deficit on diabetic control from a GP perspective can be found in *Natural Approaches to Diabetes*.[13]

Despite the evidence of widespread nutrient deficiency among individuals with diabetes,[14] and the knowledge that several nutrients are implicated in glycaemic control, no multinutrient intervention studies for diabetic control have been undertaken. Only one multinutrient supplement study on diabetic subjects has been reported and this showed a reduced rate of infection.[15] That the intervention in this study enhanced diabetic patient outcome may hopefully inspire others to undertake multinutrient intervention studies aimed at investigating effects on glycaemic and lipaemic control in diabetes.

The less that people eat as a consequence of a sedentary lifestyle, the more inadequate nutrient intake becomes and the greater the risk of deficiency. Furthermore, if the diet is low in fruit and vegetables, wholegrains, oily fish, and/or dairy products, intakes of some nutrients are bound to be lower than target values, posing a challenge to health. This is especially so among individuals with high nutrient requirements, such as those with diabetes. Although still considered to be controversial by some, taking a daily multinutrient supplement would bridge the gap between intake and requirements and ensure that nutrient target intakes are met.

Ann F Walker
Senior Lecturer in Human Nutrition, University of Reading

REFERENCES

1. Department of Health, NDNS (National Diet and Nutrition Survey). *People aged 65 years and over. Young people aged 4 to 18 years. Adults aged 19 to 64 years.* London: The Stationery Office, 1998, 2000, 2003.
2. Department of Health. *Dietary reference values for food energy and nutrients for the UK. Report on Health and Social Subjects No 41*. London: Stationery Office, 1991.
3. Jackson MJ, Broome CS, McArdle F. Marginal dietary selenium intakes in the UK: are there functional consequences? *J Nutr* 2003; **133(5 Suppl 1):** 1557S–1559S.
4. NFS data: National Food Survey. http://statistics.defra.gov.uk/esg/publications/nfs/datasets/nutshist.xls (accessed 29 Nov 2006).
5. Willett WC, Skerrett PJ. *Eat, drink and be healthy: the Harvard Medical School guide to healthy eating.* London: Simon & Schuster, 2004.
6. Fairfield KM, Fletcher RH. Vitamins for chronic disease prevention in adults: scientific review. *JAMA* 2002; **288(14):** 1720.
7. Tosiello L. Hypomagnesemia and diabetes mellitus: a review of clinical implications. *Arch Intern Med* 1996; **156(11):** 1143–1148.
8. Rodriguez-Moran M, Guerrero-Romero F. Oral magnesium supplementation improves insulin sensitivity and metabolic control in type 2 diabetic subjects: a randomised double-blind controlled trial. *Diabetes Care* 2003; **26(4):** 1147–1152.
9. Schmidt LE, Arfken CL, Heins JM. Evaluation of nutrient intake in subjects with non-insulin-dependent diabetes mellitus. *J Am Diet Assoc* 1994; **94(7):** 773–774.
10. Anderson RA, Cheng N, Bryden NA, *et al*. Elevated intakes of supplemental chromium improve glucose and insulin variables in individuals with type 2 diabetes. *Diabetes* 1997; **46(11):** 1786–1791.
11. Adams JF, Clark JS, Ireland JT, *et al*. Malabsorption of vitamin B12 and intrinsic factor secretion during biguanide therapy. *Diabetologia* 1983; **24(1):** 16–18.
12. Walker AF, Marakis G, Simpson E, *et al*. Hypotensive effects of hawthorn for patients with diabetes taking prescription drugs: a randomised controlled trial. *Br J Gen Pract* 2006; **56(527):** 437–443.
13. Brewer S. *Natural approaches to diabetes*. London: Piatkus Books, 2005.
14. Matteucci E, Passerai S, Mariotti M, *et al*. Dietary habits and nutritional biomarkers in Italian type 1 diabetes families: evidence of unhealthy diet and combined vitamin-deficient intakes. *Eur J Clin Nutr* 2005; **59(1):** 114–122.
15. Barringer TA, Kirk JK, Santaniello AC, *et al*. Effect of a multivitamin and mineral supplement on infection and quality of life. A randomised, double-blind, placebo-controlled trial. *Ann Intern Med* 2003; **138(5):** 365–371.

ADDRESS FOR CORRESPONDENCE

Ann F Walker
Senior Lecturer in Human Nutrition, Hugh Sinclair Unit of Human Nutrition, School of Chemistry, Food Biosciences and Pharmacy. University of Reading, PO Box 226, Reading, RG6 2AP.
E-mail: a.f.walker@reading.ac.uk

Malaria in the UK: new prevention guidelines for UK travellers

Malaria is a major disease worldwide, with around 300 million cases and 1 million deaths annually.[1] The transmission of malaria is diminishing in some countries, such as the Indian subcontinent, probably due to a combination of better living conditions, education, urbanisation, and better water management which reduce the numbers of mosquito vectors. In Africa, transmission remains at a high level. The effectiveness of drugs locally-used for treatment, such as pyrimethamine plus sulphadoxine (Fansidar® [Roche]) is now so significantly reduced that the UK guidelines no longer recommend this drug for emergency standby treatment.[2] Artemisinin drugs are widely used for treatment in Africa but have not been investigated for use as prophylactic drugs. Only one artemisinin combination drug (co-artemether; Riamet® [Novartis]) is licensed in European countries, but is not for prophylactic use. A small proportion of *Plasmodium vivax* parasites in Indonesia, and occasionally in East Africa, have shown evidence of resistance to chloroquine.[3] This is rare, and does not alter the recommendations for prophylaxis in the guidelines.

Malaria is the most common tropical infection imported into the UK, with around 1500 to 2000 notified cases each year.[2] However, informal surveys conducted by the Malaria Reference Laboratory and by Infectious and Tropical Diseases Centres suggest that notified cases represent only about half of all diagnosed cases. Between nine and 15 deaths from malaria occur each year, but the numbers recovering from severe or life-threatening malaria are unknown.

While a minority of cases occur in visitors from overseas, almost 60% of reported

cases are travellers who departed from and returned to the UK. Nearly all of these cases could be prevented by a combination of mosquito avoidance measures and chemoprophylaxis. Thus, approximately 1800–2400 cases of preventable malarial disease occur in UK residents each year. This is an important burden of disease with a rate comparable to, for instance, meningococcal disease of which there were between 1500–2000 cases annually in England and Wales over the last 5 years.[4]

Of the four human-infecting species of *Plasmodium* (*P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*), *P. falciparum* can cause very high levels of red blood cell parasitisation, leading to complicated malaria with vascular damage and multi-organ failure. The other species cause unpleasant, acute feverish illness but are rarely fatal except in very frail individuals. The proportion of malaria caused by *P. falciparum* has increased each year. In the UK this now accounts for well over 70% of all reported cases.[2]

The overall case-fatality rate for falciparum malaria is low, but severe malaria involves a hospital stay of 5–7 days. Cases suffering one or more organ failures, such as renal failure, acute respiratory distress syndrome, or cerebral malaria, often require prolonged intensive support and have an average mortality of 10–15%.[5,6] Experience in infectious diseases units suggests that for every death there are three to five intensive care admissions.

Travel from the UK to malaria endemic areas continues to increase.[7] The largest volume of tropical travel is for holidays, but travel to visit family and friends is also common, and business travel is also increasing. The groups most affected by malaria are those who travel from the UK to malaria-endemic areas to visit friends and relatives, accounting for nearly 80% of UK malaria cases in 2005 whose reason for travel is known. This group includes large numbers of children aged under 15 years who are over-represented among malaria sufferers compared with the proportion of children who travel. In 2005, two of the 11 documented malaria deaths were in children who visited relatives overseas (Malaria Reference Laboratory, personal communication, 2006). Therefore, it is particularly important to provide information and advice on malaria prevention for this traveller group.

A number of countries, and the World Health Organisation, provide information on the risks and prevention of malaria in travellers.[8,9]

The Advisory Committee on Malaria Prevention in UK travellers (ACMP) collates its advice specifically for UK travellers. It does this by considering the latest information on the distribution and transmission of malaria parasites, the evolving patterns of drug resistance, the efficacy and side effects of available drugs, and the details of malaria infections presenting in UK travellers. Patterns of travel among UK residents are not identical to those of residents in other countries; nor are the tropical areas of origin of families whose earlier generations immigrated to the UK. Therefore, there are minor differences between UK guidelines and those of other authorities. For instance, chloroquine plus proguanil is recommended as prophylaxis for UK travellers to malaria-risk areas of Pakistan,[2] while other guidelines recommend mefloquine.[9]

The latest UK guidelines on the prevention of malaria in UK travellers are produced by the Health Protection Agency's (HPA's) ACMP.[3] This committee comprises: tropical medicine experts who manage malaria in adults and children; HPA malaria reference experts and academic parasitologists researching malaria epidemiology and drug susceptibilities; general practice and travel advice experts; clinical pharmacologists; and an expert scientific secretary. For the first time the guidelines are presented in an updated format: web pages have country and region maps, and an easy-open, ring-bound booklet has been developed for use during consultations.

The UK guidelines for 2006–2007 update the previous guidelines of 2003. Between major revisions, updates and information about malaria prophylaxis issues are posted on the guidelines website. These new guidelines contain some major revisions due to the continuing worldwide changes in malaria transmission and drug susceptibilities.

Many travellers to Northern and Southern India now have a lower malaria risk than in previous years, allowing use of mosquito avoidance only without prophylactic drugs; travel to central areas of India still requires chemoprophylaxis. The risk in much of Bangladesh is also low enough for mosquito avoidance only (except the Chittagong Hill Tracts, where prophylaxis against chloroquine-resistant *P. falciparum* is recommended). Risks are similarly reduced for most of Sri Lanka (except for northern areas). Chloroquine plus proguanil remains suitable for most of the areas where prophylaxis is recommended.

By contrast, transmission of chloroquine-resistant falciparum malaria remains intense in west and east African countries, and the UK guidelines no longer recommend first-line use of chloroquine plus proguanil prophylaxis in any African country. The recommended prophylactic medicines for Africa are mefloquine, or atovaquone plus proguanil (Malarone® [GSK]) or doxycycline. These are regarded as approximately equally efficacious, and the choice will depend on travellers' circumstances and preferences. Doxycycline and Malarone® dosing only need to be started 2 days before departure, providing optimum protection rapidly. Malarone® is unique in that it inhibits the initial stages of parasite multiplication in the liver, and so need not be taken for longer than 1 week after leaving the endemic area; this can be useful for travellers who make repeated short trips. Newer artemisinin-containing antimalarial drugs are used only for treatment. Fears that their usefulness may be reduced by the development of resistance if they are widely used in low doses has led to strong guidance to reserve them for treatment, preferably in combination therapy.[10]

As there is increasing travel by special groups, such as immunosuppressed or older travellers, and a large increase in long-haul cruise holidays, the guidelines provide advice tailored to these groups. Information for special groups is included on popular holiday destinations and on frequently-asked questions sections.

The key elements of malaria prevention are based on the longstanding A, B, C, D system: awareness of the risk (particularly important for those visiting friends and relatives, who often wrongly assume that their tropical origins protect them from

malaria); bite prevention; chemoprophylaxis; and diagnosis and treatment without delay if malaria is suspected. Providers of primary care must consider malaria in any feverish or acutely ill returned traveller and must immediately arrange diagnostic tests or refer the patient for assessment. Test results should be available on the same day, and positive results must be acted on as a matter of urgency, as delayed treatment can lead to fatal deterioration,[11] especially in children.

Also important is adverse events reporting, including failure of properly-used chemoprophylaxis, to build up a good-quality database. Mild adverse events, particularly gastrointestinal effects, are the most commonly-recognised; also doxycycline use can be complicated by vaginal candidiasis. Proguanil and doxycycline can both cause dyspepsia or mild oesophagitis, which is less likely if the tablets are taken with a drink of water, well before lying down in the evening. Fears of widespread severe neuropsychiatric complications from mefloquine have not been realised; they seem to be only slightly more likely than after chloroquine. However, the drug is contra-indicated in individuals with a personal history of epilepsy (as is chloroquine) or depression. It may also cause malaise or agitation (women seem to be more susceptible). Doctors, nurses, pharmacists, and the public may all report directly by using the 'Yellow Card' system. This is available through pharmacies, in the *British National Formulary* (*BNF*) at www.BNF.org, and on the Medicines and Healthcare products Regulatory Agency (MHRA) 'Yellow Card' website, www.yellowcard.com.

The aim of clear guidelines is to encourage the use of malaria prevention measures by all travellers at risk of infection. Up to now, malaria reports in the UK are not significantly increasing despite increased travel. However, the aim of the ACMP is to see malaria reports decline. The availability of good travel advice in primary care and in travel clinics is essential if this is to be achieved.

Comments on the guidelines are welcome and can be made to the secretary of the ACMP at EASO, HPA Centre for Infections, 61 Colindale Avenue, London NW9 5EQ, or via 'contact us' on the ACMP pages of the HPA website www.hpa.org.uk.

Barbara Bannister
Consultant in Infectious Diseases and Chairman of the Health Protection Agency's Advisory Committee on Malaria Prevention in UK Travellers (ACMP), Royal Free Hospital, London

REFERENCES

1. Global Health Reporting. Malaria overview: http://www.globalhealthreporting.org/malaria.asp (accessed 1 Dec 2006).
2. Health Protection Agency. Malaria guidelines. http://www.hpa.org.uk/infections/topics_az/malaria/guidelines.htm (accessed 1 Dec 2006).
3. Vinetz JM. Emerging chloroquine-resistant *Plasmodium vivax* (Benign Tertian) malaria: the need for alternative drug treatment. *Clin Infect Dis* 2006; **42(8):** 1073–1074.
4. Health Protection Agency. Meningococcal reference unit: laboratory confirmed *Neisseria Meningitides*; England and Wales 1989/90 to 2004/5 www.hpa.org.uk/infections/topics_az/meningo/data_meni_t03.htm (accessed 1 Dec 2006).
5. Leder K, Black J, O'Brien D, *et al*. Malaria in travellers: a review of the GeoSentinel surveillance network. *Clin Infect Dis* 2004; **39:** 1104–1112.
6. Mishra SK, Mohanty S, Mohanty A, Das BS. Management of severe and complicated malaria. *J Postgrad Med* 2006; **4:** 281–287.
7. Office for National Statistics (ONS). *Travel trends: a report on the 2005 International Passenger Survey*. Basingstoke: Palgrave Macmillan, 2006.
8. World Health Organization. International Travel and Health 2005. www.who.int/ith/en/ (accessed 1 Dec 2006).
9. Health Information for International Travel 2005–2006. Department of Health and Human Services Centers for Disease Control and Prevention. Elsevier, 2006. www.cdc.gov/travel/yb/
10. Rehwagen C. WHO ultimatum on artemisinin monotherapy is showing results. *BMJ* 2006; **332(7551)**: 1176.
11. Viani RM, Bromberg K. Pediatric imported malaria in New York: delayed diagnosis. *Clin Pediatr* 1999; **38**: 333–336.

ADDRESS FOR CORRESPONDENCE

Barbara Bannister
Royal Free Hospital, Department of Infectious and Tropical Diseases, Infection Services, Royal Free Hospital, London, NW3 2QG
E-mail: Barbara.Bannister@royalfree.nhs.uk