

https://dspace.org/

Identification of protein-protein interactions between plasmodium falciparum and the human erythrocyte membrane protein 4.1

Lanzillotti, Roberto

2007-02-28T10:55:40Z
http://hdl.handle.net/10539/2146

Downloaded from a DSpace repository. https://dspace.org/

REFERENCES

Adams, J. H., Blair, P. L., Kaneko, O., and Peterson, D. S. (2001). An expanding ebl family of *Plasmodium falciparum*. Trends Parasitol *17*, 297-299.

Aikawa, M., Miller, L. H., Johnson, J., and Rabbege, J. (1978). Erythrocyte entry by malarial parasites. A moving junction between erythrocyte and parasite. J Cell Biol *77*, 72-82.

Aikawa, M., Miller, L. H., Rabbege, J. R., and Epstein, N. (1981). Freeze-fracture study on the erythrocyte membrane during malarial parasite invasion. J Cell Biol *91*, 55-62.

An, X. L., Takakuwa, Y., Manno, S., Han, B. G., Gascard, P., and Mohandas, N. (2001). Structural and functional characterization of protein 4.1R-phosphatidylserine interaction: potential role in 4.1R sorting within cells. J Biol Chem *276*, 35778-35785.

An, X. L., Takakuwa, Y., Nunomura, W., Manno, S., and Mohandas, N. (1996). Modulation of band 3-ankyrin interaction by protein 4.1. Functional implications in regulation of erythrocyte membrane mechanical properties. J Biol Chem *271*, 33187-33191.

Anders, R. F. (1986). Multiple cross-reactivities amongst antigens of *Plasmodium falciparum* impair the development of protective immunity against malaria. Parasite Immunol *8*, 529-539.

Ansuini, H., Cicchini, C., Nicosia, A., Tripodi, M., Cortese, R., and Luzzago, A. (2002). Biotin-tagged cDNA expression libraries displayed on lambda phage: a new tool for the selection of natural protein ligands. Nucleic Acids Res *30*, e78.

Aravind, L., Iyer, L. M., Wellems, T. E., and Miller, L. H. (2003). *Plasmodium* biology: genomic gleanings. Cell *115*, 771-785.

Archakov, A. I., Govorun, V. M., Dubanov, A. V., Ivanov, Y. D., Veselovsky, A. V., Lewi, P., and Janssen, P. (2003). Protein-protein interactions as a target for drugs in proteomics. Proteomics *3*, 380-391.

Azzazy, H. M., and Highsmith, W. E., Jr. (2002). Phage display technology: clinical applications and recent innovations. Clin Biochem *35*, 425-445.

Baklouti, F., Huang, S. C., Tang, T. K., Delaunay, J., Marchesi, V. T., and Benz, E. J., Jr. (1996). Asynchronous regulation of splicing events within protein 4.1 pre-mRNA during erythroid differentiation. Blood *87*, 3934-3941.

Bannister, L. H., Butcher, G. A., Dennis, E. D., and Mitchell, G. H. (1975). Structure and invasive behaviour of *Plasmodium* knowlesi merozoites in vitro. Parasitology *71*, 483-491.

Bannister, L. H., and Dluzewski, A. R. (1990). The ultrastructure of red cell invasion in malaria infections: a review. Blood Cells *16*, 257-292; discussion 293-257.

Bannister, L. H., Hopkins, J. M., Fowler, R. E., Krishna, S., and Mitchell, G. H. (2000). A brief illustrated guide to the ultrastructure of *Plasmodium falciparum* asexual blood stages. Parasitol Today *16*, 427-433.

Becker, P. S., Spiegel, J. E., Wolfe, L. C., and Lux, S. E. (1983). High yield purification of protein 4.1 from human erythrocyte membranes. Anal Biochem *132*, 195-201.

Benhar, I. (2001). Biotechnological applications of phage and cell display. Biotechnol Adv *19*, 1-33.

Bharara, R., Singh, S., Pattnaik, P., Chitnis, C. E., and Sharma, A. (2004). Structural analogs of sialic acid interfere with the binding of erythrocyte binding antigen-175 to glycophorin A, an interaction crucial for erythrocyte invasion by *Plasmodium falciparum*. Mol Biochem Parasitol *138*, 123-129.

Blackman, M. J. (2000). Proteases involved in erythrocyte invasion by the malaria parasite: function and potential as chemotherapeutic targets. Curr Drug Targets *1*, 59-83.

Blackman, M. J., and Holder, A. A. (1992). Secondary processing of the *Plasmodium falciparum* merozoite surface protein-1 (MSP1) by a calcium-dependent membrane bound serine protease: shedding of MSP133 as a non-covalently associated complex with other fragments of the MSP1. Mol Biochem Parasitol *50*, 307-315.

Blair, P. L., Kappe, S. H., Maciel, J. E., Balu, B., and Adams, J. H. (2002). *Plasmodium falciparum* MAEBL is a unique member of the ebl family. Mol Biochem Parasitol *122*, 35-44.

Blisnick, T., Morales Betoulle, M. E., Barale, J. C., Uzureau, P., Berry, L., Desroses, S., Fujioka, H., Mattei, D., and Braun Breton, C. (2000). Pfsbp1, a Maurer's cleft *Plasmodium falciparum* protein, is associated with the erythrocyte skeleton. Mol Biochem Parasitol *111*, 107-121.

Blythe, J. E., Surentheran, T., and Preiser, P. R. (2004). STEVOR--a multifunctional protein? Mol Biochem Parasitol *134*, 11-15.

Bozdech, Z., Llinas, M., Pulliam, B. L., Wong, E. D., Zhu, J., and DeRisi, J. L. (2003). The transcriptome of the intraerythrocytic developmental cycle of *Plasmodium falciparum*. PLoS Biol *1*, E5.

Braun Breton, C., and Pereira da Silva, L. H. (1993). Malaria proteases and red blood cell invasion. Parasitol Today *9*, 92-96.

Braun-Breton, C., Rosenberry, T. L., and da Silva, L. P. (1988). Induction of the proteolytic activity of a membrane protein in *Plasmodium falciparum* by phosphatidyl inositol-specific phospholipase C. Nature *332*, 457-459.

Bray, R. S., and Garnham, P. C. (1982). The life-cycle of primate malaria parasites. Br Med Bull *38*, 117-122.

Burkhard, P., Stetefeld, J., and Strelkov, S. V. (2001). Coiled coils: a highly versatile protein folding motif. Trends Cell Biol *11*, 82-88.

Burton, D. R. (1995). Phage display. Immunotechnology *1*, 87-94.

Camus, D., and Hadley, T. J. (1985). A *Plasmodium falciparum* antigen that binds to host erythrocytes and merozoites. Science *230*, 553-556.

Cartron, J. P., Le Van Kim, C., and Colin, Y. (1993). Glycophorin C and related glycoproteins: structure, function, and regulation. Semin Hematol *30*, 152-168.

Carucci, D. J. (2000). Malaria research in the post-genomic era. Parasitol Today *16*, 434-438.

Carucci, D. J., Yates, J. R., 3rd, and Florens, L. (2002). Exploring the proteome of *Plasmodium*. Int J Parasitol *32*, 1539-1542.

Carvalho, T. G., and Menard, R. (2005). Manipulating the *Plasmodium* genome. Curr Issues Mol Biol *7*, 39-55.

Casey, J. L., Coley, A. M., Anders, R. F., Murphy, V. J., Humberstone, K. S., Thomas, A. W., and Foley, M. (2004). Antibodies to malaria peptide mimics inhibit *Plasmodium falciparum* invasion of erythrocytes. Infect Immun *72*, 1126-1134.

Chappel, J. A., Rogers, W. O., Hoffman, S. L., and Kang, A. S. (2004). Molecular dissection of the human antibody response to the structural repeat epitope of *Plasmodium falciparum* sporozoite from a protected donor. Malar J *3*, 28.

Chishti, A. H. (1998). Function of p55 and its nonerythroid homologues. Curr Opin Hematol *5*, 116-121.

Chishti, A. H., Maalouf, G. J., Marfatia, S., Palek, J., Wang, W., Fisher, D., and Liu, S. C. (1994). Phosphorylation of protein 4.1 in *Plasmodium falciparum*-infected human red blood cells. Blood *83*, 3339-3345.

Chishti, A. H., Palek, J., Fisher, D., Maalouf, G. J., and Liu, S. C. (1996). Reduced invasion and growth of *Plasmodium falciparum* into elliptocytic red blood cells with a combined deficiency of protein 4.1, glycophorin C, and p55. Blood *87*, 3462-3469.

Chitnis, C. E., and Blackman, M. J. (2000). Host cell invasion by malaria parasites. Parasitol Today *16*, 411-415.

Chomczynski, P., and Sacchi, N. (1987). Single-step method of RNA isolation by acid guanidinium thiocyanate-phenol-chloroform extraction. Anal Biochem *162*, 156-159.

Cibert, C., Pruliere, G., Lacombe, C., Deprette, C., and Cassoly, R. (1999). Calculation of a Gap restoration in the membrane skeleton of the red blood cell: possible role for myosin II in local repair. Biophys J *76*, 1153-1165.

Cole, N., and Ralston, G. B. (1992). The effects of ionic strength on the self-association of human spectrin. Biochim Biophys Acta *1121*, 23-30.

Coley, A. M., Campanale, N. V., Casey, J. L., Hodder, A. N., Crewther, P. E., Anders, R. F., Tilley, L. M., and Foley, M. (2001). Rapid and precise epitope mapping of monoclonal antibodies against *Plasmodium falciparum* AMA1 by combined phage display of fragments and random peptides. Protein Eng *14*, 691-698.

Conboy, J., Kan, Y. W., Shohet, S. B., and Mohandas, N. (1986). Molecular cloning of protein 4.1, a major structural element of the human erythrocyte membrane skeleton. Proc Natl Acad Sci U S A *83*, 9512-9516.

Conboy, J. G. (1993). Structure, function, and molecular genetics of erythroid membrane skeletal protein 4.1 in normal and abnormal red blood cells. Semin Hematol *30*, 58-73.

Conboy, J. G., Chan, J., Mohandas, N., and Kan, Y. W. (1988). Multiple protein 4.1 isoforms produced by alternative splicing in human erythroid cells. Proc Natl Acad Sci U S A *85*, 9062-9065.

Conboy, J. G., Chan, J. Y., Chasis, J. A., Kan, Y. W., and Mohandas, N. (1991). Tissue- and development-specific alternative RNA splicing regulates expression of multiple isoforms of erythroid membrane protein 4.1. J Biol Chem *266*, 8273-8280.

Cooke, B. M., Lingelbach, K., Bannister, L. H., and Tilley, L. (2004a). Protein trafficking in *Plasmodium falciparum*-infected red blood cells. Trends Parasitol *20*, 581-589.

Cooke, B. M., Mohandas, N., and Coppel, R. L. (2001). The malaria-infected red blood cell: structural and functional changes. Adv Parasitol *50*, 1-86.

Cooke, B. M., Mohandas, N., and Coppel, R. L. (2004b). Malaria and the red blood cell membrane. Semin Hematol *41*, 173-188.

Coppel, R. L., Cowman, A. F., Lingelbach, K. R., Brown, G. V., Saint, R. B., Kemp, D. J., and Anders, R. F. (1983). Isolate-specific S-antigen of *Plasmodium falciparum* contains a repeated sequence of eleven amino acids. Nature *306*, 751-756.

Correas, I., Leto, T. L., Speicher, D. W., and Marchesi, V. T. (1986). Identification of the functional site of erythrocyte protein 4.1 involved in spectrin-actin associations. J Biol Chem *261*, 3310-3315.

Cowman, A. F., Baldi, D. L., Healer, J., Mills, K. E., O'Donnell, R. A., Reed, M. B., Triglia, T., Wickham, M. E., and Crabb, B. S. (2000). Functional analysis of proteins involved in *Plasmodium falciparum* merozoite invasion of red blood cells. FEBS Lett *476*, 84-88.

Crabb, B. S., Cooke, B. M., Reeder, J. C., Waller, R. F., Caruana, S. R., Davern, K. M., Wickham, M. E., Brown, G. V., Coppel, R. L., and Cowman, A. F. (1997). Targeted gene disruption shows that knobs enable malaria-infected red cells to cytoadhere under physiological shear stress. Cell *89*, 287-296.

Culvenor, J. G., Day, K. P., and Anders, R. F. (1991). *Plasmodium falciparum* ring-infected erythrocyte surface antigen is released from merozoite dense granules after erythrocyte invasion. Infect Immun *59*, 1183-1187.

Cwirla, S. E., Peters, E. A., Barrett, R. W., and Dower, W. J. (1990). Peptides on phage: a vast library of peptides for identifying ligands. Proc Natl Acad Sci U S A *87*, 6378-6382.

Danilov, Y. N., Fennell, R., Ling, E., and Cohen, C. M. (1990). Selective modulation of band 4.1 binding to erythrocyte membranes by protein kinase C. J Biol Chem *265*, 2556-2562.

Dasaradhi, P. V., Mohmmed, A., Kumar, A., Hossain, M. J., Bhatnagar, R. K., Chauhan, V. S., and Malhotra, P. (2005). A role of falcipain-2, principal cysteine proteases of *Plasmodium falciparum* in merozoite egression. Biochem Biophys Res Commun *336*, 1062-1068.

de la Cruz, V. F., Lal, A. A., and McCutchan, T. F. (1988). Immunogenicity and epitope mapping of foreign sequences via genetically engineered filamentous phage. J Biol Chem *263*, 4318-4322.

Deponte, M., and Becker, K. (2004). *Plasmodium falciparum*--do killers commit suicide? Trends Parasitol *20*, 165-169.

Devlin, J. J., Panganiban, L. C., and Devlin, P. E. (1990). Random peptide libraries: a source of specific protein binding molecules. Science *249*, 404-406.

Docampo, R., and Moreno, S. N. (1996). The role of Ca^{2+} in the process of cell invasion by intracellular parasites. Parasitol Today *12*, 61-65.

Dodge, J. T., Mitchell, C., and Hanahan, D. J. (1963). The preparation and chemical characteristics of hemoglobin-free ghosts of human erythrocytes. Arch Biochem Biophys *100*, 119-130.

Doerig, C. (2004). Protein kinases as targets for anti-parasitic chemotherapy. Biochim Biophys Acta *1697*, 155-168.

Dowse, T., and Soldati, D. (2004). Host cell invasion by the apicomplexans: the significance of microneme protein proteolysis. Curr Opin Microbiol *7*, 388-396.

Dowse, T. J., Pascall, J. C., Brown, K. D., and Soldati, D. (2005). Apicomplexan rhomboids have a potential role in microneme protein cleavage during host cell invasion. Int J Parasitol *35*, 747-756.

Dua, M., Raphael, P., Sijwali, P. S., Rosenthal, P. J., and Hanspal, M. (2001). Recombinant falcipain-2 cleaves erythrocyte membrane ankyrin and protein 4.1. Mol Biochem Parasitol *116*, 95-99.

Duraisingh, M. T., Maier, A. G., Triglia, T., and Cowman, A. F. (2003). Erythrocyte-binding antigen 175 mediates invasion in *Plasmodium falciparum* utilizing sialic acid-dependent and -independent pathways. Proc Natl Acad Sci U S A *100*, 4796-4801.

Dvorak, J. A., Miller, L. H., Whitehouse, W. C., and Shiroishi, T. (1975). Invasion of erythrocytes by malaria merozoites. Science *187*, 748-750.

Dyer, M., and Day, K. P. (2000). Commitment to gametocytogenesis in *Plasmodium falciparum*. Parasitol Today *16*, 102-107.

Eda, K., Eda, S., and Sherman, I. W. (2004). Identification of peptides targeting the surface of *Plasmodium falciparum*-infected erythrocytes using a phage display peptide library. Am J Trop Med Hyg *71*, 190-195.

Eda, S., and Sherman, I. W. (2005). Selection of peptides recognized by human antibodies against the surface of *Plasmodium falciparum*-infected erythrocytes. Parasitology *130*, 1-11.

Engebrecht, J. A., Brent, R., and Kaderbhai, M. A. (2004). Minipreps of plasmid DNA. In Current protocols in molecular biology, F. M. Ausubel, R. Brent, R. E. Kingston, D. D. Moore, J. G. Seidman, J. A. Smith, and K. Struhl, eds. (New York, USA, John Wiley & Sons, Inc), pp. 1.6.1-1.6.10.

Fairbanks, G., Steck, T. L., and Wallach, D. F. (1971). Electrophoretic analysis of the major polypeptides of the human erythrocyte membrane. Biochemistry *10*, 2606-2617.

Fernandez, V., Hommel, M., Chen, Q., Hagblom, P., and Wahlgren, M. (1999). Small, clonally variant antigens expressed on the surface of the *Plasmodium falciparum*-infected erythrocyte are encoded by the rif gene family and are the target of human immune responses. J Exp Med *190*, 1393-1404.

Fleck, S. L., Birdsall, B., Babon, J., Dluzewski, A. R., Martin, S. R., Morgan, W. D., Angov, E., Kettleborough, C. A., Feeney, J., Blackman, M. J., and Holder, A. A. (2003). Suramin and suramin analogues inhibit merozoite surface protein-1 secondary processing and erythrocyte invasion by the malaria parasite *Plasmodium falciparum*. J Biol Chem *278*, 47670-47677.

Flick, K., and Chen, Q. (2004). var genes, PfEMP1 and the human host. Mol Biochem Parasitol *134*, 3-9.

Florens, L., Washburn, M. P., Raine, J. D., Anthony, R. M., Grainger, M., Haynes, J. D., Moch, J. K., Muster, N., Sacci, J. B., Tabb, D. L.*, et al.* (2002). A proteomic view of the *Plasmodium falciparum* life cycle. Nature *419*, 520-526.

Foley, M., and Tilley, L. (1998). Protein trafficking in malaria-infected erythrocytes. Int J Parasitol *28*, 1671-1680.

Foley, M., Tilley, L., Sawyer, W. H., and Anders, R. F. (1991). The ring-infected erythrocyte surface antigen of *Plasmodium falciparum* associates with spectrin in the erythrocyte membrane. Mol Biochem Parasitol *46*, 137-147.

Fowler, V. M., Davis, J. Q., and Bennett, V. (1985). Human erythrocyte myosin: identification and purification. J Cell Biol *100*, 47-55.

Francis, S. E., Sullivan, D. J., Jr., and Goldberg, D. E. (1997). Hemoglobin metabolism in the malaria parasite *Plasmodium falciparu*m. Annu Rev Microbiol *51*, 97-123.

Fu, J., Saenz, F. E., Reed, M. B., Balu, B., Singh, N., Blair, P. L., Cowman, A. F., and Adams, J. H. (2005). Targeted disruption of maebl in *Plasmodium falciparum.* Mol Biochem Parasitol *141*, 113-117.

Fu, Y., Shearing, L. N., Haynes, S., Crewther, P., Tilley, L., Anders, R. F., and Foley, M. (1997). Isolation from phage display libraries of single chain variable fragment antibodies that recognize conformational epitopes in the malaria vaccine candidate, apical membrane antigen-1. J Biol Chem *272*, 25678-25684.

Fujita, T., Ralston, G. B., and Morris, M. B. (1998). Biophysical properties of human erythrocyte spectrin at alkaline pH: implications for spectrin structure, function, and association. Biochemistry *37*, 264-271.

Fukuda, M. (1993). Molecular genetics of the glycophorin A gene cluster. Semin Hematol *30*, 138-151.

Gallagher, P. G., and Forget, B. G. (1993). Spectrin genes in health and disease. Semin Hematol *30*, 4-20.

Gardiner, D. L., Holt, D. C., Thomas, E. A., Kemp, D. J., and Trenholme, K. R. (2000). Inhibition of *Plasmodium falciparum* clag9 gene function by antisense RNA. Mol Biochem Parasitol *110*, 33-41.

Gardner, M. J., Hall, N., Fung, E., White, O., Berriman, M., Hyman, R. W., Carlton, J. M., Pain, A., Nelson, K. E., Bowman, S*., et al.* (2002). Genome sequence of the human malaria parasite *Plasmodium falciparum.* Nature *419*, 498-511.

Gaur, D., Mayer, D. C., and Miller, L. H. (2004). Parasite ligand-host receptor interactions during invasion of erythrocytes by *Plasmodium* merozoites. Int J Parasitol *34*, 1413-1429.

Ghai, M., Dutta, S., Hall, T., Freilich, D., and Ockenhouse, C. F. (2002). Identification, expression, and functional characterization of MAEBL, a sporozoite and asexual blood stage chimeric erythrocyte-binding protein of *Plasmodium falciparum*. Mol Biochem Parasitol *123*, 35-45.

Ghosh, A. K., Moreira, L. A., and Jacobs-Lorena, M. (2002). *Plasmodium*-mosquito interactions, phage display libraries and transgenic mosquitoes impaired for malaria transmission. Insect Biochem Mol Biol *32*, 1325-1331.

Gilberger, T. W., Thompson, J. K., Reed, M. B., Good, R. T., and Cowman, A. F. (2003a). The cytoplasmic domain of the *Plasmodium falciparum* ligand EBA-175 is essential for invasion but not protein trafficking. J Cell Biol *162*, 317-327.

Gilberger, T. W., Thompson, J. K., Triglia, T., Good, R. T., Duraisingh, M. T., and Cowman, A. F. (2003b). A novel erythrocyte binding antigen-175 paralogue from *Plasmodium falciparum* defines a new trypsin-resistant receptor on human erythrocytes. J Biol Chem *278*, 14480-14486.

Gilligan, D. M., and Bennett, V. (1993). The junctional complex of the membrane skeleton. Semin Hematol *30*, 74-83.

Gissot, M., Briquet, S., Refour, P., Boschet, C., and Vaquero, C. (2005). PfMyb1, a *Plasmodium falciparum* transcription factor, is required for intra-erythrocytic growth and controls key genes for cell cycle regulation. J Mol Biol *346*, 29-42.

Goel, V. K., Li, X., Chen, H., Liu, S. C., Chishti, A. H., and Oh, S. S. (2003). Band 3 is a host receptor binding merozoite surface protein 1 during the *Plasmodium falciparum* invasion of erythrocytes. Proc Natl Acad Sci U S A *100*, 5164-5169.

Greenwood, J., Willis, A. E., and Perham, R. N. (1991). Multiple display of foreign peptides on a filamentous bacteriophage. Peptides from *Plasmodium falciparum* circumsporozoite protein as antigens. J Mol Biol *220*, 821-827.

Haldar, K., Samuel, B. U., Mohandas, N., Harrison, T., and Hiller, N. L. (2001). Transport mechanisms in *Plasmodium*-infected erythrocytes: lipid rafts and a tubovesicular network. Int J Parasitol *31*, 1393-1401.

Hanspal, M., Dua, M., Takakuwa, Y., Chishti, A. H., and Mizuno, A. (2002). *Plasmodium falciparum* cysteine protease falcipain-2 cleaves erythrocyte membrane skeletal proteins at late stages of parasite development. Blood *100*, 1048-1054.

Harrison, T., Samuel, B. U., Akompong, T., Hamm, H., Mohandas, N., Lomasney, J. W., and Haldar, K. (2003). Erythrocyte G protein-coupled receptor signaling in malarial infection. Science *301*, 1734-1736.

Heal, K. G., Hill, R., Stockley, P. G., Hollingdale, M. R., and Taylor-Robinson, A. W. (2000). Expression and immunogenicity of a liver stage malaria epitope presented as a foreign peptide on the surface of RNA-free MS2 bacteriophage capsids. Vaccine *18*, 251-258.

Healer, J., Crawford, S., Ralph, S., McFadden, G., and Cowman, A. F. (2002). Independent translocation of two micronemal proteins in developing *Plasmodium falciparum* merozoites. Infect Immun *70*, 5751-5758.

Hemming, N. J., Anstee, D. J., Mawby, W. J., Reid, M. E., and Tanner, M. J. (1994). Localization of the protein 4.1-binding site on human erythrocyte glycophorins C and D. Biochem J *299 (Pt 1)*, 191-196.

Hemming, N. J., Anstee, D. J., Staricoff, M. A., Tanner, M. J., and Mohandas, N. (1995). Identification of the membrane attachment sites for protein 4.1 in the human erythrocyte. J Biol Chem *270*, 5360-5366.

Hiller, N. L., Bhattacharjee, S., van Ooij, C., Liolios, K., Harrison, T., Lopez-Estrano, C., and Haldar, K. (2004). A host-targeting signal in virulence proteins reveals a secretome in malarial infection. Science *306*, 1934-1937.

Holder, A. A., and Freeman, R. R. (1984). The three major antigens on the surface of *Plasmodium falciparum* merozoites are derived from a single high molecular weight precursor. J Exp Med *160*, 624-629.

Holder, A. A., Lockyer, M. J., Odink, K. G., Sandhu, J. S., Riveros-Moreno, V., Nicholls, S. C., Hillman, Y., Davey, L. S., Tizard, M. L., Schwarz, R. T., and et al. (1985). Primary structure of the precursor to the three major surface antigens of *Plasmodium falciparum* merozoites. Nature *317*, 270-273.

Holt, D. C., Gardiner, D. L., Thomas, E. A., Mayo, M., Bourke, P. F., Sutherland, C. J., Carter, R., Myers, G., Kemp, D. J., and Trenholme, K. R. (1999). The cytoadherence linked asexual gene family of *Plasmodium falciparum*: are there roles other than cytoadherence? Int J Parasitol *29*, 939-944.

Horne, W. C., Prinz, W. C., and Tang, E. K. (1990). Identification of two cAMP-dependent phosphorylation sites on erythrocyte protein 4.1. Biochim Biophys Acta *1055*, 87-92.

Horrocks, P., Bowman, S., Kyes, S., Waters, A. P., and Craig, A. (2000). Entering the post-genomic era of malaria research. Bull World Health Organ *78*, 1424-1437.

Horrocks, P., and Lanzer, M. (1998). Transfection of *Plasmodium*: A new chapter in the molecular analysis of malaria. Parasitol Int *47*, 101-106.

Howell, S. A., Hackett, F., Jongco, A. M., Withers-Martinez, C., Kim, K., Carruthers, V. B., and Blackman, M. J. (2005). Distinct mechanisms govern proteolytic shedding of a key invasion protein in apicomplexan pathogens. Mol Microbiol *57*, 1342-1356.

Howell, S. A., Well, I., Fleck, S. L., Kettleborough, C., Collins, C. R., and Blackman, M. J. (2003). A single malaria merozoite serine protease

mediates shedding of multiple surface proteins by juxtamembrane cleavage. J Biol Chem *278*, 23890-23898.

Hsiao, L. L., Howard, R. J., Aikawa, M., and Taraschi, T. F. (1991). Modification of host cell membrane lipid composition by the intra-erythrocytic human malaria parasite *Plasmodium falciparum*. Biochem J *274 (Pt 1)*, 121-132.

Husain, A., and Branton, D. (1986). Purification of erythrocyte band 4.1 and other cytoskeletal components using hydroxyapatite-Ultrogel. Anal Biochem *155*, 206-211.

Inaba, M., Gupta, K. C., Kuwabara, M., Takahashi, T., Benz, E. J., Jr., and Maede, Y. (1992). Deamidation of human erythrocyte protein 4.1: possible role in aging. Blood *79*, 3355-3361.

Jacobs-Lorena, M. (2003). Interrupting malaria transmission by genetic manipulation of anopheline mosquitoes. J Vector Borne Dis *40*, 73-77.

John, C. C., O'Donnell, R. A., Sumba, P. O., Moormann, A. M., de Koning-Ward, T. F., King, C. L., Kazura, J. W., and Crabb, B. S. (2004). Evidence that invasion-inhibitory antibodies specific for the 19-kDa fragment of merozoite surface protein-1 (MSP-1 19) can play a protective role against blood-stage *Plasmodium falciparum* infection in individuals in a malaria endemic area of Africa. J Immunol *173*, 666-672.

Kappe, S. H., Buscaglia, C. A., Bergman, L. W., Coppens, I., and Nussenzweig, V. (2004). Apicomplexan gliding motility and host cell invasion: overhauling the motor model. Trends Parasitol *20*, 13-16.

Kappe, S. H., Noe, A. R., Fraser, T. S., Blair, P. L., and Adams, J. H. (1998). A family of chimeric erythrocyte binding proteins of malaria parasites. Proc Natl Acad Sci U S A *95*, 1230-1235.

Kariu, T., Yuda, M., Yano, K., and Chinzei, Y. (2002). MAEBL is essential for malarial sporozoite infection of the mosquito salivary gland. J Exp Med *195*, 1317-1323.

Kim, K. (2004). Role of proteases in host cell invasion by Toxoplasma gondii and other Apicomplexa. Acta Trop *91*, 69-81.

Kirk, K. (2001). Membrane transport in the malaria-infected erythrocyte. Physiol Rev *81*, 495-537.

Krettli, A. U., and Miller, L. H. (2001). Malaria: A sporozoite runs through it. Curr Biol *11*, R409-R412.

Krishna, S., Webb, R., and Woodrow, C. (2001). Transport proteins of *Plasmodium falciparum*: defining the limits of metabolism. Int J Parasitol *31*, 1331-1342.

Kun, J. F., Hibbs, A. R., Saul, A., McColl, D. J., Coppel, R. L., and Anders, R. F. (1997). A putative *Plasmodium falciparum* exported serine/threonine protein kinase. Mol Biochem Parasitol *85*, 41-51.

Kushwaha, A., Perween, A., Mukund, S., Majumdar, S., Bhardwaj, D., Chowdhury, N. R., and Chauhan, V. S. (2002). Amino terminus of *Plasmodium falciparum* acidic basic repeat antigen interacts with the erythrocyte membrane through band 3 protein. Mol Biochem Parasitol *122*, 45-54.

Kyes, S. A., Rowe, J. A., Kriek, N., and Newbold, C. I. (1999). Rifins: a second family of clonally variant proteins expressed on the surface of red cells infected with *Plasmodium falciparum*. Proc Natl Acad Sci U S A *96*, 9333-9338.

Ladner, R. C., Sato, A. K., Gorzelany, J., and de Souza, M. (2004). Phage display-derived peptides as therapeutic alternatives to antibodies. Drug Discov Today *9*, 525-529.

Laemmli, U. K. (1970). Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature *227*, 680-685.

Lanzillotti, R., and Coetzer, T. L. (2004). Myosin-like sequences in the malaria parasite *Plasmodium falciparum* bind human erythrocyte membrane protein 4.1. Haematologica *89*, 1168-1171.

Lasonder, E., Ishihama, Y., Andersen, J. S., Vermunt, A. M., Pain, A., Sauerwein, R. W., Eling, W. M., Hall, N., Waters, A. P., Stunnenberg, H. G., and Mann, M. (2002). Analysis of the *Plasmodium falciparum* proteome by high-accuracy mass spectrometry. Nature *419*, 537-542.

Lauterbach, S. B., Lanzillotti, R., and Coetzer, T. L. (2003). Construction and use of *Plasmodium falciparum* phage display libraries to identify host parasite interactions. Malar J *2*, 47.

Le Bonniec, S., Deregnaucourt, C., Redeker, V., Banerjee, R., Grellier, P., Goldberg, D. E., and Schrevel, J. (1999). Plasmepsin II, an acidic hemoglobinase from the *Plasmodium falciparum* food vacuole, is active at neutral pH on the host erythrocyte membrane skeleton. J Biol Chem *274*, 14218-14223.

Le Roch, K. G., Zhou, Y., Blair, P. L., Grainger, M., Moch, J. K., Haynes, J. D., De La Vega, P., Holder, A. A., Batalov, S., Carucci, D. J., and Winzeler,

E. A. (2003). Discovery of gene function by expression profiling of the malaria parasite life cycle. Science *301*, 1503-1508.

Leto, T. L., and Marchesi, V. T. (1984). A structural model of human erythrocyte protein 4.1. J Biol Chem *259*, 4603-4608.

Li, F., Dluzewski, A., Coley, A. M., Thomas, A., Tilley, L., Anders, R. F., and Foley, M. (2002). Phage-displayed peptides bind to the malarial protein apical membrane antigen-1 and inhibit the merozoite invasion of host erythrocytes. J Biol Chem *277*, 50303-50310.

Ling, E., Danilov, Y. N., and Cohen, C. M. (1988). Modulation of red cell band 4.1 function by cAMP-dependent kinase and protein kinase C phosphorylation. J Biol Chem *263*, 2209-2216.

Liu, J., Tan, H., and Rost, B. (2002). Loopy proteins appear conserved in evolution. J Mol Biol *322*, 53-64.

Lobo, C. A., Rodriguez, M., Reid, M., and Lustigman, S. (2003). Glycophorin C is the receptor for the *Plasmodium falciparum* erythrocyte binding ligand PfEBP-2 (baebl). Blood *101*, 4628-4631.

Lupas, A. (1996). Coiled coils: new structures and new functions. Trends Biochem Sci *21*, 375-382.

Magowan, C., Coppel, R. L., Lau, A. O., Moronne, M. M., Tchernia, G., and Mohandas, N. (1995). Role of the *Plasmodium falciparum* mature-parasite-infected erythrocyte surface antigen (MESA/PfEMP-2) in malarial infection of erythrocytes. Blood *86*, 3196-3204.

Magowan, C., Liang, J., Yeung, J., Takakuwa, Y., Coppel, R. L., and Mohandas, N. (1998). *Plasmodium falciparum*: influence of malarial and host erythrocyte skeletal protein interactions on phosphorylation in infected erythrocytes. Exp Parasitol *89*, 40-49.

Magowan, C., Nunomura, W., Waller, K. L., Yeung, J., Liang, J., Van Dort, H., Low, P. S., Coppel, R. L., and Mohandas, N. (2000). *Plasmodium falciparum* histidine-rich protein 1 associates with the band 3 binding domain of ankyrin in the infected red cell membrane. Biochim Biophys Acta *1502*, 461-470.

Maguire, P. A., Prudhomme, J., and Sherman, I. W. (1991). Alterations in erythrocyte membrane phospholipid organization due to the intracellular growth of the human malaria parasite, *Plasmodium falciparum.* Parasitology *102 Pt 2*, 179-186.

Malhotra, P., Dasaradhi, P. V., Kumar, A., Mohmmed, A., Agrawal, N., Bhatnagar, R. K., and Chauhan, V. S. (2002). Double-stranded RNA-

mediated gene silencing of cysteine proteases (falcipain-1 and -2) of *Plasmodium falciparum*. Mol Microbiol *45*, 1245-1254.

Manoutcharian, K., Gevorkian, G., Cano, A., and Almagro, J. C. (2001). Phage displayed biomolecules as preventive and therapeutic agents. Curr Pharm Biotechnol *2*, 217-223.

Marfatia, S. M., Lue, R. A., Branton, D., and Chishti, A. H. (1994). *In vitro* binding studies suggest a membrane-associated complex between erythroid p55, protein 4.1, and glycophorin C. J Biol Chem *269*, 8631-8634.

Marfatia, S. M., Lue, R. A., Branton, D., and Chishti, A. H. (1995). Identification of the protein 4.1 binding interface on glycophorin C and p55, a homologue of the Drosophila discs-large tumor suppressor protein. J Biol Chem *270*, 715-719.

Marti, M., Good, R. T., Rug, M., Knuepfer, E., and Cowman, A. F. (2004). Targeting malaria virulence and remodeling proteins to the host erythrocyte. Science *306*, 1930-1933.

Mayer, D. C., Kaneko, O., Hudson-Taylor, D. E., Reid, M. E., and Miller, L. H. (2001). Characterization of a *Plasmodium falciparum* erythrocyte-binding protein paralogous to EBA-175. Proc Natl Acad Sci U S A *98*, 5222-5227.

Mayer, D. C., Mu, J. B., Feng, X., Su, X. Z., and Miller, L. H. (2002). Polymorphism in a *Plasmodium falciparum* erythrocyte-binding ligand changes its receptor specificity. J Exp Med *196*, 1523-1528.

Mayer, D. C., Mu, J. B., Kaneko, O., Duan, J., Su, X. Z., and Miller, L. H. (2004). Polymorphism in the *Plasmodium falciparum* erythrocyte-binding ligand JESEBL/EBA-181 alters its receptor specificity. Proc Natl Acad Sci U S A *101*, 2518-2523.

McCallum-Deighton, N., and Holder, A. A. (1992). The role of calcium in the invasion of human erythrocytes by *Plasmodium falciparum*. Mol Biochem Parasitol *50*, 317-323.

Mikkelsen, R. B., Kamber, M., Wadwa, K. S., Lin, P. S., and Schmidt-Ullrich, R. (1988). The role of lipids in *Plasmodium falciparum* invasion of erythrocytes: a coordinated biochemical and microscopic analysis. Proc Natl Acad Sci U S A *85*, 5956-5960.

Miller, L. H., Baruch, D. I., Marsh, K., and Doumbo, O. K. (2002). The pathogenic basis of malaria. Nature *415*, 673-679.

Moore, D. D., and Dowhan, D. (2004). Manipulation of DNA. In Current protocols in molecular biology, K. Struhl, ed. (John Wiley & Sons, Inc), pp. 2.01-02.01.09.

Narum, D. L., Fuhrmann, S. R., Luu, T., and Sim, B. K. (2002). A novel *Plasmodium falciparum* erythrocyte binding protein-2 (EBP2/BAEBL) involved in erythrocyte receptor binding. Mol Biochem Parasitol *119*, 159-168.

Narum, D. L., and Thomas, A. W. (1994). Differential localization of full-length and processed forms of PF83/AMA-1 an apical membrane antigen of *Plasmodium falciparum* merozoites. Mol Biochem Parasitol *67*, 59-68.

Newbold, C., Craig, A., Kyes, S., Rowe, A., Fernandez-Reyes, D., and Fagan, T. (1999). Cytoadherence, pathogenesis and the infected red cell surface in *Plasmodium falciparum*. Int J Parasitol *29*, 927-937.

Nunomura, W., Takakuwa, Y., Parra, M., Conboy, J., and Mohandas, N. (2000). Regulation of protein 4.1R, p55, and glycophorin C ternary complex in human erythrocyte membrane. J Biol Chem *275*, 24540-24546.

Ockenhouse, C. F., Klotz, F. W., Tandon, N. N., and Jamieson, G. A. (1991). Sequestrin, a CD36 recognition protein on *Plasmodium falciparum* malaria-infected erythrocytes identified by anti-idiotype antibodies. Proc Natl Acad Sci U S A *88*, 3175-3179.

O'Donnell, R. A., and Blackman, M. J. (2005). The role of malaria merozoite proteases in red blood cell invasion. Curr Opin Microbiol *8*, 422-427.

O'Donnell, R. A., de Koning-Ward, T. F., Burt, R. A., Bockarie, M., Reeder, J. C., Cowman, A. F., and Crabb, B. S. (2001). Antibodies against merozoite surface protein (MSP)-1 (19) are a major component of the invasion-inhibitory response in individuals immune to malaria. J Exp Med *193*, 1403-1412.

Oh, S. S., Voigt, S., Fisher, D., Yi, S. J., LeRoy, P. J., Derick, L. H., Liu, S., and Chishti, A. H. (2000). *Plasmodium falciparum* erythrocyte membrane protein 1 is anchored to the actin-spectrin junction and knob-associated histidine-rich protein in the erythrocyte skeleton. Mol Biochem Parasitol *108*, 237-247.

Palek, J. (1995). The red cell membrane. In Hematology, W. J. Williams, E. Beutler, M. A. Lichtman, B. S. Coller, and T. J. Kipps, eds. (New York, McGraw-Hill), pp. 406-417.

Pandey, K. C., Singh, S., Pattnaik, P., Pillai, C. R., Pillai, U., Lynn, A., Jain, S. K., and Chitnis, C. E. (2002). Bacterially expressed and refolded

receptor binding domain of *Plasmodium falciparum* EBA-175 elicits invasion inhibitory antibodies. Mol Biochem Parasitol *123*, 23-33.

Parker, P. D., Tilley, L., and Klonis, N. (2004). *Plasmodium falciparum* induces reorganization of host membrane proteins during intraerythrocytic growth. Blood *103*, 2404-2406.

Parmley, S. F., and Smith, G. P. (1988). Antibody-selectable filamentous fd phage vectors: affinity purification of target genes. Gene *73*, 305-318.

Pasternack, G. R., and Racusen, R. H. (1989). Erythrocyte protein 4.1 binds and regulates myosin. Proc Natl Acad Sci U S A *86*, 9712-9716.

Pasvol, G. (2003). How many pathways for invasion of the red blood cell by the malaria parasite? Trends Parasitol *19*, 430-432.

Pasvol, G., Carlsson, J., and Clough, B. (1993). The red cell membrane and invasion by malarial parasites. Baillieres Clin Haematol *6*, 513-534.

Pei, X., An, X., Guo, X., Tarnawski, M., Coppel, R., and Mohandas, N. (2005). Structural and functional studies of interaction between *Plasmodium falciparum* knob-associated histidine-rich protein (KAHRP) and erythrocyte spectrin. J Biol Chem *280*, 31166-31171.

Perkins, M. E., and Rocco, L. J. (1988). Sialic acid-dependent binding of *Plasmodium falciparum* merozoite surface antigen, Pf 200, to human erythrocytes. J Immunol *141*, 3190-3196.

Perkins, M. E., and Ziefer, A. (1994). Preferential binding of *Plasmodium falciparum* SERA and rhoptry proteins to erythrocyte membrane inner leaflet phospholipids. Infect Immun *62*, 1207-1212.

Peters, L. L., and Lux, S. E. (1993). Ankyrins: structure and function in normal cells and hereditary spherocytes. Semin Hematol *30*, 85-118.

Peterson, D. S., and Wellems, T. E. (2000). EBL-1, a putative erythrocyte binding protein of *Plasmodium falciparum*, maps within a favored linkage group in two genetic crosses. Mol Biochem Parasitol *105*, 105-113.

Pinder, J., Fowler, R., Bannister, L., Dluzewski, A., and Mitchell, G. H. (2000). Motile systems in malaria merozoites: how is the red blood cell invaded? Parasitol Today *16*, 240-245.

Preiser, P., Kaviratne, M., Khan, S., Bannister, L., and Jarra, W. (2000). The apical organelles of malaria merozoites: host cell selection, invasion, host immunity and immune evasion. Microbes Infect *2*, 1461-1477.

Rangachari, K., Dluzewski, A., Wilson, R. J., and Gratzer, W. B. (1986). Control of malarial invasion by phosphorylation of the host cell membrane cytoskeleton. Nature *324*, 364-365.

Rasti, N., Wahlgren, M., and Chen, Q. (2004). Molecular aspects of malaria pathogenesis. FEMS Immunol Med Microbiol *41*, 9-26.

Reed, M. B., Caruana, S. R., Batchelor, A. H., Thompson, J. K., Crabb, B. S., and Cowman, A. F. (2000). Targeted disruption of an erythrocyte binding antigen in *Plasmodium falciparum* is associated with a switch toward a sialic acid-independent pathway of invasion. Proc Natl Acad Sci U S A *97*, 7509-7514.

Ridley, R. G. (2002). Medical need, scientific opportunity and the drive for antimalarial drugs. Nature *415*, 686-693.

Roeffen, W. F., Raats, J. M., Teelen, K., Hoet, R. M., Eling, W. M., van Venrooij, W. J., and Sauerwein, R. W. (2001). Recombinant human antibodies specific for the Pfs48/45 protein of the malaria parasite *Plasmodium falciparum*. J Biol Chem *276*, 19807-19811.

Rogerson, S. J., and Brown, G. V. (1997). Chondroitin sulphate A as an adherence receptor for *Plasmodium falciparum*-infected erythrocytes. Parasitol Today *13*, 70-75.

Roggwiller, E., Betoulle, M. E., Blisnick, T., and Braun Breton, C. (1996). A role for erythrocyte band 3 degradation by the parasite gp76 serine protease in the formation of the parasitophorous vacuole during invasion of erythrocytes by *Plasmodium falciparum*. Mol Biochem Parasitol *82*, 13-24.

Rosenthal, P. J. (2004). Cysteine proteases of malaria parasites. Int J Parasitol *34*, 1489-1499.

Salmon, B. L., Oksman, A., and Goldberg, D. E. (2001). Malaria parasite exit from the host erythrocyte: a two-step process requiring extraerythrocytic proteolysis. Proc Natl Acad Sci U S A *98*, 271-276.

Samuel, B. U., Mohandas, N., Harrison, T., McManus, H., Rosse, W., Reid, M., and Haldar, K. (2001). The role of cholesterol and glycosylphosphatidylinositol-anchored proteins of erythrocyte rafts in regulating raft protein content and malarial infection. J Biol Chem *276*, 29319-29329.

Scheibel, L. W., Colombani, P. M., Hess, A. D., Aikawa, M., Atkinson, C. T., and Milhous, W. K. (1987). Calcium and calmodulin antagonists inhibit human malaria parasites (*Plasmodium falciparum*): implications for drug design. Proc Natl Acad Sci U S A *84*, 7310-7314.

Schulman, S., Roth, E. F., Jr., Cheng, B., Rybicki, A. C., Sussman, II, Wong, M., Wang, W., Ranney, H. M., Nagel, R. L., and Schwartz, R. S. (1990). Growth of *Plasmodium falciparum* in human erythrocytes containing abnormal membrane proteins. Proc Natl Acad Sci U S A *87*, 7339-7343.

Schwartz, R. S., Olson, J. A., Raventos-Suarez, C., Yee, M., Heath, R. H., Lubin, B., and Nagel, R. L. (1987). Altered plasma membrane phospholipid organization in *Plasmodium falciparum*-infected human erythrocytes. Blood *69*, 401-407.

Scott, J. K., and Smith, G. P. (1990). Searching for peptide ligands with an epitope library. Science *249*, 386-390.

Serghides, L., Smith, T. G., Patel, S. N., and Kain, K. C. (2003). CD36 and malaria: friends or foes? Trends Parasitol *19*, 461-469.

Sibley, L. D. (2004). Intracellular parasite invasion strategies. Science *304*, 248-253.

Sijwali, P. S., Kato, K., Seydel, K. B., Gut, J., Lehman, J., Klemba, M., Goldberg, D. E., Miller, L. H., and Rosenthal, P. J. (2004). *Plasmodium falciparum* cysteine protease falcipain-1 is not essential in erythrocytic stage malaria parasites. Proc Natl Acad Sci U S A *101*, 8721-8726.

Silva, M. D., Cooke, B. M., Guillotte, M., Buckingham, D. W., Sauzet, J. P., Le Scanf, C., Contamin, H., David, P., Mercereau-Puijalon, O., and Bonnefoy, S. (2005). A role for the *Plasmodium falciparum* RESA protein in resistance against heat shock demonstrated using gene disruption. Mol Microbiol *56*, 990-1003.

Sim, B. K., Chitnis, C. E., Wasniowska, K., Hadley, T. J., and Miller, L. H. (1994). Receptor and ligand domains for invasion of erythrocytes by *Plasmodium falciparum*. Science *264*, 1941-1944.

Sim, B. K., Orlandi, P. A., Haynes, J. D., Klotz, F. W., Carter, J. M., Camus, D., Zegans, M. E., and Chulay, J. D. (1990). Primary structure of the 175K *Plasmodium falciparum* erythrocyte binding antigen and identification of a peptide which elicits antibodies that inhibit malaria merozoite invasion. J Cell Biol *111*, 1877-1884.

Sim, B. K., Toyoshima, T., Haynes, J. D., and Aikawa, M. (1992). Localization of the 175-kilodalton erythrocyte binding antigen in micronemes of *Plasmodium falciparum* merozoites. Mol Biochem Parasitol *51*, 157-159.

Singh, N., Preiser, P., Renia, L., Balu, B., Barnwell, J., Blair, P., Jarra, W., Voza, T., Landau, I., and Adams, J. H. (2004). Conservation and developmental control of alternative splicing in maebl among malaria parasites. J Mol Biol *343*, 589-599.

Smith, G. P. (1985). Filamentous fusion phage: novel expression vectors that display cloned antigens on the virion surface. Science *228*, 1315-1317.

Smith, G. P., and Petrenko, V. A. (1997). Phage Display. Chem Rev *97*, 391-410.

Smith, J. D., and Craig, A. G. (2004). The surface of the *Plasmodium falciparum*-infected erythrocyte. In Malaria parasites: genomes and molecular biology, A. P. Waters, and C. J. Janse, eds. (Wymondham, UK, Caister Academic Press), 339-364.

Soldati, D., Foth, B. J., and Cowman, A. F. (2004). Molecular and functional aspects of parasite invasion. Trends Parasitol *20*, 567-574.

Sowa, K. M., Cavanagh, D. R., Creasey, A. M., Raats, J., McBride, J., Sauerwein, R., Roeffen, W. F., and Arnot, D. E. (2001). Isolation of a monoclonal antibody from a malaria patient-derived phage display library recognising the Block 2 region of *Plasmodium falciparum* merozoite surface protein-1. Mol Biochem Parasitol *112*, 143-147.

Sowa, M. P., Sharling, L., Humphreys, G., Cavanagh, D. R., Gregory, W. F., Fenn, K., Creasey, A. M., and Arnot, D. E. (2004). High throughput immuno-screening of cDNA expression libraries produced by in vitro recombination; exploring the *Plasmodium falciparum* proteome. Mol Biochem Parasitol *133*, 267-274.

Staines, H. M., Powell, T., Thomas, S. L. Y., and Ellory, J. C. (2004). *Plasmodium falciparum*-induced channels. Int J Parasitol *34*, 665-673.

Stewart, M. J., Schulman, S., and Vanderberg, J. P. (1986). Rhoptry secretion of membranous whorls by *Plasmodium falciparum* merozoites. Am J Trop Med Hyg *35*, 37-44.

Takakuwa, Y. (2000). Protein 4.1, a multifunctional protein of the erythrocyte membrane skeleton: structure and functions in erythrocytes and nonerythroid cells. Int J Hematol *72*, 298-309.

Talmud, P., Tybjaerg-Hansen, A., Bhatnagar, D., Mbewu, A., Miller, J. P., Durrington, P., and Humphries, S. (1991). Rapid screening for specific mutations in patients with a clinical diagnosis of familial hypercholesterolaemia. Atherosclerosis *89*, 137-141.

Tanaka, T., Kadowaki, K., Lazarides, E., and Sobue, K. (1991). Ca2(+)-dependent regulation of the spectrin/actin interaction by calmodulin and protein 4.1. J Biol Chem *266*, 1134-1140.

Tang, T. K., Leto, T. L., Correas, I., Alonso, M. A., Marchesi, V. T., and Benz, E. J., Jr. (1988). Selective expression of an erythroid-specific isoform of protein 4.1. Proc Natl Acad Sci U S A *85*, 3713-3717.

Tang, T. K., Qin, Z., Leto, T., Marchesi, V. T., and Benz, E. J., Jr. (1990). Heterogeneity of mRNA and protein products arising from the protein 4.1 gene in erythroid and nonerythroid tissues. J Cell Biol *110*, 617-624.

Tanner, M. J. (1997). The structure and function of band 3 (AE1): recent developments (review). Mol Membr Biol *14*, 155-165.

Theisen, M., Soe, S., Jessing, S. G., Okkels, L. M., Danielsen, S., Oeuvray, C., Druilhe, P., and Jepsen, S. (2001). Identification of a major B-cell epitope of the *Plasmodium falciparum* glutamate-rich protein (GLURP), targeted by human antibodies mediating parasite killing. Vaccine *19*, 201-212.

Thomas, S. L. Y., and Lew, V. L. (2004). *Plasmodium falciparum* and the permeation pathway of the host red blood cell. Trends Parasitol *20*, 122-125.

Tolia, N. H., Enemark, E. J., Sim, B. K., and Joshua-Tor, L. (2005). Structural basis for the EBA-175 erythrocyte invasion pathway of the malaria parasite *Plasmodium falciparum*. Cell *122*, 183-193.

Topolska, A. E., Wang, L., Black, C. G., and Coppel, R. L. (2004). Merozoite cell biology. In Malaria parasites: genomes and molecular biology, A. P. Waters, and C. J. Janse, eds. (Wymondham, UK, Caister Academic Press), 365-444.

Trager, W., and Jensen, J. B. (1976). Human malaria parasites in continuous culture. Science *193*, 673-675.

Trager, W., Rozario, C., Shio, H., Williams, J., and Perkins, M. E. (1992). Transfer of a dense granule protein of *Plasmodium falciparum* to the membrane of ring stages and isolation of dense granules. Infect Immun *60*, 4656-4661.

Trelka, D. P., Schneider, T. G., Reeder, J. C., and Taraschi, T. F. (2000). Evidence for vesicle-mediated trafficking of parasite proteins to the host cell cytosol and erythrocyte surface membrane in *Plasmodium falciparum* infected erythrocytes. Mol Biochem Parasitol *106*, 131-145.

Trenholme, K. R., Gardiner, D. L., Holt, D. C., Thomas, E. A., Cowman, A. F., and Kemp, D. J. (2000). clag9: A cytoadherence gene in *Plasmodium falciparum* essential for binding of parasitized erythrocytes to CD36. Proc Natl Acad Sci U S A *97*, 4029-4033.

Triglia, T., Thompson, J. K., and Cowman, A. F. (2001). An EBA175 homologue which is transcribed but not translated in erythrocytic stages of *Plasmodium falciparum*. Mol Biochem Parasitol *116*, 55-63.

Tsukita, S., and Yonemura, S. (1997). ERM (ezrin/radixin/moesin) family: from cytoskeleton to signal transduction. Curr Opin Cell Biol *9*, 70-75.

Tyler, J. M., Hargreaves, W. R., and Branton, D. (1979). Purification of two spectrin-binding proteins: biochemical and electron microscopic evidence for site-specific reassociation between spectrin and bands 2.1 and 4.1. Proc Natl Acad Sci U S A *76*, 5192-5196.

Tyler, J. M., Reinhardt, B. N., and Branton, D. (1980). Associations of erythrocyte membrane proteins. Binding of purified bands 2.1 and 4.1 to spectrin. J Biol Chem *255*, 7034-7039.

Ullu, E., Tschudi, C., and Chakraborty, T. (2004). RNA interference in protozoan parasites. Cell Microbiol *6*, 509-519.

Vera-Bravo, R., Valbuena, J. J., Ocampo, M., Garcia, J. E., Rodriguez, L. E., Puentes, A., Lopez, R., Curtidor, H., Torres, E., Trujillo, M.*, et al.* (2005). Amino terminal peptides from the *Plasmodium falciparum* EBA-181/JESEBL protein bind specifically to erythrocytes and inhibit in vitro merozoite invasion. Biochimie *87*, 425-436.

Voet, D., and Voet, J. G. (1995). Hemoglobin: protein function in microcosm. In Biochemistry (New York, John Wiley & Sons, Inc.), pp. 215-223.

Walensky, L. D., Gascard, P., Fields, M. E., Blackshaw, S., Conboy, J. G., Mohandas, N., and Snyder, S. H. (1998). The 13-kD FK506 binding protein, FKBP13, interacts with a novel homologue of the erythrocyte membrane cytoskeletal protein 4.1. J Cell Biol *141*, 143-153.

Walensky, L. D., Mohandas, N., and Lux, S. E. (2003). Disorders of the red blood cell membrane. In Blood: Principles and Practice of Hematology, R. I. Handin, S. E. Lux, and T. P. Stossel, eds. (Philadelphia, Lippincott), pp. 1709-1859.

Waller, K. L., Nunomura, W., An, X., Cooke, B. M., Mohandas, N., and Coppel, R. L. (2003). Mature parasite-infected erythrocyte surface antigen (MESA) of *Plasmodium falciparum* binds to the 30-kDa domain of protein 4.1 in malaria-infected red blood cells. Blood *102*, 1911-1914.

Waller, K. L., Nunomura, W., Cooke, B. M., Mohandas, N., and Coppel, R. L. (2002). Mapping the domains of the cytoadherence ligand *Plasmodium falciparum* erythrocyte membrane protein 1 (PfEMP1) that bind to the knob-associated histidine-rich protein (KAHRP). Mol Biochem Parasitol *119*, 125-129.

Ward, G. E., Miller, L. H., and Dvorak, J. A. (1993). The origin of parasitophorous vacuole membrane lipids in malaria-infected erythrocytes. J Cell Sci *106 (Pt 1)*, 237-248.

Watkins, N. A., and Ouwehand, W. H. (2000). Introduction to antibody engineering and phage display. Vox Sang *78*, 72-79.

WHO (1991). Learning unit 11: life cycle of the malaria parasite. In Basic malaria microscopy: learner's guide (Geneva).

WHO (2005). World malaria report 2005.

Wickham, M. E., Culvenor, J. G., and Cowman, A. F. (2003). Selective inhibition of a two-step egress of malaria parasites from the host erythrocyte. J Biol Chem *278*, 37658-37663.

Wiesner, J., Mattei, D., Scherf, A., and Lanzer, M. (1998). Biology of giant proteins of *Plasmodium*: resolution on polyacrylamide-agarose composite gels. Parasitol Today *14*, 38-40.

Wilson, K. (1994). Protein and enzyme techniques. In Practical biochemistry: principles and techniques, K. Wilson, and J. Walker, eds. (Cambridge, Cambridge University Press), pp. 162-226.

Wilson, R. J. (1990). Biochemistry of red cell invasion. Blood Cells *16*, 237-252; discussion 253-236.

Winardi, R., Discher, D., Kelley, C., Zon, L., Mays, K., Mohandas, N., and Conboy, J. G. (1995). Evolutionarily conserved alternative pre-mRNA splicing regulates structure and function of the spectrin-actin binding domain of erythroid protein 4.1. Blood *86*, 4315-4322.

Winograd, E., Prudhomme, J. G., and Sherman, I. W. (2005). Band 3 clustering promotes the exposure of neoantigens in *Plasmodium falciparum*-infected erythrocytes. Mol Biochem Parasitol *142*, 98-105.

Winograd, E., and Sherman, I. W. (2004). Malaria infection induces a conformational change in erythrocyte band 3 protein. Mol Biochem Parasitol *138*, 83-87.

Winter, G., Kawai, S., Haeggstrom, M., Kaneko, O., von Euler, A., Kawazu, S., Palm, D., Fernandez, V., and Wahlgren, M. (2005). SURFIN is a polymorphic antigen expressed on *Plasmodium falciparum* merozoites and infected erythrocytes. J Exp Med *201*, 1853-1863.

Workman, R. F., and Low, P. S. (1998). Biochemical analysis of potential sites for protein 4.1-mediated anchoring of the spectrin-actin skeleton to the erythrocyte membrane. J Biol Chem *273*, 6171-6176.