

### Prevalence of Hepatitis C Virus Antibody

*To the Editor:* The prognosis of thalassemia major has improved greatly over the last 20 years, owing to intensive blood transfusion regimens and chelation therapy.<sup>1</sup> However, thalassemia patients are at a high risk of post-transfusion hepatitis (PTH). Hepatitis C virus (HCV) is the leading cause of PTH worldwide.<sup>2-4</sup> People who are at a high risk of HCV infection are those who receive multiple blood transfusions, especially thalassemia and sickle cell anemia patients.<sup>5</sup> Between 50% and 60% of patients develop chronic hepatitis, and almost 30% go on to develop cirrhosis of the liver. Hepatocellular carcinoma may result as a late consequence of the HCV infection.<sup>6</sup>

$\beta$ -thalassemia and sickle cell disease (SCD) are common in Saudi Arabia. In Madina, the estimated gene frequency of  $\beta$ -thalassemia is 0.100, and the prevalence of sickle cell homozygosity (HbSS) is 0.01.<sup>7</sup> The Madina Maternity & Children's Hospital (MMCH) is a 400-bed hospital with a 200-bed pediatric section. It is the main referral hospital for the Madina region and its surrounding villages, and serves approximately 350,000 children. The Thalassemia Center was established in 1992 within the pediatric section to provide comprehensive management of thalassemic patients, which includes regular blood transfusion at three to four weekly intervals. The age limit for admission for pediatric patients is 13 years, however, for thalassemic patients the limit is 18 years. The aim of this study was to identify the prevalence of HCV antibody in 80 patients with thalassemia and SCD on multiple transfusion regimens, who were regularly attending the Thalassemia Center at MMCH for a comprehensive management program.

### Patients and Methods

In January 1998, 80 transfusion patients with  $\beta$ -thalassemia and SCD were screened for HCV antibody and hepatitis B surface antigen (HbSAg). The diagnoses of thalassemia and SCD were confirmed by hemoglobin electrophoresis (Helena Laboratories, Texas, USA). All patients received blood transfusions for a minimum of two years at three to four weekly intervals. None of the patients had a history of alcohol abuse, homosexuality or intravenous drug use. All patients were screened for HCV antibody by using a third-generation enzyme-linked immunosorbent assay (ELISA) (Murex Anti-HCV Version III), which utilizes antigens from the putative core (C structural), protease/helicase (NS3, non-structural), NS4

(non-structural) and replicase (NS5, non-structural) regions of the virus to provide a sensitive diagnostic test. Positive results by ELISA were confirmed by recombinant immunoblot assay (Chiron, RIBA, HCV 2.0 S1A). This is a strip immunoblot assay, which utilizes four recombinant HCV-encoded antigens which are immobilized as individual bands onto test strips. The presence of HbSAg was determined with appropriate commercially available assay Auszyme monoclonal, which is a qualitative, third-generation enzyme immunoassay for the detection of HbSAg in human serum or plasma (Abbott Laboratories, Diagnostic Division, USA). The units of blood were provided by the Central Blood Bank in Madina, which introduced routine screening for HCV antibody using second-generation ELISA, for all blood donors in 1993. All patients routinely received HBV vaccine at the time of diagnosis.

### Results

Of the 80 patients, 32 were seropositive to hepatitis C virus, giving a prevalence rate of 40%, 29 (91%) were thalassemic, and three patients (9%) had sickle cell anemia. Of the 32 seropositive patients, 18 (56%) were Saudis and 14 (44%) were non-Saudis, and comprised 19 males (59%) and 13 females (41%). Twenty-eight patients (88%) received more than 100 units of blood for transfusion, and 29 patients (91%) received blood transfusions for more than five years. As well, 14 patients (44%) had ALT of 100 IU/L or more (normal 40 IU/L), 24 patients (75%) had serum ferritin of more than 2000 ng/mL, and seven of 14 patients with elevated ALT had serum ferritin of more than 5000 ng/mL.

### Discussion

This is the first study from the Madina Region which reports the prevalence of hepatitis C virus antibody among a high-risk group of thalassemia and sickle cell patients. We found a prevalence of 40%, which is similar to other regional studies,<sup>8,9</sup> however, it is lower than what has been reported from the Riyadh region by Al Fawaz et al.,<sup>10</sup> where a prevalence of 70% was reported. Indeed, the prevalence of anti-HCV positivity ranges from 8.7% to more than 70%, and also differs even in similar geographic areas.<sup>11</sup> The majority of our patients (91%) were thalassemic, a result which is similar to other studies.<sup>10,12</sup> Thalassemic patients are at a greater risk of exposure to HCV because of their life-long requirement of blood transfusion until bone marrow transplantation is done, a procedure which is not commonly available in most developing countries. The three patients with sickle cell anemia had stroke and were on chronic blood transfusion.

Approximately 88% of our patients received more than 100 units of packed red blood cell transfusion and 91% received blood transfusion for more than five years. Only 44% had raised ALT, which shows that this marker is not reliable for predicting HCV infection, as other studies have also confirmed.<sup>10,13,14</sup> Approximately 75% of the patients had elevated serum ferritin, and 50% of those with raised ALT had significant elevation of serum ferritin, which probably suggests that both iron overloading and hepatitis C infection contributed to liver damage in our thalassemic patients, whose compliance with desferrioxamine therapy was less than optimum.

Liver biopsy was not done in our patients. It is an essential investigation for assessing the degree and type of liver damage in chronic hepatitis before starting  $\alpha$ -interferon therapy. Recent reports indicate that  $\alpha$ -interferon induces a sustained virologic and biochemical remission of hepatitis in  $\beta$ -thalassemic patients with chronic HCV infection and non-advanced liver disease. Moreover, it can be used in children and young adults with chronic hepatitis C disease and thalassemia major.<sup>15,16</sup>

In conclusion, it seems that in the treatment of chronic hepatitis C infection with  $\alpha$ -interferon, one should use direct assay for hepatitis C virus ribonucleic acid by polymerase chain reaction in both serum and liver biopsy, in order to define subgroups of patients who may benefit from this treatment and to monitor the response of treatment. Until a vaccine against HCV becomes available, preventive measures such as blood donor screening using advanced techniques for detecting HCV infection before transfusion and strict infection control measures are crucial for the control of the spread of HCV among these high-risk patients.

### Acknowledgements

We would like to express our thanks to the Hospital Director, Dr. Abdulla Allam, for his help and support, to the Laboratory Department for their cooperation, and to Mrs. Aisha Khan and Mrs. Awatif Abdulaziz, staff nurses at the Thalassemia Center, for the collection of medical data. We also thank Dr. Ghulam Nabi for his critical review, and Miss Darna Sarail Alie for the secretarial work.

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### Right-Sided Methicillin-Resistant Staphylococcal Endocarditis in a Child

*To the Editor:* Infective endocarditis (IE) is an uncommon but serious disease in children. Among the causative agents of IE, *Staphylococcus aureus* plays an important and varied role. It is known to cause IE in patients with structurally normal hearts, and is usually associated with significant morbidity and mortality. Right-sided *S. aureus* endocarditis is considered to be a less severe disease than left-sided one. It is, however, less frequent and has been described mainly in adults with intravenous drug abuse, in whom it carries a relatively good prognosis, and has been managed adequately with short courses of antibiotics.

We recently experienced a case of tricuspid valve endocarditis due to methicillin-resistant *Staphylococcus aureus* (MRSA) in a child with a previously normal heart who died in spite of aggressive medical and surgical treatment. We report this case to illustrate the serious

nature of this entity of IE in pediatric patients, and to emphasize the need for an aggressive approach in its management.

### Case Report

A previously healthy 3½-year-old Saudi girl was diagnosed to have insulin-dependent diabetes mellitus, and

was admitted at a tertiary care center for initiation of insulin therapy and blood sugar control. A peripheral intravenous canula with heparin lock was used as an access for blood sampling and was left in place for 10 days. One week following her admission, the patient had fever associated with generalized fatigability and was treated but with no improvement. Three weeks after her illness, she presented to our hospital with persistent fever, inability to walk and bilateral hip joint pain.

Examination at admission revealed a sick-looking, pale child with several petechiae over the forehead and trunk. She was febrile, with an axillary temperature of 39°C. Her respiratory rate was 30/min, pulse rate was 130/min and blood pressure was 90/50 mm Hg. She had generalized lymphadenopathy and hepatosplenomegaly. Both hip joints were tender with restricted movements. Cardiovascular examination revealed normal first and second heart sounds with no murmurs, and no embolic or cutaneous immune complex manifestations of endocarditis were detected. The rest of the examination was unremarkable.

Initial investigations showed a white cell count of  $10 \times 10^9/L$ , hemoglobin of 7.0 g/dL, platelet counts of  $200,000/mm^3$ , ESR of 120 mm/hr. Blood and right hip joint aspirate grew MRSA, which is reported to be sensitive to vancomycin, ciprofloxacin and rifampicin. The patient was started on intravenous vancomycin at 40 mg/kg/day given every six hours and gentamicin at 7.5 mg/kg/day given every 8 hours. On the seventh day of admission, the patient developed heart failure, and heart examination revealed a grade II/IV systolic murmur with a maximum intensity over the left lower sternal border.

Echocardiography showed presence of vegetation measuring 1.5x1.0 cm over the tricuspid valve involving the anterior and posterior leaflets and a moderate tricuspid regurgitation. She was commenced on antifailure therapy. In spite of the above antibiotics therapy, repeated blood cultures continued to grow MRSA, and on the ninth day of admission, intravenous ciprofloxacin 20 mg/kg/day every 12 hours and rifampicin 12 mg/kg/day were added. Her condition deteriorated and she developed respiratory failure. Ventilation perfusion scan was suggestive of multiple pulmonary emboli in the right lung.

Minimum inhibitory concentration (MIC) was performed by *E. coli* test and confirmed that the isolate

was sensitive to vancomycin (MIC=2.0 mg/mL) and ciprofloxacin (MIC=1.0 mg/mL), however, it was resistant to gentamicin, rifampicin, catrimoxazole and fucidin. Vancomycin trough level was taken and it was within therapeutic range of 8.0 mg/mL.

On the 20th day of admission, the patient was taken for surgery. At surgery, the tricuspid valve was almost completely obstructed with huge vegetation that involved almost all the septal leaflets of the valve. Excision of the tricuspid valve vegetation with partial excision of the tricuspid valve was done. Postoperatively, the patient continued to be febrile and sick, and she developed multiple pneumatocele on both lungs. On the seventh postoperative day, she developed refractory circulatory failure and finally arrested and died despite resuscitation efforts.

### Discussion

Right-sided infective endocarditis is a known entity in adults with intravenous drug abuse, however, in the pediatric age group, it is not commonly seen. In particular, tricuspid-valve endocarditis caused by MRSA in a child with a normal heart is an extremely uncommon disease.<sup>1</sup> To our knowledge, there has been only one such case previously reported. In that case, several sensitive antibiotics were administered for about 30 days, however, these drugs were not effective and the patient developed recurrent emboli in addition to refractory heart failure. Subsequently, a successful tricuspid valve replacement with a Björk-Shiley mechanical valve was done.<sup>2</sup>

Our patient developed tricuspid valve IE with persistent bacteremia and serious complications such as heart failure, multiple septic emboli and metastatic infection of the hip joint, in spite of being on several antibiotics. The failure of medical treatment in our patient and the other reported case may indicate that the therapeutic options for MRSA IE are still problematic. In spite of the use of combination therapy such as rifampicin and aminoglycoside to vancomycin or quinolone-like ciprofloxacin to rifampicin, there have been reports of failure with these regimens.<sup>3</sup> This indicates that patients with right-sided IE caused by MRSA may need aggressive medical treatment. Undoubtedly, the role of surgery is crucial, especially if it is considered early in the treatment plan. It has been suggested by many studies that combined medical and early surgical treatment of complicated IE is associated with improved survival and outcome.<sup>4,5</sup> It may be worthwhile to mention that the possible portal of entry of MRSA in our patient may have been the peripheral intravenous device. This possibility has been mentioned in a previous study where patients with *S. aureus* bacteremia

had intravenous devices that increased the risk of developing endocarditis.<sup>6</sup>

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### Insulin Storage in a Clay Pot

*To the Editor:* In a recent issue of the *Annals*, Al Shaibi et al.<sup>1</sup> reported their preliminary data on the efficient storage of insulin vials in a semiporous clay pot containing water in desert conditions. The six-week storage did not cause any apparent loss in insulin potency and bioavailability. Nevertheless, before accepting insulin storage in clay pots universally, it would be desirable to quantify insulin by liquid chromatography and to monitor temperature and humidity simultaneously.

Rather than assaying the potency and bioavailability of insulin through fall in the plasma glucose levels in volunteers or diabetic patients, insulin quantum should be monitored regularly by liquid chromatography or high-performance liquid chromatography. The potency would be best calculated by a comparison of peak chromatograph areas using standardized reference preparations as controls.<sup>2</sup>

During the six-week storage of insulin in the clay pot, temperatures were recorded at various sites only 12 times.<sup>1</sup> Variations in temperatures should be monitored uninterruptedly using electron temperature loggers rather than thermometers. The loggers could be preset to record temperatures at hourly intervals. In Adelaide, Australia, it

was possible to monitor the temperature around different vaccines at different storage sites. Retrieval of data from electronic loggers revealed that out of 40 vaccine storage sites, vaccines at 34 sites had been exposed to subzero temperatures for varying intervals, and in three sites, the temperature had exceeded 22°C.<sup>3</sup>

In all probability, cooling caused by rapid evaporation of water in the dry climate in the desert was responsible for the mean temperature of 26.6°C in the unglazed clay pot. A humid environment would vitiate the temperature in clay pots outside the desert. That is likely to be the rule rather than the exception during the impending global climate change and raised vapor pressure.<sup>4</sup> Furthermore, high temperatures and humidity would imply excessive radiative

and evaporative transfer of heat. During the 1995 heat wave in Chicago, the maximum atmospheric temperature was 40°C, but the heat index, an estimate of evaporative and radiative transfer of heat, was 48.3°C.<sup>5</sup>

Innovative storage devices to store insulin or other labile therapeutics, prophylactics or diagnostics without relying on electrically operated appliances would be of immense utility in developing countries. Poor electricity supplies do disrupt the working of electrically operated appliances meant for maintaining temperature at a stipulated level.<sup>6</sup> Certainly, it would be possible through in-depth evaluation of the clay pot technology<sup>1</sup> to offer potent therapeutics and prophylactics to masses in developing countries.

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### Reply

*To the Editor:* Dr. Arya comments that our findings that insulin activity is not degraded over a six-week period

when stored in an unglazed clay pot (*zeer*) in high-temperature desert conditions should be confirmed by analytical methods that do not measure bioactivity. Although such information might be interesting, the ultimate endpoint of interest in insulin is bioactivity. Clinically, this is measured by the blood-glucose lowering effect of insulin, as reported in our experiment.

The comment that cooling efficiency of a *zeer* is affected by humidity was not studied by us. Our results were obtained during the middle of the summer in Jeddah, where daytime temperatures routinely exceed 40°C. Humidity levels tend to be high, resulting in a high heat index. To assess the cooling efficiency of a *zeer* at various combinations of temperature and humidity would be an interesting experiment.

We do not agree with the comment that “temperature should be monitored uninterruptedly using electron

temperature loggers rather than thermometers.” We can assure Dr. Arya that temperatures in Jeddah do not vary greatly from hour to hour or even day to day, obviating the need for continuous monitoring. Furthermore, our purpose in publishing these results were two-fold, first, to encourage others to use and benefit from it, and second, to demonstrate that local “technology” can be adapted inexpensively to meet local needs. Complicated and expensive experiments using large amounts of data are an irresponsible use of scarce resources if a simple experiment answers the same question. We thank Dr. Arya for the comments.

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**Brucellosis in Saudi Arabia: Past, Present and Future**

*To the Editor:* In his recent editorial, Dr. Al-Eissa mentions that “the situation in Saudi Arabia is unique and more complicated because of continuous importation of millions of slaughter animals annually, poor animal quarantine procedures and lack of legislation to control marketing and movement of animals.”<sup>1</sup> In Saudi Arabia, brucellosis is endemic in domestic animals. The geographic distribution of human brucellosis is closely related to the endemicity of animal infection, method of animal husbandry, human eating habits, standards of hygiene and other socioeconomic activities.<sup>2</sup> Due to the Arabian custom of drinking unpasteurized goat and camel milk, active and chronic brucellosis occurs frequently in

the local population.<sup>3</sup> Even though brucellosis is preventable, it remains one of the major health problems in both the urban and rural areas of Saudi Arabia.<sup>4</sup> The high incidence of brucellosis cannot be blamed on imported animals, because there are already overwhelming pools of infected domestic animals in the rural areas.

Brucellosis is a multisystemic disease, and the clinical presentation is mainly in the form of fever, arthropathies, visceromegaly and anemia. The studies carried out by Aderale et al.,<sup>5</sup> Nabi and Mir,<sup>6</sup> Rathi et al.,<sup>7</sup> Rashid,<sup>8</sup> and Opawoye,<sup>9</sup> all in different parts of the Kingdom, confirm that the features of brucellosis are similar in the rural and urban areas.

Brucellosis remains a problem in the rural areas of the Kingdom, where the reservoir of infection persists unabated, and where patterns of human behavior are difficult to change. This is probably because the majority of the inhabitants in many parts of the Kingdom are villagers or Bedouins, who often live in close proximity to their livestock, consume raw milk and make white sheep and goat cheese, using unhygienic methods. It is better to initiate ways and means to prevent the disease rather than struggle later to cure it.

In order to combat this preventable disease in the rural areas and the Kingdom as a whole, the following steps must be taken:

1. Community meetings should be held at the grassroots level, with the elders highlighting the importance of boiling noncommercially prepared milk before drinking, or using it in preparing products such as cheese, and of not eating meat in an uncooked state.
2. There should be interministerial coordination between the Ministries of Agriculture, Health, Municipal and Rural Affairs in order to formulate a national policy of ways and means of eradicating brucellosis.
3. During market days in the rural areas, officers of the Ministry of Agriculture should make their presence felt by those who bring their livestock for sale. Vaccination of animals and education can proceed hand in hand. It is the responsibility of veterinarians to accept the challenge to control animal brucellosis, which in turn will control the disease in humans.<sup>10</sup>
4. The preventive section of the Ministry of Health should spearhead an intensive national health education on the radio and TV on the dangers posed by brucellosis.

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### Reply

*To the Editor:* I thank Dr. Opawoye for his comments on my editorial,<sup>1</sup> and appreciate the opportunity to respond. Dr. Opawoye emphasizes certain points addressed in my editorial, and takes issue with the fact that "the situation in Saudi Arabia is unique and more complicated because of continuous importation of millions of slaughter animals annually, poor animal quarantine procedures and lack of legislation to control marketing and movement of animals." He gravely concerned me when he mentioned that "the high incidence of brucellosis cannot be blamed on imported animals, because in Saudi Arabia brucellosis is endemic in domestic animals." Indeed, there is not even anecdotal evidence presented to support such a statement. In a few years' time, are we going to argue whether Rift Valley fever is a recently imported or an originally endemic infection in Saudi Arabia? An exchange of views is usually healthy and consistent with the scientific method, however, views are sometimes incorrect and misinformed if facts are ignored. Dr. Opawoye's statement impugns the integrity of a few investigators and their surveys.<sup>2,3</sup> We should make sure that we use published data and provide thorough and balanced presentation of facts. An egregious problem with Dr. Opawoye's critique was his failure to read or understand the first results of a national survey for brucellosis antibodies among animals in Saudi Arabia by Radwan et al., which is cited in his letter.<sup>2</sup> Radwan et al. found that the incidence of brucellosis among imported living slaughter animals was double that of local animals in their extensive serologic survey in 1977.

I wish to set the record straight with regards to today's endemicity of brucellosis in Saudi Arabia and its relationship with earlier uncontrolled importation of infected animals from neighboring African and Asian countries where brucellosis is endemic.<sup>4</sup> As mentioned in the editorial, the increasing incidence of brucellosis in the early 1980s is attributed to the changes in the system of animal production and marketing.<sup>4</sup> In the mid-1970s, the dairy industry had been formed with pregnant heifers from North America and Europe.<sup>5</sup> Intensive sheep and goat breeding projects were established and subsidized by the government. The local desire for meat increased considerably and the uncontrolled importation of huge numbers of living animals from many countries occurred, including countries where brucellosis is prevalent.<sup>4</sup> During that period, imported animals were poorly screened for infection. None other than Benjamin Franklin in the late 1700s commented on how long it is between the time that a certain thing is known and when we begin to act. In the year 2000, we are beginning to feel the effects of Rift Valley fever, because we ignored the threat of importation of infected animals, and we have been suffering from brucellosis for the past 20 years.

It is time for us to think globally and act locally. It is time for us to deal with the problems of introduction of infected animals into the Kingdom, and ensure that well-equipped animal quarantine centers in Saudi ports are established. It is time for us to stop apologizing for lapses in the public health system, and the ludicrously small amount of money spent in preventive medicine. Our previous and current lessons are clear: prevention is cheaper than treatment. Our challenge today is to design creative and forward-thinking strategies to keep brucellosis, Rift Valley fever, and other infectious hazards from whittling away at our most valuable resource, our people. I appreciate Dr. Opawoye's letter, and hope that my response is helpful to him and other readers.

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**Predictive Factors of Poor Lung Function  
in Cured Tuberculosis Patients**

*To the Editor:* Spirometry measurements were performed in 46 previously treated and cured tuberculosis (TB) patients (23 males, 23 females) in order to study factors that predict poor lung function. Forced vital capacity (FVC), forced expiratory volume in 1 sec (FEV<sub>1</sub>), and ratio were abnormal in 13 cases, and oxygen saturation was <90% in three cases. A significantly higher rate of abnormal spirometry was observed in patients with poor compliance (58.3% vs. 17.6%), patients with duration of treatment <6 months (53.3% vs. 16.1%), and in patients with advanced lung damage (38.5% vs. 10%). Therefore, compliance with the prescribed drug regimen and significant poor lung damage seen on radiography were found to adversely affect the degree of loss of lung function. Furthermore, lung functions appear to improve with time, and the longer the duration after recovery from

TB, the better is the lung function over a period of 5 years. Measures to prevent poor respiratory function in treated TB patients include better TB service to improve compliance with therapy, and preferably through full implementation of the DOT system.

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