

REFERENCES

- Alfadhli, S., & Rathod, P. K. (2000). Gene organization of a Plasmodium falciparum serine hydroxymethyltransferase and its functional expression in Escherichia coli. *Mol Biochem Parasitol*, 110(2), 283-291.
- Amaratunga, M., Fluhr, K., Jarrett, J. T., Drennan, C. L., Ludwig, M. L., Matthews, R. G. (1996). A synthetic module for the metH gene permits facile mutagenesis of the cobalamin-binding region of Escherichia coli methionine synthase: initial characterization of seven mutant proteins. *Biochemistry*, 35(7), 2453-2463.
- Banerjee, R. V., Johnston, N. L., Sobeski, J. K., Datta, P., & Matthews, R. G. (1989). Cloning and sequence analysis of the Escherichia coli metH gene encoding cobalamin-dependent methionine synthase and isolation of a tryptic fragment containing the cobalamin-binding domain. *J Biol Chem*, 264(23), 13888-13895.
- Banks, E. C., Doughty, S. W., Toms, S. M., Wheelhouse, R. T., & Nicolaou, A. (2007). Inhibition of cobalamin-dependent methionine synthase by substituted benzo-fused heterocycles. *FEBS J*, 274(1), 287-299.
- Barnwell, J. W., & Wertheimer, S. P. (1989). Plasmodium vivax: merozoite antigens, the Duffy blood group, and erythrocyte invasion. *Prog Clin Biol Res*, 313, 1-11.

Belz, S., & Nau, H. (1998). Determination of folate patterns in mouse plasma, erythrocytes, and embryos by HPLC coupled with a microbiological assay. *Anal Biochem*, 265(1), 157-166.

Bracchi-Ricard, V., Nguyen, K. T., Zhou, Y., Rajagopalan, P. T., Chakrabarti, D., & Pei, D. (2001). Characterization of an eukaryotic peptide deformylase from *Plasmodium falciparum*. *Arch Biochem Biophys*, 396(2), 162-170.

Bukirwa, H., Garner, P., & Critchley, J. (2004). Chlorproguanil-dapsone for treating uncomplicated malaria. *Cochrane Database Syst Rev*(4), CD004387.

Bzik, D. J., Li, W. B., Horii, T., & Inselburg, J. (1987). Molecular cloning and sequence analysis of the *Plasmodium falciparum* dihydrofolate reductase-thymidylate synthase gene. *Proc Natl Acad Sci U S A*, 84(23), 8360-8364.

Chen, S. L., Blomberg, M. R., & Siegbahn, P. E. How is a co-methyl intermediate formed in the reaction of cobalamin-dependent methionine synthase? Theoretical evidence for a two-step methyl cation transfer mechanism. *J Phys Chem B*, 115(14), 4066-4077.

Chitnumsub, P., Yuvaniyama, J., Vanichtanankul, J., Kamchonwongpaisan, S., Walkinshaw, M. D., & Yuthavong, Y. (2004). Characterization, crystallization and preliminary X-ray analysis of bifunctional dihydrofolate reductase-thymidylate synthase from *Plasmodium falciparum*. *Acta Crystallogr D Biol Crystallogr*, 60(Pt 4), 780-783.

Datta, S., Koutmos, M., Patridge, K. A., Ludwig, M. L., & Matthews, R. G. (2008).

A disulfide-stabilized conformer of methionine synthase reveals an

- unexpected role for the histidine ligand of the cobalamin cofactor. *Proc Natl Acad Sci U S A*, 105(11), 4115-4120.
- Esposito, F., Lombardi, S., Modiano, D., Zavala, F., Reeme, J., Lamizana, L. (1988). Prevalence and levels of antibodies to the circumsporozoite protein of *Plasmodium falciparum* in an endemic area and their relationship to resistance against malaria infection. *Trans R Soc Trop Med Hyg*, 82(6), 827-832.
- Fidock, D. A., Rosenthal, P. J., Croft, S. L., Brun, R., & Nwaka, S. (2004). Antimalarial drug discovery: efficacy models for compound screening. *Nat Rev Drug Discov*, 3(6), 509-520.
- Fu, T. M., Almqvist, J., Liang, Y. H., Li, L., Huang, Y., & Su, X. D. Crystal structures of cobalamin-independent methionine synthase (MetE) from *Streptococcus mutans*: a dynamic zinc-inversion model. *J Mol Biol*, 412(4), 688-697.
- Gardner, M. J., Hall, N., Fung, E., White, O., Berriman, M., Hyman, R. W. (2002). Genome sequence of the human malaria parasite *Plasmodium falciparum*. *Nature*, 419(6906), 498-511.
- Gonzalez, J. C., Peariso, K., Penner-Hahn, J. E., & Matthews, R. G. (1996). Cobalamin-independent methionine synthase from *Escherichia coli*: a zinc metalloenzyme. *Biochemistry*, 35(38), 12228-12234.
- Gregson, A., & Plowe, C. V. (2005). Mechanisms of resistance of malaria parasites to antifolates. *Pharmacol Rev*, 57(1), 117-145.

- Griswold, D. P., Jr., Trader, M. W., Frei, E., 3rd, Peters, W. P., Wolpert, M. K., & Laster, W. R., Jr. (1987). Response of drug-sensitive and -resistant L1210 leukemias to high-dose chemotherapy. *Cancer Res*, 47(9), 2323-2327.
- Hall, S. J., Sims, P. F., & Hyde, J. E. (1991). Functional expression of the dihydrofolate reductase and thymidylate synthetase activities of the human malaria parasite *Plasmodium falciparum* in *Escherichia coli*. *Mol Biochem Parasitol*, 45(2), 317-330.
- Hultquist, M. E., Smith, J. M., Jr., & et al. (1949). Analogs of pteroylglutamic acid; 9-methylpteroyl-glutamic acid and derivatives. *J Am Chem Soc*, 71(2), 619-622.
- Jana, S., & Paliwal, J. (2007). Novel molecular targets for antimalarial chemotherapy. *Int J Antimicrob Agents*, 30(1), 4-10.
- Jarrett, J. T., Amaratunga, M., Drennan, C. L., Scholten, J. D., Sands, R. H., Ludwig, M. L. (1996). Mutations in the B12-binding region of methionine synthase: how the protein controls methylcobalamin reactivity. *Biochemistry*, 35(7), 2464-2475.
- Jensen, N. P., Ager, A. L., Bliss, R. A., Canfield, C. J., Kotecka, B. M., Rieckmann, K. H. (2001). Phenoxypropoxybiguanides, prodrugs of DHFR-inhibiting diaminotriazine antimalarials. *J Med Chem*, 44(23), 3925-3931.
- Kain, K. C. (2003). Current status and replies to frequently posed questions on atovaquone plus proguanil (Malarone) for the prevention of malaria. *BioDrugs*, 17 Suppl 1, 23-28.
- Kamchonwongpaisan, S., Quarrell, R., Charoensetakul, N., Ponsinet, R., Vilaivan, T., Vanichtanankul, J. (2004). Inhibitors of multiple mutants of *Plasmodium*

- falciparum dihydrofolate reductase and their antimalarial activities. *J Med Chem*, 47(3), 673-680.
- Kenyon, S. H., Nicolaou, A., Ast, T., & Gibbons, W. A. (1996). Stimulation in vitro of vitamin B12-dependent methionine synthase by polyamines. *Biochem J*, 316 (Pt 2), 661-665.
- Killick-Kendrick, R. (1978). Recent advances and outstanding problems in the biology of phlebotomine sandflies. A review. *Acta Trop*, 35(4), 297-313.
- Kolhouse, J. F., Utley, C., Stabler, S. P., & Allen, R. H. (1991). Mechanism of conversion of human apo- to holomethionine synthase by various forms of cobalamin. *J Biol Chem*, 266(34), 23010-23015.
- Krungskrai, J., Webster, H. K., & Yuthavong, Y. (1989a). Characterization of cobalamin-dependent methionine synthase purified from the human malarial parasite, *Plasmodium falciparum*. *Parasitol Res*, 75(7), 512-517.
- Krungskrai, J., Webster, H. K., & Yuthavong, Y. (1989b). De novo and salvage biosynthesis of pteroylpentaglutamates in the human malaria parasite, *Plasmodium falciparum*. *Mol Biochem Parasitol*, 32(1), 25-37.
- Kublin, J. G., Dzinjalama, F. K., Kamwendo, D. D., Malkin, E. M., Cortese, J. F., Martino, L. M. (2002). Molecular markers for failure of sulfadoxine-pyrimethamine and chlorproguanil-dapsone treatment of *Plasmodium falciparum* malaria. *J Infect Dis*, 185(3), 380-388.
- Lau, H., Ferlan, J. T., Brophy, V. H., Rosowsky, A., & Sibley, C. H. (2001). Efficacies of lipophilic inhibitors of dihydrofolate reductase against parasitic protozoa. *Antimicrob Agents Chemother*, 45(1), 187-195.

- Leclerc, D., Campeau, E., Goyette, P., Adjalla, C. E., Christensen, B., Ross, M. (1996). Human methionine synthase: cDNA cloning and identification of mutations in patients of the cblG complementation group of folate/cobalamin disorders. *Hum Mol Genet*, 5(12), 1867-1874.
- Lee, C. S., Salcedo, E., Wang, Q., Wang, P., Sims, P. F., & Hyde, J. E. (2001). Characterization of three genes encoding enzymes of the folate biosynthetic pathway in *Plasmodium falciparum*. *Parasitology*, 122 Pt 1, 1-13.
- Ma, J., Stampfer, M. J., Christensen, B., Giovannucci, E., Hunter, D. J., Chen, J. (1999). A polymorphism of the methionine synthase gene: association with plasma folate, vitamin B12, homocyst(e)ine, and colorectal cancer risk. *Cancer Epidemiol Biomarkers Prev*, 8(9), 825-829.
- Marsh, K. (1998). Malaria disaster in Africa. *Lancet*, 352(9132), 924.
- Matthews, R. G., Sheppard, C., & Goulding, C. (1998). Methylenetetrahydrofolate reductase and methionine synthase: biochemistry and molecular biology. *Eur J Pediatr*, 157 Suppl 2, S54-59.
- Moscatelli, A., Scali, M., Prescianotto-Baschong, C., Ferro, M., Garin, J., Vignani, R. (2005). A methionine synthase homolog is associated with secretory vesicles in tobacco pollen tubes. *Planta*, 221(6), 776-789.
- Nirmalan, N., Sims, P. F., & Hyde, J. E. (2004). Translational up-regulation of antifolate drug targets in the human malaria parasite *Plasmodium falciparum* upon challenge with inhibitors. *Mol Biochem Parasitol*, 136(1), 63-70.
- Nzila, A. M., Nduati, E., Mberu, E. K., Hopkins Sibley, C., Monks, S. A., Winstanley, P. A. (2000). Molecular evidence of greater selective pressure for drug

resistance exerted by the long-acting antifolate Pyrimethamine/Sulfadoxine compared with the shorter-acting chlorproguanil/dapsone on Kenyan *Plasmodium falciparum*. *J Infect Dis*, 181(6), 2023-2028.

Nzila, A., Ward, S. A., Marsh, K., Sims, P. F., & Hyde, J. E. (2005a). Comparative folate metabolism in humans and malaria parasites (part I): pointers for malaria treatment from cancer chemotherapy. *Trends Parasitol*, 21(6), 292-298.

Nzila, A., Ward, S. A., Marsh, K., Sims, P. F., & Hyde, J. E. (2005b). Comparative folate metabolism in humans and malaria parasites (part II): activities as yet untargeted or specific to *Plasmodium*. *Trends Parasitol*, 21(7), 334-339.

Ommeh, S., Nduati, E., Mberu, E., Kokwaro, G., Marsh, K., Rosowsky, A. (2004). In vitro activities of 2,4-diaminoquinazoline and 2,4-diaminopteridine derivatives against *Plasmodium falciparum*. *Antimicrob Agents Chemother*, 48(10), 3711-3714.

Parry, J. (2005). WHO combats counterfeit malaria drugs in Asia. *BMJ*, 330(7499), 1044.

Pied, S., Tabone, M. D., Chatellier, G., Marussig, M., Jardel, C., Nosten, F. (1995). Non specific resistance against malaria pre-erythrocytic stages: involvement of acute phase proteins. *Parasite*, 2(3), 263-268.

Pradhan, P. (2009). Malarial anaemia and nitric oxide induced megaloblastic anaemia: a review on the causes of malarial anaemia. *J Vector Borne Dis*, 46(2), 100-108.

Prasannan, P., Suliman, H. S., & Robertus, J. D. (2009). Kinetic analysis of site-directed mutants of methionine synthase from *Candida albicans*. *Biochem Biophys Res Commun*, 382(4), 730-734.

Riley, E. M., Allen, S. J., Wheeler, J. G., Blackman, M. J., Bennett, S., Takacs, B. (1992). Naturally acquired cellular and humoral immune responses to the major merozoite surface antigen (PfMSP1) of *Plasmodium falciparum* are associated with reduced malaria morbidity. *Parasite Immunol*, 14(3), 321-337.

Ruwende, C., Khoo, S. C., Snow, R. W., Yates, S. N., Kwiatkowski, D., Gupta, S. (1995). Natural selection of hemi- and heterozygotes for G6PD deficiency in Africa by resistance to severe malaria. *Nature*, 376(6537), 246-249.

Salcedo, E., Cortese, J. F., Plowe, C. V., Sims, P. F., & Hyde, J. E. (2001). A bifunctional dihydrofolate synthetase--folylpolyglutamate synthetase in *Plasmodium falciparum* identified by functional complementation in yeast and bacteria. *Mol Biochem Parasitol*, 112(2), 239-252.

Sibley, C. H., Hyde, J. E., Sims, P. F., Plowe, C. V., Kublin, J. G., Mberu, E. K. (2001). Pyrimethamine-sulfadoxine resistance in *Plasmodium falciparum*: what next? *Trends Parasitol*, 17(12), 582-588.

Sirawaraporn, W., Sathitkul, T., Sirawaraporn, R., Yuthavong, Y., & Santi, D. V. (1997). Antifolate-resistant mutants of *Plasmodium falciparum* dihydrofolate reductase. *Proc Natl Acad Sci U S A*, 94(4), 1124-1129.

Sirichaiwat, C., Intaraudom, C., Kamchonwongpaisan, S., Vanichtanankul, J., Thebtaranonth, Y., & Yuthavong, Y. (2004). Target guided synthesis of 5-benzyl-2,4-diamonopyrimidines: their antimalarial activities and binding

- affinities to wild type and mutant dihydrofolate reductases from *Plasmodium falciparum*. *J Med Chem*, 47(2), 345-354.
- Stover, P., & Schirch, V. (1993). The metabolic role of leucovorin. *Trends Biochem Sci*, 18(3), 102-106.
- Tanioka, Y., Miyamoto, E., Yabuta, Y., Ohnishi, K., Fujita, T., Yamaji, R. Methyladeninylcobamide functions as the cofactor of methionine synthase in a Cyanobacterium, *Spirulina platensis* NIES-39. *FEBS Lett*, 584(14), 3223-3226.
- Udomsangpetch, R., Wahlin, B., Carlson, J., Berzins, K., Torii, M., Aikawa, M. (1989). *Plasmodium falciparum*-infected erythrocytes form spontaneous erythrocyte rosettes. *J Exp Med*, 169(5), 1835-1840.
- Vervenne, R. A., Dirks, R. W., Ramesar, J., Waters, A. P., & Janse, C. J. (1994). Differential expression in blood stages of the gene coding for the 21-kilodalton surface protein of ookinetes of *Plasmodium berghei* as detected by RNA in situ hybridisation. *Mol Biochem Parasitol*, 68(2), 259-266.
- Waly, M. I., Kharbanda, K. K., & Deth, R. C. Ethanol lowers glutathione in rat liver and brain and inhibits methionine synthase in a cobalamin-dependent manner. *Alcohol Clin Exp Res*, 35(2), 277-283.
- Watkins, D., & Rosenblatt, D. S. (1989). Functional methionine synthase deficiency (cblE and cblG): clinical and biochemical heterogeneity. *Am J Med Genet*, 34(3), 427-434.
- White, N. J. (2004). Antimalarial drug resistance. *J Clin Invest*, 113(8), 1084-1092.
- Wirth, D. F. (2002). Biological revelations. *Nature*, 419(6906), 495-496.

- Zhang, K., & Rathod, P. K. (2002). Divergent regulation of dihydrofolate reductase between malaria parasite and human host. *Science*, 296(5567), 545-547.
- Banerjee, R. V., Johnston, N. L., Sobeski, J. K., Datta, P., & Matthews, R. G. (1989). Cloning and sequence analysis of the *Escherichia coli* metH gene encoding cobalamin-dependent methionine synthase and isolation of a tryptic fragment containing the cobalamin-binding domain. *J Biol Chem*, 264(23), 13888-13895.
- Brinkmann, U., Mattes, R. E., & Buckel, P. (1989). High-level expression of recombinant genes in *Escherichia coli* is dependent on the availability of the dnaY gene product. *Gene*, 85(1), 109-114.
- Huang, J., Villemain, J., Padilla, R., & Sousa, R. (1999). Mechanisms by which T7 lysozyme specifically regulates T7 RNA polymerase during different phases of transcription. *J Mol Biol*, 293(3), 457-475.
- Inouye, M., Arnheim, N., & Sternglanz, R. (1973). Bacteriophage T7 lysozyme is an N-acetylmuramyl-L-alanine amidase. *J Biol Chem*, 248(20), 7247-7252.
- Jiang, L., Zhang, B., Wang, G., Wang, K., & Xiao, X. (2009). Expression, purification and characterization of rat zinc finger protein Mipu1 in *Escherichia coli*. *Mol Cell Biochem*, 328(1-2), 137-144.
- Kurland, C., & Gallant, J. (1996). Errors of heterologous protein expression. *Curr Opin Biotechnol*, 7(5), 489-493.
- Moffatt, B. A., & Studier, F. W. (1987). T7 lysozyme inhibits transcription by T7 RNA polymerase. *Cell*, 49(2), 221-227.

Studier, F. W. (1991). Use of bacteriophage T7 lysozyme to improve an inducible T7 expression system. *J Mol Biol*, 219(1), 37-44.

Zhang, S., Burkett, T. J., Yamashita, I., & Garfinkel, D. J. (1997). Genetic redundancy between SPT23 and MGA2: regulators of Ty-induced mutations and Ty1 transcription in *Saccharomyces cerevisiae*. *Mol Cell Biol*, 17(8), 4718-4729.

Zhang, X., & Studier, F. W. (1997). Mechanism of inhibition of bacteriophage T7 RNA polymerase by T7 lysozyme. *J Mol Biol*, 269(1), 10-27.