Complement synthesis by the human hepatoma-derived cell line HepG2. *Journal of Clinical Investigation* 70, 906–913.
- Munro, H.N. (1990). Iron regulation of ferritin gene expression. *Journal of Cellular Biochemistry* 44, 107–115.

- Nash, T.E., and Deelder, A.M. (1985). Comparison of four schistosome excretory-secretory antigens: phenol sulfuric test active peak, cathodic circulating antigen, gut-associated proteoglycan, and circulating anodic antigen. *Am. J. Trop. Med. Hyg.* *34*, 236–241.
- Nawaratna, S.S.K., McManus, D.P., Moertel, L., Gobert, G.N., and Jones, M.K. (2011). Gene Atlasing of Digestive and Reproductive Tissues in *Schistosoma mansoni*. *PLoS Neglected Tropical Diseases* *5*, e1043.
- Nawaratna, S.S.K., Gobert, G.N., Willis, C., Chuah, C., McManus, D.P., and Jones, M.K. (2014). Transcriptional profiling of the oesophageal gland region of male worms of *Schistosoma mansoni*. *Molecular and Biochemical Parasitology* *196*, 82–9.
- Nawrocki, E.P., Burge, S.W., Bateman, A., Daub, J., Eberhardt, R.Y., Eddy, S.R., Floden, E.W., Gardner, P.P., Jones, T.A., Tate, J., et al. (2015). Rfam 12.0: updates to the RNA families database. *Nucleic Acids Research* *43*, D130–D137.
- Noseda, M., Chang, L., McLean, G., Grim, J.E., Clurman, B.E., Smith, L.L., and Karsan, A. (2004). Notch activation induces endothelial cell cycle arrest and participates in contact inhibition: role of p21Cip1 repression. *Mol. Cell. Biol.* *24*, 8813–8822.
- Nowacki, F.C., Swain, M.T., Klychnikov, O.I., Niazi, U., Ivens, A., Quintana, J.F., Hensbergen, P.J., Hokke, C.H., Buck, A.H., and Hoffmann, K.F. (2015). Protein and small non-coding RNA-enriched extracellular vesicles are released by the pathogenic blood fluke *Schistosoma mansoni*. *Journal of Extracellular Vesicles* *4*, 1–16.
- Okemefuna, A.I., Nan, R., Gor, J., and Perkins, S.J. (2009). Electrostatic Interactions Contribute to the Folded-back Conformation of Wild Type Human Factor H. *Journal of Molecular Biology* *391*, 98–118.
- Oliveira, S.D.S., Quintas, L.E.M., Amaral, L.S., Noël, F., Farsky, S.H., and Silva, C.L.M. (2011). Increased Endothelial Cell-Leukocyte Interaction in Murine Schistosomiasis: Possible Priming of Endothelial Cells by the Disease. *PLoS ONE* *6*, e23547.
- de Oliveira Fraga, L.A., Torrero, M.N., Tocheva, A.S., Mitre, E., and Davies, S.J. (2010a). Induction of Type 2 Responses by Schistosome Worms during Prepatent Infection. *The Journal of Infectious Diseases* *201*, 464–472.
- de Oliveira Fraga, L.A., Lamb, E.W., Moreno, E.C., Chatterjee, M., Dvořák, J., Delcroix, M., Sajid, M., Caffrey, C.R., and Davies, S.J. (2010b). Rapid induction of IgE responses to a worm cysteine protease during murine pre-patent schistosome infection. *BMC Immunology* *11*, 56.
- Ono, M., Yaguchi, H., Ohkura, N., Kitabayashi, I., Nagamura, Y., Nomura, T., Miyachi, Y., Tsukada, T., and Sakaguchi, S. (2007). Foxp3 controls regulatory T-cell function by interacting with AML1/Runx1. *Nature* *446*, 685–689.
- van Oordt, B.E.P., van den Heuvel, J.M., Tielens, A.G.M., and van den Bergh, S.G. (1985). The energy production of the adult *Schistosoma mansoni* is for a large part aerobic. *Molecular and Biochemical Parasitology* *16*, 117–126.

- Orcia, D., Zeraik, A.E., Lopes, J.L.S., Macedo, J.N.A., dos Santos, C.R., Oliveira, K.C., Anderson, L., Wallace, B.A., Verjovski-Almeida, S., Araujo, A.P.U., et al. (2016). Interaction of an esophageal MEG protein from schistosomes with a human S100 protein involved in inflammatory response. *Biochimica et Biophysica Acta - General Subjects* 1861, 1.
- Osman, A., Niles, E.G., Verjovski-Almeida, S., and LoVerde, P.T. (2006). *Schistosoma mansoni* TGF-beta receptor II: role in host ligand-induced regulation of a schistosome target gene. *PLoS Pathogens* 2, e54.
- Oumi, N., Taniguchi, K.A., Kanai, A.M., Yasunaga, M., Nakanishi, T., and Sato, K. (2012). A Crucial Role of Bone Morphogenetic Protein Signaling in the Wound Healing Response in Acute Liver Injury Induced by Carbon Tetrachloride. *International Journal of Hepatology* 2012, 1–10.
- Oyinloye, B., Adenowo, F., Gxaba, N., and Kappo, A. (2014). The promise of antimicrobial peptides for treatment of human schistosomiasis. *Current Drug Targets* 15, 852–9.
- Pagni, M., Ioannidis, V., Cerutti, L., Zahn-Zabal, M., Jongeneel, C.V., and Falquet, L. (2004). MyHits: a new interactive resource for protein annotation and domain identification. *Nucleic Acids Research* 32, W332–W335.
- Paradis, E., Claude, J., and Strimmer, K. (2004). APE: Analyses of Phylogenetics and Evolution in R language. *Bioinformatics* 20, 289–290.
- Parizade, M., Arnon, R., Lachmann, P.J., and Fishelson, Z. (1994). Functional and antigenic similarities between a 94-kD protein of *Schistosoma mansoni* (SCIP-1) and human CD59. *J. Exp. Med.* 179, 1625–1636.
- Park, W.J., Liu, J., and Adler, P.N. (1994). Frizzled gene expression and development of tissue polarity in the *Drosophila* wing. *Dev. Genet.* 15, 383–389.
- Parker-Manuel, S.J., Ivens, A.C., Dillon, G.P., and Wilson, R.A. (2011). Gene Expression Patterns in Larval *Schistosoma mansoni* Associated with Infection of the Mammalian Host. *PLoS Neglected Tropical Diseases* 5, e1274.
- Patocka, N., Sharma, N., Rashid, M., and Ribeiro, P. (2014). Serotonin signaling in *Schistosoma mansoni*: a serotonin-activated G protein-coupled receptor controls parasite movement. *PLoS Pathogens* 10, e1003878.
- Paulson, A.F., Prasad, M.S., Thuringer, A.H., and Manzerra, P. (2014). Regulation of cadherin expression in nervous system development. *Cell Adhesion & Migration* 8, 19–28.
- Pearce, E.J., and MacDonald, A.S. (2002). The immunobiology of schistosomiasis. *Nature Reviews. Immunology* 2, 499–511.
- Pearce, E.J., Hall, B.F., and Sher, A. (1990). Host-specific evasion of the alternative complement pathway by schistosomes correlates with the presence of a phospholipase C-sensitive surface molecule resembling human decay accelerating factor. *Journal of Immunology* 144, 2751–2756.

- Pearce, E.J., Kane, C.M., Sun, J., Taylor, J.J., McKee, A.S., and Cervi, L. (2004). Th2 response polarization during infection with the helminth parasite *Schistosoma mansoni*. *Immunological Reviews* 201, 117–126.
- Pellegrino, J., and Coelho, P.M.Z. (1978). *Schistosoma mansoni*: Wandering Capacity of a Worm Couple. *The Journal of Parasitology* 64, 181.
- Petersen, T.N., Brunak, S., von Heijne, G., and Nielsen, H. (2011). SignalP 4.0: discriminating signal peptides from transmembrane regions. *Nature Methods* 8, 785–786.
- Philippson, G.S., Wilson, R.A., and DeMarco, R. (2015). Accelerated evolution of schistosome genes coding for proteins located at the host-parasite interface. *Genome Biology and Evolution* 7, 431–43.
- Picard, M.A.L., Boissier, J., Roquis, D., Grunau, C., Allienne, J.F., Duval, D., Toulza, E., Arancibia, N., Caffrey, C.R., Long, T., et al. (2016). Sex-Biased Transcriptome of *Schistosoma mansoni*: Host-Parasite Interaction, Genetic Determinants and Epigenetic Regulators Are Associated with Sexual Differentiation. *PLoS Neglected Tropical Diseases* 10, 1–28.
- Piha-Gossack, A., Sossin, W., and Reinhardt, D.P. (2012). The evolution of extracellular fibrillins and their functional domains. *PLoS ONE* 7, e33560.
- Ploder, M., Pelinka, L., Schmuckenschlager, C., Wessner, B., Ankersmit, H.J., Fuerst, W., Redl, H., Roth, E., and Spittler, A. (2006). Lipopolysaccharide-induced tumor necrosis factor alpha production and not monocyte human leukocyte antigen-DR expression is correlated with survival in septic trauma patients. *Shock* 25, 129–134.
- Pober, J.S., and Sessa, W.C. (2007). Evolving functions of endothelial cells in inflammation. *Nature Reviews Immunology* 7, 803–815.
- Protasio, A.V., Tsai, I.J., Babbage, A., Nichol, S., Hunt, M., Aslett, M.A., de Silva, N., Velarde, G.S., Anderson, T.J.C., Clark, R.C., et al. (2012). A systematically improved high quality genome and transcriptome of the human blood fluke *Schistosoma mansoni*. *PLoS Neglected Tropical Diseases* 6, 1.
- Protasio, A.V., Dunne, D.W., and Berriman, M. (2013). Comparative Study of Transcriptome Profiles of Mechanical- and Skin-Transformed *Schistosoma mansoni* Schistosomula. *PLoS Neglected Tropical Diseases* 7, e2091.
- R Core Team (2016). R: A Language and Environment for Statistical Computing (Vienna, Austria: R Foundation for Statistical Computing). Available: <https://www.R-project.org/> (Accessed 13 June 2017).
- Ramalho-Pinto, F.J., Carvalho, E.M.R.D., and Horta, M.D.P.M. (1992). Mechanisms of evasion of *Schistosoma mansoni* schistosomula to the lethal activity of complement. *Mem Inst Oswaldo Cruz* 87, 111–116.
- Ramaswamy, K., Salafsky, B., Potluri, S., He, Y.X., Li, J.W., and Shibuya, T. (1995). Secretion of an anti-inflammatory, immunomodulatory factor by Schistosomulae of *Schistosoma mansoni*. *J. Inflamm.* 46, 13–22.

- Ranasinghe, S.L., Fischer, K., Gobert, G.N., and McManus, D.P. (2015a). Functional expression of a novel Kunitz type protease inhibitor from the human blood fluke *Schistosoma mansoni*. *Parasites & Vectors* 8, 1.
- Ranasinghe, S.L., Fischer, K., Gobert, G.N., and McManus, D.P. (2015b). A novel coagulation inhibitor from *Schistosoma japonicum*. *Parasitology* 142, 1663–1672.
- Ranganathan, P., Weaver, K.L., and Capobianco, A.J. (2011). Notch signalling in solid tumours: a little bit of everything but not all the time. *Nature Reviews Cancer* 11, 338–351.
- Rao, K.V., and Ramaswamy, K. (2000). Cloning and expression of a gene encoding Sm16, an anti-inflammatory protein from *Schistosoma mansoni*. *Mol. Biochem. Parasitol.* 108, 101–108.
- Rawlings, J.S. (2004). The JAK/STAT signaling pathway. *Journal of Cell Science* 117, 1281–1283.
- Reinhardt, C., Bergentall, M., Greiner, T.U., Schaffner, F., Östergren-Lundén, G., Petersen, L.C., Ruf, W., and Bäckhed, F. (2012). Tissue factor and PAR1 promote microbiota-induced intestinal vascular remodelling. *Nature* 483, 627–631.
- Reitsma, S., Slaaf, D.W., Vink, H., van Zandvoort, M.A.M.J., and oude Egbrink, M.G.A. (2007). The endothelial glycocalyx: composition, functions, and visualization. *Pflugers Arch.* 454, 345–359.
- Renne, T., Schmaier, A.H., Nickel, K.F., Blomback, M., and Maas, C. (2012). In vivo roles of factor XII. *Blood* 120, 4296–4303.
- Rhoads, A., and Au, K.F. (2015). PacBio Sequencing and Its Applications. *Genomics, Proteomics & Bioinformatics* 13, 278–289.
- Ribeiro, P., and Geary, T.G. (2010). Neuronal signaling in schistosomes: current status and prospects for postgenomics. *Canadian Journal of Zoology* 88, 1–22.
- Ribeiro, P., and Patocka, N. (2013). Neurotransmitter transporters in schistosomes: Structure, function and prospects for drug discovery. *Parasitology International* 62, 629–638.
- Ribeiro, P., Gupta, V., and El-Sakkary, N. (2012). Biogenic amines and the control of neuromuscular signaling in schistosomes. *Invertebrate Neuroscience : IN* 12, 13–28.
- Riner, D.K., Ferragine, C.E., Maynard, S.K., and Davies, S.J. (2013). Regulation of innate responses during pre-patent schistosome infection provides an immune environment permissive for parasite development. *PLoS Pathogens* 9, e1003708.
- Robertson, I., Jensen, S., and Handford, P. (2011). TB domain proteins: evolutionary insights into the multifaceted roles of fibrillins and LTBP. *Biochemical Journal* 433, 263–276.
- Rogerio, A.P., and Anibal, F.F. (2012). Role of Leukotrienes on Protozoan and Helminth Infections. *Mediators of Inflammation* 2012, 1–13.

- Rose, M.F., Zimmerman, E.E., Hsu, L., Golby, A.J., Saleh, E., Folkerth, R.D., Santagata, S.S., Milner, D.A., and Ramkissoon, S.H. (2014). Atypical presentation of cerebral schistosomiasis four years after exposure to *Schistosoma mansoni*. *Epilepsy & Behavior Case Reports* 2, 80–85.
- Roy, A., Kucukural, A., and Zhang, Y. (2010). I-TASSER: a unified platform for automated protein structure and function prediction. *Nat Protoc* 5, 725–738.
- van Royen, N., Voskuil, M., Hoefer, I., Jost, M., de Graaf, S., Hedwig, F., Andert, J.-P., Wormhoudt, T.A.M., Hua, J., Hartmann, S., et al. (2004). CD44 regulates arteriogenesis in mice and is differentially expressed in patients with poor and good collateralization. *Circulation* 109, 1647–1652.
- RStudio Team (2016). RStudio: Integrated Development for R (Boston, MA: RStudio, Inc.). Available: <http://www.rstudio.com/> (Accessed 13 June 2017).
- Ruppel, A., Rother, U., Vongerichten, H., and Diesfeld, H.J. (1983). *Schistosoma mansoni*: complement activation in human and rodent sera by living parasites of various developmental stages. *Parasitology* 87 (Pt 1), 75–86.
- Salem, N., Balkman, J.D., Wang, J., Wilson, D.L., Lee, Z., King, C.L., and Basilion, J.P. (2010). In vivo imaging of schistosomes to assess disease burden using positron emission tomography (PET). *PLoS Neglected Tropical Diseases* 4, 9.
- Sandmann, T., Vogg, M.C., Owlarn, S., Boutros, M., and Bartscherer, K. (2011). The head-regeneration transcriptome of the planarian *Schmidtea mediterranea*. *Genome Biology* 12, R76.
- Sanin, D.E., and Mountford, A.P. (2015). Sm16, a major component of *Schistosoma mansoni* cercarial excretory/secretory products, prevents macrophage classical activation and delays antigen processing. *Parasites & Vectors* 8, 1.
- Santilli, G., Aronow, B.J., and Sala, A. (2003). Essential requirement of apolipoprotein J (clusterin) signaling for IkappaB expression and regulation of NF-kappaB activity. *J. Biol. Chem.* 278, 38214–38219.
- Santoro, F., Lachmann, P.J., Capron, A., and Capron, M. (1979). Activation of Complement by *Schistosoma mansoni* Schistosomula: Killing of Parasites by the Alternative Pathway and Requirement of IgG for Classical Pathway Activation. *Journal of Immunology* 123, 1551–1557.
- Saule, P., Adriaenssens, E., Delacre, M., Chassande, O., Bossu, M., Auriault, C., and Wolowczuk, I. (2002). Early variations of host thyroxine and interleukin-7 favor *Schistosoma mansoni* development. *The Journal of Parasitology* 88, 849–55.
- Saule, P., Vicogne, J., Delacre, M., Macia, L., Tailleux, A., Dissous, C., Auriault, C., and Wolowczuk, I. (2005). Host glucose metabolism mediates T4 and IL-7 action on *Schistosoma mansoni* development. *The Journal of Parasitology* 91, 737–44.
- Schramm, G., Falcone, F.H., Gronow, A., Haisch, K., Mamat, U., Doenhoff, M.J., Oliveira, G., Galle, J., Dahinden, C.A., and Haas, H. (2003). Molecular

Characterization of an Interleukin-4-inducing Factor from *Schistosoma mansoni* Eggs. Journal of Biological Chemistry 278, 18384–18392.

Schroeder, H., Skelly, P.J., Zipfel, P.F., Losson, B., and Vanderplasschen, A. (2009). Subversion of complement by hematophagous parasites. Developmental & Comparative Immunology 33, 5–13.

Schüssler, P., Pötters, E., Winnen, R., Michel, A., Bottke, W., and Kunz, W. (1996). Ferritin mRNAs in *Schistosoma mansoni* do not have iron-responsive elements for post-transcriptional regulation. European Journal of Biochemistry / FEBS 241, 64–9.

Secor, W.E. (2014). Water-based interventions for schistosomiasis control. Pathogens and Global Health 108, 246–254.

Secor, W.E. (2015). Early lessons from schistosomiasis mass drug administration programs. F1000Research 2015, 4(F1000 Faculty Rev):1157.

Sell, K.W., and Dean, D.A. (1972). Surface Antigens on *Schistosoma mansoni*. Clinical Experimental Immunology 12, 315–324.

Selzner, N., Selzner, M., Odermatt, B., Tian, Y., Van Rooijen, N., and Clavien, P.A. (2003). ICAM-1 triggers liver regeneration through leukocyte recruitment and Kupffer cell-dependent release of TNF-alpha/IL-6 in mice. Gastroenterology 124, 692–700.

Shaker, Y.M., Wu, C.H., el-Shobaki, F.A., Ashour, E., Khattab, H.M., Draz, H.M., Kamel, R., and Wu, G.Y. (1998). Human portal serum stimulates cell proliferation in immature *Schistosoma mansoni*. Parasitology 117 (Pt 4), 293–299.

Shaker, Y.M., Hamdy, M.A., Ismail, M., Draz, H.M., Ashour, E., and Gouda, W. (2011). Effect of host portal and peripheral sera fractions on cell proliferation of *Schistosoma mansoni* schistosomules. Trop Biomed 28, 630–637.

Sharma, J.N., and Mohammed, L.A. (2006). The role of leukotrienes in the pathophysiology of inflammatory disorders: is there a case for revisiting leukotrienes as therapeutic targets? Inflammopharmacology 14, 10–16.

Shaulian, E., and Karin, M. (2001). AP-1 in cell proliferation and survival. Oncogene 20, 2390–2400.

Shavva, V.S., Mogilenko, D.A., Dizhe, E.B., Oleinikova, G.N., Perevozchikov, A.P., and Orlov, S.V. (2013). Hepatic nuclear factor 4 α positively regulates complement C3 expression and does not interfere with TNF α -mediated stimulation of C3 expression in HepG2 cells. Gene 524, 187–92.

Sievers, F., Wilm, A., Dineen, D., Gibson, T.J., Karplus, K., Li, W., Lopez, R., McWilliam, H., Remmert, M., Soding, J., et al. (2014). Fast, scalable generation of high-quality protein multiple sequence alignments using Clustal Omega. Molecular Systems Biology 7, 539–539.

Sillitoe, I., Lewis, T.E., Cuff, A., Das, S., Ashford, P., Dawson, N.L., Furnham, N., Laskowski, R.A., Lee, D., Lees, J.G., et al. (2015). CATH: comprehensive structural

and functional annotations for genome sequences. *Nucleic Acids Research* 43, D376–D381.

Silva, E.E., Clarke, M.W., and Podesta, R.B. (1993). Characterization of a C3 receptor on the envelope of *Schistosoma mansoni*. *Journal of Immunology* 151, 7057–7066.

Simeonov, A., Jadhav, A., Sayed, A.A., Wang, Y., Nelson, M.E., Thomas, C.J., Inglese, J., Williams, D.L., and Austin, C.P. (2008). Quantitative high-throughput screen identifies inhibitors of the *Schistosoma mansoni* redox cascade. *PLoS Negl Trop Dis* 2, e127.

Simpson, E.H. (1951). The Interpretation of Interaction in Contingency Tables. *Journal of the Royal Statistical Society. Series B (Methodological)* 13, 238–241.

Singh, B., Fleury, C., Jalalvand, F., and Riesbeck, K. (2012). Human pathogens utilize host extracellular matrix proteins laminin and collagen for adhesion and invasion of the host. *FEMS Microbiol. Rev.* 36, 1122–1180.

Singh, S., Brocker, C., Koppaka, V., Chen, Y., Jackson, B.C., Matsumoto, A., Thompson, D.C., and Vasiliou, V. (2013). Aldehyde dehydrogenases in cellular responses to oxidative/electrophilic stress. *Free Radical Biology and Medicine* 56, 89–101.

Sirisinha, S., Rattanasiriwilai, W., Puengtomwatanakul, S., Sobhon, P., Saitongdee, P., and Koonchornboon, T. (1986). Complement-mediated killing of *Opisthorchis viverrini* via activation of the alternative pathway. *Int. J. Parasitol.* 16, 341–346.

Skelly, P.J. (2004). Intravascular schistosomes and complement. *Trends in Parasitology* 20, 370–4.

Skelly, P.J. (2013). The use of imaging to detect schistosomes and diagnose schistosomiasis. *Parasite Immunology* 35, 295–301.

Skelly, P.J., and Shoemaker, C.B. (1996). Rapid appearance and asymmetric distribution of glucose transporter SGTP4 at the apical surface of intramammalian-stage *Schistosoma mansoni*. *Proc. Natl. Acad. Sci. U.S.A.* 93, 3642–3646.

Skelly, P.J., and Shoemaker, C.B. (2001). The *Schistosoma mansoni* host-interactive tegument forms from vesicle eruptions of a cyton network. *Parasitology* 122 Pt 1, 67–73.

Skelly, P.J., and Wilson, R.A. (2006). Making sense of the schistosome surface. *Advances in Parasitology* 63, 185–284.

Skelly, P.J., Kim, J.W., Cunningham, J., and Shoemaker, C.B. (1994). Cloning, Characterization, and Functional Expression of cDNAs Encoding Glucose Transporter Proteins from the Human Parasite *Schistosoma mansoni*. *The Journal of Biological Chemistry* 269, 4247–4253.

- Skelly, P.J., Pfeiffer, R., Verrey, F., and Shoemaker, C.B. (1999). SPRM1lc, a heterodimeric amino acid permease light chain of the human parasitic platyhelminth, *Schistosoma mansoni*. *Parasitology* 119 (Pt 6), 569–76.
- Skelly, P.J., Da'dara, A.A., Li, X.H., Castro-Borges, W., and Wilson, R.A. (2014). Schistosome Feeding and Regurgitation. *PLoS Pathogens* 10.
- Smithers, S.R., Terry, R.J., and Hockley, D.J. (1969). Host antigens in schistosomiasis. *Proceedings of the Royal Society B* 171, 483–494.
- Smyth, D.J., Glanfield, A., McManus, D.P., Hacker, E., Blair, D., Anderson, G.J., and Jones, M.K. (2006). Two Isoforms of a Divalent Metal Transporter (DMT1) in *Schistosoma mansoni* Suggest a Surface-associated Pathway for Iron Absorption in Schistosomes. *Journal of Biological Chemistry* 281, 2242–2248.
- Sotillo, J., Pearson, M., Becker, L., Mulvenna, J., and Loukas, A. (2015). A quantitative proteomic analysis of the tegumental proteins from *Schistosoma mansoni* schistosomula reveals novel potential therapeutic targets. *International Journal for Parasitology* 45, 505–516.
- Sotillo, J., Pearson, M., Potriquet, J., Becker, L., Pickering, D., Mulvenna, J., and Loukas, A. (2016). Extracellular vesicles secreted by *Schistosoma mansoni* contain protein vaccine candidates. *International Journal for Parasitology* 46, 1–5.
- Standen, O.D. (1953). The relationship of sex in *Schistosoma mansoni* to migration within the hepatic portal system of experimentally infected mice. *Ann Trop Med Parasitol* 47, 139–145.
- Stefanová, I., Hilgert, I., Bazil, V., Kristofová, H., and Horejsí, V. (1989). Human leucocyte surface glycoprotein CDw44 and lymphocyte homing receptor are identical molecules. *Immunogenetics* 29, 402–404.
- Stepanenko, A.A., and Dmitrenko, V.V. (2015). HEK293 in cell biology and cancer research: Phenotype, karyotype, tumorigenicity, and stress-induced genome-phenotype evolution. *Gene* 569, 182–190.
- Stevens, R.C., Cherezov, V., Katritch, V., Abagyan, R., Kuhn, P., Rosen, H., and Wüthrich, K. (2012). The GPCR Network: a large-scale collaboration to determine human GPCR structure and function. *Nature Reviews Drug Discovery* 12, 25–34.
- Sun, J., and Bhatia, M. (2014). Substance P at the Neuro-Immune Crosstalk in the Modulation of Inflammation, Asthma and Antimicrobial Host Defense. *Inflammation & Allergy-Drug Targets* 13, 112–120.
- Taft, A.S., Vermeire, J.J., Bernier, J., Birkeland, S.R., Cipriano, M.J., Papa, A.R., McArthur, A.G., and Yoshino, T.P. (2009). Transcriptome analysis of *Schistosoma mansoni* larval development using serial analysis of gene expression (SAGE). *Parasitology* 136, 469–485.
- Tait, J.F., Frankenberg, D.A., Miao, C.H., Killary, A.M., Adler, D.A., and Disteche, C.M. (1991). Chromosomal localization of the human annexin III (ANX3) gene. *Genomics* 10, 441–448.

- Taman, A., and Ribeiro, P. (2011). Characterization of a truncated metabotropic glutamate receptor in a primitive metazoan, the parasitic flatworm *Schistosoma mansoni*. *PloS One* 6, e27119.
- Tebeje, B.M., Harvie, M., You, H., Loukas, A., and McManus, D.P. (2016). Schistosomiasis vaccines: where do we stand? *Parasites & Vectors* 9, 1.
- Tenniswood, M.P.R., and Simpson, A.J.G. (1982). The extraction, characterization and in vitro translation of RNA from adult *Schistosoma mansoni*. *Parasitology* 84, 253.
- Thermo Scientific. Assessment of Nucleic Acid Purity. Available: <https://tools.thermofisher.com/content/sfs/brochures/TN52646-E-0215M-NucleicAcid.pdf> (Accessed 13 June 2017).
- The UniProt Consortium (2017). UniProt: the universal protein knowledgebase. *Nucleic Acids Research* 45, D158–D169.
- Tielens, A.G., and van den Bergh, S.G. (1987). Glycogen metabolism in *Schistosoma mansoni* worms after their isolation from the host. *Molecular and Biochemical Parasitology* 24, 247–54.
- Torre-escudero, E.D., Pérez-sánchez, R., Manzano-román, R., and Oleaga, A. (2014). Proteomic mapping of the lung vascular endothelial cell surface in *Schistosoma bovis*-infected hamsters. *Journal of Proteomics* 106, 86–98.
- de la Torre-Escudero, E., Manzano-Román, R., Siles-Lucas, M., Pérez-Sánchez, R., Moyano, J.C., Barrera, I., and Oleaga, A. (2012). Molecular and functional characterization of a *Schistosoma bovis* annexin: Fibrinolytic and anticoagulant activity. *Veterinary Parasitology* 184, 25–36.
- Trapnell, C. (2015). Defining cell types and states with single-cell genomics. *Genome Research* 25, 1491–1498.
- Trottein, F., Descamps, L., Nutten, S., Dehouck, M.P., Angeli, V., Capron, A., Cecchelli, R., and Capron, M. (1999a). *Schistosoma mansoni* activates host microvascular endothelial cells to acquire an anti-inflammatory phenotype. *Infection and Immunity* 67, 3403–9.
- Trottein, F., Nutten, S., Angeli, V., Delerive, P., Teissier, E., Capron, A., Staels, B., and Capron, M. (1999b). *Schistosoma mansoni* schistosomula reduce E-selectin and VCAM-1 expression in TNF-alpha-stimulated lung microvascular endothelial cells by interfering with the NF-kappaB pathway. *European Journal of Immunology* 29, 3691–701.
- Tsai, I.J., Zarowiecki, M., Holroyd, N., Garciarrubio, A., Sanchez-Flores, A., Brooks, K.L., Tracey, A., Bobes, R.J., Fragoso, G., Sciutto, E., et al. (2013). The genomes of four tapeworm species reveal adaptations to parasitism. *Nature* 496, 57–63.
- Tyakht, A.V., Ilina, E.N., Alexeev, D.G., Ischenko, D.S., Gorbachev, A.Y., Semashko, T.A., Larin, A.K., Selezneva, O.V., Kostryukova, E.S., Karalkin, P.A., et

- al. (2014). RNA-Seq gene expression profiling of HepG2 cells: the influence of experimental factors and comparison with liver tissue. *BMC Genomics* 15, 1108.
- Vale, N., Gouveia, M.J., Rinaldi, G., Brindley, P.J., Gärtner, F., and Correia da Costa, J.M.C. (2017). Praziquantel for schistosomiasis, single drug revisited metabolism, mode of action and resistance. *Antimicrobial Agents and Chemotherapy* AAC.02582-16.
- Van Hellemond, J.J., Retra, K., Brouwers, J.F.H.M., van Balkom, B.W.M., Yazdanbakhsh, M., Shoemaker, C.B., and Tielens, A.G.M. (2006). Functions of the tegument of schistosomes: clues from the proteome and lipidome. *International Journal for Parasitology* 36, 691–9.
- Vasconcelos, E.G., Nascimento, P.S., Meirelles, M.N., Verjovski-Almeida, S., and Ferreira, S.T. (1993). Characterization and localization of an ATP-diphosphohydrolase on the external surface of the tegument of *Schistosoma mansoni*. *Mol. Biochem. Parasitol.* 58, 205–214.
- Verjovski-Almeida, S., DeMarco, R., Martins, E.A.L., Guimarães, P.E.M., Ojopi, E.P.B., Paquola, A.C.M., Piazza, J.P., Nishiyama, M.Y., Kitajima, J.P., Adamson, R.E., et al. (2003). Transcriptome analysis of the acelomate human parasite *Schistosoma mansoni*. *Nature Genetics* 35, 148–57.
- Veza, P., and Kim, J.H. (1999). Metabotropic glutamate receptors and the generation of locomotor activity: Interactions with midbrain dopamine. *Neuroscience and Biobehavioral Reviews* 23, 577–589.
- Vilella, A.J., Severin, J., Ureta-Vidal, A., Heng, L., Durbin, R., and Birney, E. (2009). EnsemblCompara GeneTrees: Complete, duplication-aware phylogenetic trees in vertebrates. *Genome Res.* 19, 327–335.
- Wagner, E., and Frank, M.M. (2010). Therapeutic potential of complement modulation. *Nature Reviews Drug Discovery* 9, 43–56.
- Wallner, B.P., Mattaliano, R.J., Hession, C., Cate, R.L., Tizard, R., Sinclair, L.K., Foeller, C., Chow, E.P., Browning, J.L., Ramachandran, K.L., et al. (1986). Cloning and expression of human lipocortin, a phospholipase A2 inhibitor with potential anti-inflammatory activity. *Nature* 320, 77–81.
- Wang, Z., Gerstein, M., and Snyder, M. (2009). RNA-Seq: a revolutionary tool for transcriptomics. *Nature Reviews Genetics* 10, 57–63.
- Warren, K.S., Mahmoud, A.A., Cummings, P., Murphy, D.J., and Houser, H.B. (1974). Schistosomiasis mansoni in Yemeni in California: duration of infection, presence of disease, therapeutic management. *Am. J. Trop. Med. Hyg.* 23, 902–909.
- Webster, B.L., Diaw, O.T., Seye, M.M., Webster, J.P., and Rollinson, D. (2013). Introgressive Hybridization of *Schistosoma haematobium* Group Species in Senegal: Species Barrier Break Down between Ruminant and Human Schistosomes. *PLoS Neglected Tropical Diseases* 7, e2110.

- Wehrens, R., and Buydens, L.M.C. (2007). Self- and Super-organizing Maps in R: The kohonen Package. *Journal of Statistical Software* *21*, 1–19.
- Wendt, G.R., and Collins, J.J. (2016). Schistosomiasis as a disease of stem cells. *Current Opinion in Genetics & Development* *40*, 95–102.
- Wheater, P.R., and Wilson, R.A. (1979). *Schistosoma mansoni*: a histological study of migration in the laboratory mouse. *Parasitology* *79*, 49–62.
- Wickham, H. (2009). *ggplot2: Elegant Graphics for Data Analysis* (New York: Springer).
- Wijayawardena, B.K., Minchella, D.J., and DeWoody, J.A. (2016). The influence of trematode parasite burden on gene expression in a mammalian host. *BMC Genomics* *17*, 1–14.
- Wilson, R.A. (2009). The saga of schistosome migration and attrition. *Parasitology* *136*, 1581–1592.
- Wilson, R.A. (2012). Virulence factors of schistosomes. *Microbes and Infection / Institut Pasteur* *14*, 1442–50.
- Wilson, R.A., and Barnes, P.E. (1977). The formation and turnover of the membranocalyx on the tegument of *Schistosoma mansoni*. *Parasitology* *74*, 61–71.
- Wilson, R.A., Draskau, T., Miller, P., and Lawson, J.R. (1978). *Schistosoma mansoni*: the activity and development of the schistosomulum during migration from the skin to the hepatic portal system. *Parasitology* *77*, 57–73.
- Wilson, R.A., Coulson, P.S., and Dixon, B. (1986). Migration of the schistosomula of *Schistosoma mansoni* in mice vaccinated with radiation-attenuated cercariae, and normal mice: an attempt to identify the timing and site of parasite death. *Parasitology* *92*, 101.
- Wilson, R.A., Li, X.H., MacDonald, S., Neves, L.X., Vitoriano-Souza, J., Leite, L.C.C., Farias, L.P., James, S., Ashton, P.D., DeMarco, R., et al. (2015). The Schistosome Esophagus Is a “Hotspot” for Microexon and Lysosomal Hydrolase Gene Expression: Implications for Blood Processing. *PLoS Neglected Tropical Diseases* *9*, 12.
- Wilson, R.A., Li, X.H., and Castro-Borges, W. (2016). Do schistosome vaccine trials in mice have an intrinsic flaw that generates spurious protection data? *Parasites & Vectors* *9*, 89.
- Windemueler, H.G., and Spaeth, A.E. (1980). Respiratory fuels and nitrogen metabolism in vivo in small intestine of fed rats: Quantitative importance of glutamine, glutamate, and aspartate. *The Journal of Biological Chemistry* *255*, 107–112.
- Windmueller, H.G., and Spaeth, A.E. (1975). Intestinal metabolism of glutamine and glutamate from the lumen as compared to glutamine from blood. *Archives of Biochemistry and Biophysics* *171*, 662–672.

- Woulfe, D., Yang, J., and Brass, L. (2001). ADP and platelets: the end of the beginning. *Journal of Clinical Investigation* *107*, 1503–1505.
- Wu, C., Hou, N., Piao, X., Liu, S., Cai, P., Xiao, Y., and Chen, Q. (2015). Non-immune immunoglobulins shield *Schistosoma japonicum* from host immunorecognition. *Scientific Reports* *5*.
- Yang, F., Brune, J.L., Baldwin, W.D., Barnett, D.R., and Bowman, B.H. (1983). Identification and characterization of human haptoglobin cDNA. *Proc. Natl. Acad. Sci. U.S.A.* *80*, 5875–5879.
- Yang, J., Yan, R., Roy, A., Xu, D., Poisson, J., and Zhang, Y. (2015). The I-TASSER Suite: protein structure and function prediction. *Nat. Methods* *12*, 7–8.
- Ye, Q., Zhu, J.Y., Ming, Z.P., Zhao, Q.P., Grevelding, C.G., Liu, R., Zhong, Q.P., Jiang, M.S., and Dong, H.F. (2012). Studies on the establishment of a co-culture system of lung stage *Schistosoma japonicum* with host cells. *Parasitology Research* *111*, 735–748.
- Yoshino, T.P., Brown, M., Wu, X.-J., Jackson, C.J., Ocadiz-Ruiz, R., Chalmers, I.W., Kolb, M., Hokke, C.H., and Hoffmann, K.F. (2014). Excreted/secreted *Schistosoma mansoni* venom allergen-like 9 (SmVAL9) modulates host extracellular matrix remodelling gene expression. *International Journal for Parasitology* *44*, 551–63.
- You, H., Gobert, G.N., Cai, P., Mou, R., Nawaratna, S., Fang, G., Villinger, F., and McManus, D.P. (2015). Suppression of the Insulin Receptors in Adult *Schistosoma japonicum* Impacts on Parasite Growth and Development: Further Evidence of Vaccine Potential. *PLOS Neglected Tropical Diseases* *9*, e0003730.
- Yu, Y., Ping, J., Chen, H., Jiao, L., Zheng, S., Han, Z.G., Hao, P., and Huang, J. (2010). A comparative analysis of liver transcriptome suggests divergent liver function among human, mouse and rat. *Genomics* *96*, 281–289.
- Zamanian, M., Kimber, M.J., McVeigh, P., Carlson, S.A., Maule, A.G., and Day, T.A. (2011). The repertoire of G protein-coupled receptors in the human parasite *Schistosoma mansoni* and the model organism *Schmidtea mediterranea*. *BMC Genomics* *12*, 596.
- Zanotti, E.M., Magalhães, L.A., and Piedrabuena, A.E. (1982). [Localization of *Schistosoma mansoni* in the portal plexus of *Mus musculus* infected experimentally by a single sex of trematode]. *Revista de Saude Publica* *16*, 220–32.
- Zhang, Y. (2008). I-TASSER server for protein 3D structure prediction. *BMC Bioinformatics* *9*, 40.
- Zhong, C., Skelly, P.J., Leaffer, D., Cohn, R.G., Caulfield, J.P., and Shoemaker, C.B. (1995). Immunolocalization of a *Schistosoma mansoni* facilitated diffusion glucose transporter to the basal, but not the apical, membranes of the surface syncytium. *Parasitology* *110* (Pt 4), 383–394.
- Zhou, Z., Xu, M.-J., and Gao, B. (2016). Hepatocytes: a key cell type for innate immunity. *Cellular and Molecular Immunology* *13*, 301–315.

Zhu, L., Liu, J., Dao, J., Lu, K., Li, H., Gu, H., Liu, J., Feng, X., and Cheng, G. (2016). Molecular characterization of *S. japonicum* exosome-like vesicles reveals their regulatory roles in parasite-host interactions. *Scientific Reports* 6, 1–14.