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Hepatitis and Malaria Update

CONFERENCE COVERAGE

By Mary-Louise Scully, MD

Recent Advances in Travel Medicine: New Products for the Prevention of Hepatitis A and B and Malaria in Travelers

THIS SYMPOSIUM WAS HELD IN CONJUNCTION WITH THE RECENT AMERICAN Society of Tropical Medicine and Hygiene (ASTMH) Annual Meeting in Atlanta, Ga. The first segment of the program covered several new and important developments on the topic of hepatitis in travelers, and the remainder of the evening provided an update on malaria prevention.

Alan Spira reviewed the clinical aspects and risk factors for acquisition of hepatitis A (HAV) and hepatitis B (HBV) infection. Physicians' advice to travelers should always include food and water precautions for prevention of HAV and avoidance of blood and bodily fluid contact for HBV. However, unexpected exposures from events such as accidents, illnesses requiring medical care, and unprotected sex can occur during travel. Therefore, in addition to exposure prevention, all at-risk travelers should be vaccinated.

Jay Keystone discussed the currently available monovalent hepatitis A and B vaccines and the combination hepatitis A and B vaccine, Twinrix, which has recently been approved. A 1-mL unit dose contains 720 ELISA units of inactivated HAV and 20 µg of recombinant HBsAg protein. It is recommended for all susceptible persons 18 years or older who are at risk of exposure to HAV or HBV. The dosing schedule is 0, 1, and 6 months. Results of controlled studies demonstrate similar immunogenicity profiles for the combination vaccine and monovalent vaccines: the combination and monovalent vaccines each induced seroconversion to HAV in 99% of subjects, while for HBsAg, the seroconversion rates were 95% and 92%, respectively. The combination and monovalent vaccines had similar safety profiles, the most common adverse events being soreness at the injection site, headache, and fatigue.

As many as 40% of travelers first seek travel advice within only a few weeks of departure. In order to ensure such travelers still receive effective vaccinations, a number of accelerated schedules for HBV are in use, although not all are approved by the FDA. One such dosing schedule is 0, 7, 21 days, and 12 months. Using this schedule for combination hepatitis A and B vaccine provided greater than 80% seroprotection for HBV and 100% for HAV 1 week after the third dose.¹ In addition, an open, randomized, multicenter study of 244 adults in Germany examined

the effect of interchanging between monovalent and combination vaccine formulations during the course of an immunization series and found that this approach did not alter seroconversion rates.² Therefore, patients who begin immunization with monovalent hepatitis A and B vaccines can complete the series with combination hepatitis A and B vaccine without any compromise in effectiveness.

The use of the combination vaccine will save time for doctors and their staff, reduce administration costs, and allow more efficient use of vaccine storage space. The traveler will benefit by receiving fewer total injections (3 vs 5). This has practical implications for the patient who needs multiple vaccinations for their trip.

Following the presentations, there was a panel discussion moderated by Elaine Jong, during which several issues were raised. One concerned the best approach to the patient whose HBV schedule is unintentionally interrupted. In this situation, the vaccine series should just be continued. *There is no need to restart the series.* The difficult issue of what to do with HBV nonresponders was also discussed. Some physicians have had success using an accelerated schedule of 0, 7, 21 *intradermal* HBV, or using twice the normal dose (ie, 40 µg) at a single administration. Panelists stressed the important point that the hepatitis A titer (IgG) should be used only for detecting whether a patient has natural immunity to HAV and *should not* be ordered to check for seroconversion after the combination or monovalent HAVs.

The topic of discussion then shifted to malaria. Kevin Kain discussed new strategies for malaria prevention. Malaria remains a significant problem with 1227 US cases reported in 1998, the most recent year for which figures are available. The predominant species was *Plasmodium falciparum* (*Pf*) with 525 cases (42.8%). The majority of these *Pf* cases were acquired in Africa—the highest proportion from countries in West Africa.³

Many cases of imported malaria are in individuals who return to their country of origin after long absences to visit friends and relatives (VFRs). One prospective study of VFRs leaving Canada to travel to India showed that only 54% had sought advice before traveling (more than 70% from a family doctor), only 31% intended to use any antimalarial chemoprophylaxis, and only 7% had been prescribed a recommended drug regimen. More alarming is the fact that less than 10% were planning to use any personal measures to prevent mosquito bites.⁴

The currently recommended drugs for chloroquine-resistant *Pf* malaria (CR*Pf*) prophylaxis include mefloquine (MFQ), doxycycline (Doxy), chloroquine/proguanil (CP) or atovaquone/proguanil (AP). AP is now marketed as a fixed dose combination with the trade name Malarone. Each AP tablet contains 250 mg of atovaquone and 100 mg of proguanil. The

pediatric tablet contains 62.5 mg atovaquone and 25 mg of proguanil. Atovaquone is a selective inhibitor of parasite mitochondrial electron transport. Proguanil's metabolite, cycloguanil, is a dihydrofolate reductase inhibitor. Together the drugs demonstrate antimalarial synergy. AP is now approved for prophylaxis of *Pf* malaria including CR*Pf*. Prophylactic treatment with AP should be started 1 or 2 days before travel to an endemic area, continued daily during the stay, and for 7 days after return. The dose should be taken at the same time each day with food or a milky drink to minimize the gastrointestinal side effects.

Three placebo-controlled studies of AP prophylaxis for *Pf* malaria done in Gabon, Kenya, and Zambia showed a protective efficacy of 98%.⁵⁻⁷ More studies are ongoing in nonimmune persons. To date, one study comparing AP to CP and another comparing AP to MFQ suggests that AP was better tolerated than MFQ and CP, and that AP may be more effective in preventing *Pf* malaria than CP.^{8,9}

No operational resistance to AP has yet been documented. AP does have causal prophylactic activity for *Pf* but not for *Plasmodium vivax* (*Pv*). Therefore, if a traveler is going to be heavily exposed to *Pv*, Dr. Kain emphasized that a terminal course of primaquine prophylaxis should be given.

Studies using AP in pregnancy are ongoing in Thailand and Zambia, with no treatment failures to date in 26 subjects. AP is secreted in breast milk, but it is unlikely that infants exposed passively to AP during breastfeeding achieve adequate levels to provide protection. Therefore, the infant of a breastfeeding mother who is receiving AP should also be prescribed malaria prophylaxis. However, at this time, the safety and effectiveness of AP for treatment or prophylaxis of malaria in pediatric patients who weigh less than 11 kg has not been established.

No dosage adjustments are needed for the elderly or patients with mild-to-moderate renal or hepatic impairment. However, AP is contraindicated in patients with severe renal failure (CrCl less than 30 mL/min).

AP scores well in terms of efficacy, tolerability, and convenience. It has the added benefit of causal activity for *Pf*. However, it is relatively expensive. More data are needed on the long-term safety and tolerability of AP.

AP can be added to the recommended drug choices for malaria prophylaxis. The availability of more drug options for prophylaxis will hopefully improve patient compliance and result in a decrease in the number of cases and fatalities associated with imported malaria. ❖

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Meningococcal Disease in Pilgrims

DISEASE UPDATE

Synopsis: Since the outbreak of *Neisseria meningitidis* infections that occurred in Hajj pilgrims in 1987, Saudi Arabia has required pilgrims to be vaccinated with the bivalent meningococcal A/C vaccine. In recent years, outbreaks of meningococcal disease associated with pilgrims to the Hajj have shifted from serogroup A to W135. Saudi Arabia has changed the policy for the 2002 Hajj season to require that all pilgrims be vaccinated with the quadrivalent meningococcal vaccine.

Source: Memish ZA. Meningococcal disease and travel. *Clin Infect Dis*. 2002;34:84-90.

ALARGE AND SERIOUS OUTBREAK OF SEROGROUP A meningococcal disease associated with the Hajj

occurred in 1987. The outbreak led to a requirement that pilgrims traveling to Saudi Arabia be vaccinated with the meningococcal vaccine. Following the institution of this requirement, small outbreaks of meningococcal diseases still occurred in Mecca and Jidda, mainly in unvaccinated persons. Following the Hajj in 2000, an outbreak involving predominantly W135 was identified. It affected at least 330 pilgrims and their *contacts* in numerous countries.¹ (See prior review in *TMA Update* July/August 2000;10(4):29-30.) In 2001, more than 150 cases of meningococcal disease were identified in the period following the Hajj, with greater than 50% attributed to serogroup W135.²

As a result of the shift to serogroup W135 predominance, the Ministry of Health of Saudi Arabia is instituting a change of policy for the Hajj in 2002. All local population at risk will be vaccinated with the quadrivalent vaccine. Moreover, all pilgrims must be vaccinated with the quadrivalent meningococcal vaccines. The vaccine needs to be administered at least 10 days before and not greater than 3 years prior to arrival in Saudi Arabia. Children 3 months to 2 years old should receive 2 doses of the vaccine separated by a 3-month interval.³

The transmission of meningococcal disease to contacts by vaccinated pilgrims demonstrates the failure of the polysaccharide vaccine to eliminate *N meningitidis* carriage in vaccinees. Furthermore, while the serogroup A and C polysaccharide vaccines have a clinical efficacy of 85-100% in older children and adults, the serogroup C polysaccharide is ineffective in children younger than 2 years of age.⁴ The efficacy of serogroup Y and W135 polysaccharides is less clear. Newer vaccines such as the meningococcal conjugate vaccines hold promise for improved protection and should become available within the next few years.

To assess pharyngeal colonization in pilgrims after returning from Saudi Arabia, the Centers for Disease Control and Prevention (CDC) performed a study in 2001. The carriage of W135 was found to be similar between pilgrims and nonpilgrims.⁵ Therefore, the CDC does not recommend prophylactic antibiotics for returning pilgrims.

On the other hand, prophylactic medication after close-case contact (household, day care center, exposure to patients' oral secretions) should be given within the first 24 hours of exposure. For adults, the recommended antibiotic is one oral dose of ciprofloxacin 500 mg or ofloxacin 400 mg or azithromycin 500 mg. For post-exposure prophylaxis in children, rifampin can be given at 5 mg/kg every 12 hours for 2 days in those younger than 1 month old, and 10 mg/kg every 12 hours for 2 days in those older than 1 month old. In children younger

than 15 years of age, a single dose of ceftriaxone 125 mg IM is an alternative prophylaxis.

There is one meningococcal vaccine available in the United States, and that is the quadrivalent vaccine containing polysaccharide to serogroups A, C, Y, and W135 (Menomune). A serogroup A/C polysaccharide vaccine has been used outside of the United States, and a conjugate serogroup C vaccine has been available in the United Kingdom. Because of the change requiring the quadrivalent vaccine for pilgrims to Saudi Arabia, the immunization records of travelers should clearly reflect the administration of the quadrivalent A, C, Y, W135 vaccine. In addition to providing the immunization, a discussion of postexposure prophylaxis would benefit the travelers. ❖

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Pica and Parasites

ABSTRACT & COMMENTARY

Synopsis: Exposure to and possible ingestion of soil contaminated by raccoon feces was associated with eosinophilic meningitis and severe neurologic consequences in 2 children.

Source: Raccoon roundworm encephalitis—Chicago, Illinois, and Los Angeles, California, 2000. *MMWR Morb Mortal Wkly Rep.* 2002;50:1153-1155.

A 2-YEAR-OLD BOY WITH IRON DEFICIENCY ANEMIA and pica was noted to have dirt on his mouth while playing in a suburban Chicago park. Two and a half weeks later, he developed low-grade fever, lethargy, and ataxia with eosinophilia in his blood (28% of 21,000 white cells per mm³) and cerebrospinal fluid (CSF, 32%

of 80 white cells per mm³). Blood and CSF antibody testing were positive for antibodies to *Baylisascaris procyonis* as was subsequent soil testing for ova in the park where the child had played. The child survived but has profound neurologic compromise and requires continuous nursing care.

A 17-year-old boy with developmental disabilities and geophagia regularly played in a yard at his group home for handicapped adolescents. He became comatose following 2 days of low-grade fever and incoordination. Eosinophilia was noted in peripheral blood (15% of 15,900 white cells per mm³) and spinal fluid (37% of 19 white cells per mm³). Brain biopsy, blood serology, and CSF antibody testing, as well as analysis of sand box soil in the yard where the boy had played, were all positive for *B procyonis*. The boy remained comatose for a year and then died.

■ COMMENT BY PHILIP R. FISCHER, MD, DTM&H

B procyonis is a roundworm that infects more than two thirds of raccoons in many parts of the United States.¹ Eggs in raccoon feces become infective 2-4 weeks after defecation and can remain viable for years. Infection in a variety of birds and mammals (including pet rabbits² and humans) occurs with ingestion of parasite egg-contaminated soil; for humans, this is a particular problem in children with pica. In the gastrointestinal tract, larvae emerge from the eggs and migrate to cause neural larva migrans or, less commonly, ocular or visceral larva migrans.

Pica (geophagia), as noted by the 2 cases reported in *Morbidity and Mortality Weekly Report*, usually occurs in children with iron deficiency anemia or neurodevelopmental compromise. Especially when it involves pet feces, pica is socially bothersome and can facilitate the transmission of diseases such as toxocarasis³ and toxoplasmosis.⁴ Pica has also been linked to intestinal parasite infections in children in Jamaica,⁵ Kenya,⁶ and Guinea.⁷

CSF pleocytosis with eosinophilia is uncommon. Eosinophilic meningitis can be found with some tumors and following some surgical procedures. Usually, however, eosinophilic meningitis is due to infection with *Angiostrongylus cantonensis*, a parasite obtained by eating raw snails. This is reported from areas bordering the Pacific Ocean⁸ as well as in travelers to the Caribbean and elsewhere.^{9,10}

Each of the children reported recently in the *Morbidity and Mortality Weekly Report* failed to respond noticeably to albendazole. Once larva migrans is established, there is no proven therapy for *B procyonis* infection. Due to the possibility of extremely poor out-

comes with this infection, however, presumptive therapy with albendazole (25-50 mg/kg/d for 10 days) could be considered for any child who was noted to eat soil that might have been contaminated by *B procyonis* eggs.

Clearly, one need not leave urban America to get "exotic" parasitic infections. Pica, when noted, should prompt medical evaluation to ensure that no treatable iron deficiency goes unrecognized. Travelers, like children playing in American parks, need to be particularly cautious about washing their hands before eating. *B procyonis* eggs can be widespread in residential communities,¹¹ and environmental interventions will be important in the control of this infection. ❖

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Tafenoquine for Malaria Prophylaxis

ABSTRACT & COMMENTARY

Synopsis: *Tafenoquine (WR238605) is a new long-acting 8-aminoquinolone with potential to be used as malarial chemoprophylaxis in geographic areas with chloroquine-resistant Plasmodium falciparum and Plasmodium vivax malaria.*

Source: Shanks GD, et al. A new primaquine analogue, tafenoquine (WR238605), for prophylaxis against *Plasmodium falciparum* malaria. *Clin Infect Dis.* 2001;33:1968-1974.

TAFENOQUINE WAS TESTED IN A DOUBLE-BLINDED, placebo-controlled, randomized clinical trial during malarial transmission season in a highly endemic area in western Kenya. This comparative clinical trial had 4 arms. To clear any pre-existing cases of parasitemia, all 249 volunteers initially received a curative treatment regimen of halofantrine. Subjects were then randomized to receive 1 of 4 drug regimens: placebo throughout; 3 days of 400 mg (base) of tafenoquine per day followed by placebo weekly; 3 days of 200 mg of tafenoquine per day followed by 200 mg weekly of tafenoquine and 3 days of 400 mg of tafenoquine followed by 400 mg weekly of tafenoquine. Prophylaxis was continued for 13 weeks. Volunteers who received 400 mg for only 3 days had protective efficacy of 68% (95% CI 53-79%), those who received 200 mg for 3 days followed by weekly 200 mg dosing had a protective efficacy of 86% (95% CI, 73-93%), and those who received 400 mg for 3 days followed by a weekly 400 mg dose had a protective efficacy of 89% (95% CI, 77-95%).

■ COMMENT BY MICHELE BARRY, MD, FACP

Tafenoquine (WR238065) is a new long-acting 8-aminoquinolone with a half-life of 2 weeks. This long half-life raises the possibility that short-term travelers to highly endemic malarious areas could be protected by the use of a 3-day regimen taken before travel. G6PD-deficient persons would have to be excluded, and, in this study, 2 serious hemolytic events occurred in G6PD-deficient volunteers whose G6PD status had been incorrectly determined during screening. Otherwise, the drug was well tolerated except for minor skin rashes and low-level asymptomatic methemoglobinemia, which was anticipated with this primaquine-like compound.

Before any further conclusions can be made, studies in nonimmune travelers must be conducted, as all these vol-

unteers were semi-immune volunteers living in a malarious area of Kenya. Moreover, the long half-life of tafenoquine implies that some parasites will be exposed to low concentrations of the drug during its elimination phase, which could encourage the selection of drug-resistant strains quickly if the drug were to be used persistently in an endemic setting. Certainly, short-term travelers who may leave endemic areas with therapeutic drug levels would be a target group to use this new compound successfully without encouraging drug resistance. ❖

Who Wants to Be . . .

CONFERENCE QUIZ

WHO WANTS TO BE A MILLIONAIRE? IF IT'S YOU, YOU probably won't reach that goal by reading about travel medicine. But, who wants to be a good travel medicine provider? If that's you, read on! Americans know that quizzes are fun, whether in an effort to gain wealth or merely to avoid being the "weakest link." Educators also are well aware that we can learn from tests and quizzes. In an effort to stimulate your current awareness of important news in the field, *Travel Medicine Advisor Update* is pleased to provide this annotated trivia quiz stemming from items that came up at the recent meeting of the American Society of Travel Medicine and Hygiene in Atlanta.

1. In what Asian nation has *Plasmodium vivax* re-emerged as a problem for American travelers?

- a. India
- b. Thailand
- c. Uzbekistan

The correct answer is c. India has long offered both falciparum and vivax malaria as significant risks for travelers. Outside urban areas, Thailand continues to be endemic for malaria. Recently, however, malaria has been increasingly identified in travelers to the south of Uzbekistan near the Tajik border. There were 7 cases in 1999 and 46 in 2000. So far, all malaria in Uzbekistan has been due to P vivax, and chloroquine offers adequate chemoprophylaxis. From a session led by Monica Parise of the CDC on 11-12-01.

2. Which malaria chemoprophylaxis regimen is linked to a higher risk of overall adverse events among these 3 regimens?

- a. Mefloquine
- b. Atovaquone-proguanil
- c. Chloroquine-proguanil
- d. None of the above

The correct answer is d. The overall incidence of side effects is about equal with mefloquine and atovaquone-

proguanil even though severe neuropsychiatric reactions are more common with mefloquine. (See also Clin Infect Dis. 2001;33:1015-1021) Similarly, chloroquine-proguanil was linked to more gastrointestinal symptoms than was atovaquone-proguanil, but the overall incidence of adverse effects was about equal between these 2 combinations. (See also Lancet 2000;356:1888-1894) From a session led by Monica Parise of the CDC on 11-12-01.

3. How many cases of malaria are imported into the United States each year?

- a. 50
- b. 250
- c. 1500
- d. 10,000

The best answer is c. In addition, there have been 115 malaria deaths in travelers following their arrival into the United States since 1963. Most, if not all, deaths would have been prevented by the use of appropriate chemoprophylaxis and/or prompt diagnosis and therapy after symptoms began. From a session led by Robert Newman of the CDC on 11-12-01.

4. Atovaquone-proguanil:

- a. is effective as treatment of all forms of *P vivax* malaria.
- b. should be avoided in children weighing less than 11 kg.
- c. is available in adult and pediatric sizes of tablets.

The correct answer is c. This combination therapy does not kill vivax or ovale hypnozoites and does not obviate the need for primaquine following successful treatment of P vivax. There are good data emerging that atovaquone-proguanil is both safe and effective in children weighing from 5 kg to 11 kg. The pediatric-sized pills contain one fourth as much medication as the adult pills. Again, from Monica Parise's 11-12-01 session.

5. Individuals traveling to visit friends and relatives are:

- a. more likely to die of malaria than nonimmune travelers.
- b. more likely to get pretravel advice from a travel medicine specialist.
- c. only 20% as likely to take chemoprophylaxis as other travelers to the same area.

The correct answer is again c. Attention must be paid to these "VFR" travelers. From a presentation by Jay Keystone on 11-12-01.

6. Meningococcal vaccine:

- a. is useful for individuals going to Mecca on a Hajj.
- b. prevents all common types of meningococcal meningitis.
- c. prevents the development of a carrier state.

The correct answer is a. Meningococcal vaccine is indeed useful and required for pilgrims visiting Saudi Arabia. The quadrivalent A-C-Y-W135 vaccine prevents most of the travel-related cases of this dis-

ease but is ineffective against the serotype B. Vaccination prevents disease, but vaccinated travelers can become carriers and spread organisms to family members after they return from their pilgrimages. In a report from Singapore by Annelies Wilder-Smith on 11-12-01.

7. Which of the following diseases occurs in or near Afghanistan?

- a. Crimean-Congo hemorrhagic fever
- b. West Nile encephalitis
- c. Leishmaniasis
- d. Malaria
- e. All of the above

The correct answer is e. Steve Berger of Gideon[®] fame reviewed diseases endemic to Afghanistan and surrounding areas on 11-12-01.

8. What is true about the ASTMH-certifying exam in tropical medicine and travelers' health?

- a. Nonphysicians will soon be able to sit for the exam.
- b. Approximately 100 people have taken the test.
- c. Almost everyone who takes the test passes.

The correct answer is a. Details are being worked out so that non-physician licensed health care providers can take the test. More than 500 people have taken the test, and the pass rate is 64%.

9. Who said, "While keeping in mind the realities we can nevertheless be confident that malaria is well on its way toward oblivion"?

- a. Steve Hoffman, 2001
- b. Louis Miller, 1985
- c. PF Russell, 1955

The correct answer is c. Russell was a leading malariologist through the middle part of the 20th century. Unfortunately, malaria eradication efforts failed, and Russell's optimistic predictions did not come true. Steve Hoffman discussed this on 11-13-01 during his presidential address. Who is Louis Miller? A leading malaria researcher at the NIH. How are you doing on the quiz? If you were a millionaire, would you contribute some of your wealth to pushing malaria toward oblivion? More resources and energy must be devoted to the effort.

10. Brucellosis can present as fatigue in returned travelers. What is not true about this condition?

- a. It is only caused by one species.
- b. It is associated with unpasteurized dairy products—often goat cheese in the Americas.
- c. Fever and back pain can be presenting complaints.

The correct answer is a (since different species are common in different geographical areas). From a case presentation by David Freedman on 11-14-01.

11. Multiple church youth groups doing construction work in Mexico have developed respiratory illnesses. What is true about these outbreaks?

- a. They are due to Coccidiomycosis.
- b. They are associated with flooding and stagnant water.
- c. Rapid initiation of antimicrobial therapy is required to prevent death.
- d. Masks should be avoided when working in dusty areas.

The correct answer is a. These infections seem to be associated with dust that is inhaled during times of dryness. When returned travelers present with flu-like symptoms after visiting Mexico, one should consider fungal causes. This was similarly important after the Spring Break outbreak of histoplasmosis in Mexico. From a CDC report presented on 11-14-01.

12. Concerned about dive-bombing flies leaving larvae in eyes of tourists in Barbados? If so:

- a. consider a diagnosis of sheep fly infestation.
- b. consider getting diagnostic help from www.dpd.cdc.gov/dpdx/default.htm.
- c. realize that removal of larvae will likely be curative.
- d. All of the above

The correct answer is d. From a fascinating case report (Levett PN et al. A case of human external ophthalmomyiasis in Barbados, abstract 818).

13. Sleepy, or still enthused about this quiz? What is true about African sleeping sickness?

- a. Of 30 cases in US travelers in the past 34 years, 7 were reported in 2000.
- b. An increased incidence has also been reported in European travelers.
- c. Since 1990, 14 of 15 US cases have been found in travelers to game parks in or near Tanzania.
- d. Effective free medicines are available from the CDC at 404-639-3670.
- e. All of the above

Once again, the correct answer is "all of the above." From a CDC report on 11-14-01.

14. How many people work at WHO?

The joking answer of former US President Jimmy Carter during a session on the eradication of dracunculiasis on 11-15-01 was "about 50%."

15. How have you done on this quiz? All correct answers? Learning something about pretravel malaria prevention counsel? Reminded of clinical presentations of brucellosis, fungal infections, and sleeping sickness in travelers? Enthused about learning more? To stay up-to-date, you can:

- a. keep reading *Travel Medicine Advisor Update*.
- b. stay in touch with the American Society of Tropical Medicine and Hygiene at www.astmh.org.
- c. check out the International Society of Travel Medicine at www.istm.org.
- d. go to next year's ASTMH meeting in Denver, Colo, in

- November.
e. All of the above

Answer e could be correct. The choices are yours.

CME Questions

- All of the following are true about the combination Hepatitis A and B vaccine (Twinrix) except:**
 - It is recommended for susceptible persons 18 years or older.
 - The dosing schedule is 0, 1, and 6 months.
 - The most common adverse side effects are soreness at the injection site, headache, and fatigue.
 - Interchanging combination hepatitis A and B vaccine and monovalent hepatitis A and B vaccines during a series results in decreased immunogenicity.
 - Use of the combination hepatitis A and B vaccine series requires 2 less injections than individual monovalent hepatitis A and B vaccines.
- Which one of the following statements regarding the combination atovaquone/proguanil is true?**
 - It should be taken on an empty stomach.
 - It needs dosage adjustment for the elderly.
 - It needs to be taken for 4 weeks after returning from a malaria-endemic area.
 - It is contraindicated in patients with creatinine clearance less than 30 mL/min.
 - It does not have causal activity for *P falciparum*.
- Meningococcal disease in connection with Hajj pilgrims has been associated with all the following except:**
 - Serogroup A meningococcus
 - Meningococcal carriage in vaccinated persons
 - A recent shift to serogroup W 135 related disease
 - Serogroup Y transmission to unvaccinated contacts of cases

- Implementation of a requirement for quadrivalent vaccination in pilgrims (A, C, Y, and W 135)

- Human infection with the roundworm *Baylisascaris procyonis* has been associated with which one of the following epidemiological or clinical traits?**
 - Encephalitis that responds well to albendazole
 - Travel to rural areas
 - Ingestion of soil contaminated by raccoon feces
 - Ingestion of raw snails during travel along the Pacific Rim
 - Boar hunting expeditions in rural North America
- Characteristics associated with the antimalarial agent, tafenoquine (WR 238605), include each of the following except one. Which one?**
 - A public health role for intermittent treatment of large populations in holoendemic malarious areas.
 - Severe hemolysis when this agent is administered to G6PD-deficient individuals.
 - A long half-life, which exceeds that of primaquine many fold.
 - Activity against chloroquine-resistant strains of *P vivax* and *P falciparum*.

Readers are Invited. . .

Readers are invited to submit questions or comments on material seen in or relevant to *Travel Medicine Advisor*. Send your questions to: Robin Mason, *Travel Medicine Advisor*, c/o American Health Consultants, P.O. Box 740059, Atlanta, GA 30374. For subscription information, you can reach the editors and customer service personnel for *Travel Medicine Advisor* via the internet by sending e-mail to neill.larimore@ahcpub.com. We look forward to hearing from you. ❖

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