

# Endemic Infections in Saudi Arabia

435 medicine teamwork

[ [Important](#) | [Notes](#) | [Extra](#) | [Editing file](#) ]

## lecture objectives:

- ⇒ Common terminology describing Endemicity
- ⇒ Common Endemic disease in KSA: especially typhoid, salmonella/Brucella.
- ⇒ Gastroenteritis, Viral hemorrhagic fever (Dengue, RVF).
- ⇒ Leishmaniasis, MERS-COV, Malaria
- ⇒ For each endemic diseases: Epidemiology, Pathogenesis, Clinical features, Complications, Diagnostic workup, Differential diagnosis, Treatment & prevention.

Done By:Khawla alammari




Revised By:Rawan Aldhuwayhi

References: Doctors' Slides+Davidson

# Endemic Infections in Saudi Arabia

Definitions	
<b>Endemic</b>	The <b>constant presence</b> and/or usual prevalence of a disease or infectious agent in a population within a geographic area. The amount of a particular disease that is usually present in a community is referred to as <b>baseline or endemic level</b> .
<b>Hyperendemic</b>	Persistent, high levels of disease occurrence.
<b>Epidemic</b>	Refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
<b>Pandemic</b>	Refers to an epidemic that has spread <i>over several countries or continents</i> , usually affecting a large number of people.
<b>Outbreak</b>	Carries the same definition of epidemic, but is often used for a more limited geographic area.
<b>Sporadic</b>	Is a disease that occurs infrequently and irregularly.

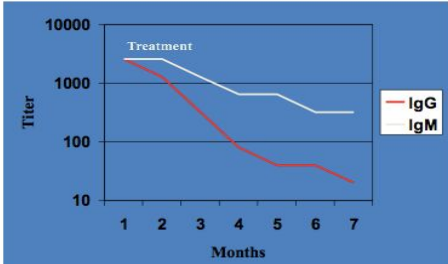
Typhoid(Enteric) fever الحمى المعوية	
<b>Definition</b>	It is an acute febrile disease, caused by <b>Salmonella typhi</b> and S. paratyphi A, B,C. <ul style="list-style-type: none"> <li>● <b>S.typhi and paratyphi lives only in humans.</b></li> <li>● Persons with typhoid fever carry the bacteria in their <b>bloodstream and intestinal tract.</b></li> </ul>
<b>Differential Dx</b>	<b>Brucellosis / Tuberculosis / Infective endocarditis / Lymphoma / Adult Still's disease /Malaria.</b>
<b>Transmission</b>	faecal–oral route,It is transmitted through the <b>ingestion of food or drink contaminated by infected people.</b>
<b>Pathogenesis of Enteric fever</b>	<p>→ The organisms penetrate ileal mucosa</p> <p>→ Reach mesenteric lymph nodes - multiply there.</p> <p>→ Invade Bloodstream <b>causing primary bacteremia</b></p> <p>→ Infect Liver, Gallbladder <b>especially if somebody has gallbladder stones</b>, spleen, Kidney, Bone marrow.</p> <p>→ After 7-10 days bacilli pass into bloodstream <b>(secondary bacteremia )</b>.</p>
<b>Carriers</b>	<ul style="list-style-type: none"> <li>● 5% of the survivors continue to excrete the organism for months = carriers.</li> <li>● In carriers the bacteria remain in the <u>gallbladder</u> and are shed into the intestine.</li> <li>● <b>Carriers</b> recovering from typhoid fever shed S. Typhi in their feces .</li> </ul>

<b>Clinical Features</b>	<ul style="list-style-type: none"> <li>● Develop 1- 3 weeks after exposure.</li> <li>● May be mild <b>flu-like illness (cough,runny nose,headache)</b> or severe / Gradual onset : Intermittent fever,malaise, headache, abdominal pain, constipation or diarrhoea <b>rose-colored spots on the chest</b> ,enlarged spleen or liver.</li> <li>● Healthy carrier state may follow acute illness.</li> </ul>			
	<table border="1"> <tr> <td data-bbox="269 583 412 800"> <b>Rash in Typhoid (Rose spots)</b> </td> <td data-bbox="412 583 1349 800"> <ul style="list-style-type: none"> <li>○ <b>Rose spots:</b> 2 -4 mm in diameter raised discrete irregular blanching pink macules found in front of chest.</li> <li>○ Appear at the end of first week</li> <li>○ Fade after 3 – 4 days</li> <li>○ <b>you can take a skin biopsy and then if you do culture you'll find the organism</b></li> </ul> </td> <td data-bbox="1349 583 1583 800">  </td> </tr> </table>	<b>Rash in Typhoid (Rose spots)</b>	<ul style="list-style-type: none"> <li>○ <b>Rose spots:</b> 2 -4 mm in diameter raised discrete irregular blanching pink macules found in front of chest.</li> <li>○ Appear at the end of first week</li> <li>○ Fade after 3 – 4 days</li> <li>○ <b>you can take a skin biopsy and then if you do culture you'll find the organism</b></li> </ul>	
<b>Rash in Typhoid (Rose spots)</b>	<ul style="list-style-type: none"> <li>○ <b>Rose spots:</b> 2 -4 mm in diameter raised discrete irregular blanching pink macules found in front of chest.</li> <li>○ Appear at the end of first week</li> <li>○ Fade after 3 – 4 days</li> <li>○ <b>you can take a skin biopsy and then if you do culture you'll find the organism</b></li> </ul>			
<b>Complications</b>	<ul style="list-style-type: none"> <li>● Pneumonia, meningitis, osteomyelitis <b>it is a multisystem disease, could be confined to the gut only or causes complication to other organs.</b></li> <li>● Severe intestinal hemorrhage and intestinal perforation <b>so the patient will present with peritonitis which is a very serious complication</b></li> <li>● If not treated can be fatal. <b>early diagnosis and treatment are very important</b></li> </ul>			
<b>Investigations</b>	<ol style="list-style-type: none"> <li>1. <b>Taking a proper history is the most important thing</b></li> <li>2. <b>Blood Culture:</b> <b>the most important diagnostic method in 1st wk</b>, the blood culture depends on the time of the presentation, the later the patient presents to you the less the value of blood culture. If the patient presents on the 1st week don't do a stool culture, <b>DO A BLOOD CULTURE.</b> <ul style="list-style-type: none"> <li>✓ <b>BUT !!!!</b>If someone is taking antibiotics, his blood culture will be negative even if he has the infection, but bone marrow culture is more accurate and will be positive.</li> </ul> </li> <li>3. <b>stool cultures:</b>The faeces contain the organism more frequently in the second and third weeks.</li> </ol> <p>►<b>Note about Blood Cultures in Typhoid Fevers :</b> Bacteremia occurs early in the disease Blood Cultures are positive in(1<sup>st</sup> week in 90%, 2<sup>nd</sup> week in 75%, 3<sup>rd</sup> week in 60%, 4<sup>th</sup> week and later in 25%).</p> <p>►<b>What about other tests:</b></p> <ul style="list-style-type: none"> <li>- WBC <b>might be normal, or leukopenia</b>(typically in 1st wk)</li> <li>- ESR <b>not diagnostic,but it can be helpful in follow up/response to treatment</b></li> <li>- Widal test (serum agglutination test). It has cross reactions– false positives. Also false negatives. <i>Not a good test. Useless test, does not have a diagnostic value, waste of money</i></li> </ul>			
<b>Treatment</b>	<ol style="list-style-type: none"> <li>1. Fluoroquinolones, like ciprofloxacin are the <b>drugs of choice</b> for treatment of typhoid fever,but resistance is common</li> <li>2. 3rd generation cephalosporins, like Ceftriaxone are effective as alternative to fluoroquinolone</li> </ol> <p>►<b>Notes:</b></p> <ul style="list-style-type: none"> <li>- Fever may continue for several days after starting therapy.</li> <li>- The majority are cured with antibiotics.</li> <li>- 10% may relapse.</li> </ul>			
<b>Prevention and control</b>	<p><b>Control measures:</b></p> <ul style="list-style-type: none"> <li>● Health education</li> <li>● Antibiotic treatment</li> <li>● <b>Excluding disease carriers from food handling.</b></li> <li>● A <b>vaccine</b> is available recommended for travelers to high risk areas. It does not provide full protection.</li> </ul>			

<p><b>Definition</b></p>	<ul style="list-style-type: none"> <li>● Systemic febrile illness</li> <li>● It occurs worldwide. It is very common, can mimic any disease (The great mimicker)</li> <li>● <b>Zoonosis.</b></li> <li>● Although six species of bacilli are known ,B. melitensis and B. abortus are the most frequent.</li> <li>● The incubation period is <b>1 – 4 weeks.</b></li> </ul>	
<p><b>Differential Dx</b></p>	<p><b>Typhoid fever/ Tuberculosis/ Infective endocarditis/ Collagen vascular disease/ lymphoma.</b></p>	
<p><b>Transmission</b></p>	<p>Infection transmitted to humans by: <b>There are different ways of getting the disease</b></p> <ol style="list-style-type: none"> <li>1. <b>Contact with fluids or meat from infected animals</b> (sheep, cattle, goats, pigs, camels or other animals)</li> <li>2. Eating food products such as unpasteurized <b>milk and cheese</b> .</li> <li>3. The disease is rarely, if ever, transmitted between humans.</li> </ol>	
<p><b>Pathogenesis</b></p>	<p>Enters the body → To lymph nodes → To bloodstream → Reticuloendothelial System → Blood → Any organ.</p>	
<p><b>Clinical Manifestations</b></p>	<p>Often fits one of the three pattern:</p> <ul style="list-style-type: none"> <li>- Acute febrile illness resembling typhoid.</li> <li>- Fever &amp; acute mono-arthritis (hip/knee). <b>it could be septic arthritis or reactive arthritis</b></li> <li>- low grade fever, low back pain, hip pain.</li> </ul>	
	<p><b>Symptoms</b></p>	<p>Fever, Night sweats, Fatigue, Anorexia, Weight loss, Arthralgia, Low back pain, Depression <b>Patients could present with mental changes (psychosis)</b></p>
	<p><b>Signs</b></p>	<ul style="list-style-type: none"> <li>○ Arthritis</li> <li>○ Lymphadenopathy</li> <li>○ Hepatosplenomegaly</li> </ul>
<p><b>Localised Brucellosis</b></p>	<p><b>Osteoarticular disease</b></p>	<p>especially sacroileitis, vertebral spondylitis and large joints arthritis</p>
	<p><b>Genitourinary disease</b></p>	<p>especially epididymo-orchitis</p>
	<p><b>Neurobrucellosis</b></p>	<p>usually presenting as <b>meningitis</b>, radiculopathy (is a condition due to a compressed nerve in the spine that can cause pain, numbness, tingling, or weakness along the course of the nerve)</p>
	<p><b>Abscess</b></p>	<p>involving the liver, spleen, abdomen (<b>abdominal pain + fever</b>)</p>
<p><b>Investigations</b></p>	<ul style="list-style-type: none"> <li>● <b>WBC</b> might be normal or leukopenia</li> <li>● <b>ESR</b> could be elevated in acute infection</li> <li>● <b>Blood cultures (Definitive diagnosis)</b> (slow growth = 4 weeks) you have to inform the lab to a suspected diagnosis of brucellosis for 2 reasons : 1) The majority of blood cultures will be thrown away within a week. Brucella grows within 5-7 days (minimal) and sometimes this require 5-6 weeks. 2) Brucella is <b>very contagious</b> has a propensity for infecting laboratory workers.</li> <li>● <b>Serology:</b> helpful in diagnosing Acute infection, SAT (serum agglutination test) positive in recent infection <b>does not indicate the severity of the disease</b> <ul style="list-style-type: none"> <li>→ single high antibody titre of more than 1/320 or a fourfold rise in titre is needed to support a diagnosis of acute infection</li> </ul> </li> </ul>	

<b>Treatment</b>	<b>Uncomplicated</b>	<ul style="list-style-type: none"> <li>○ Streptomycin (10 days) + Doxycycline for 6 weeks <b>the best combination</b></li> <li>○ <b>Rifampicin</b> + Doxycycline for 6 weeks (<b>however</b> In areas where <b>TB is common</b> like KSA <b>rifampicin should be preserved</b> for the treatment of TB only <b>الدكتور انهار على هالنقطه</b>. Try not treat a patient with brucellosis with rifampicin in order not to make him resistant to this drug which worsen the situation if he get infected with TB. It is used for few indications (use it for brucella endocarditis, Neurobrucellosis (meningitis) pregnancy or children because you cannot use streptomycin or doxycycline). In France or Australia you can use rifampicin to treat brucellosis because TB is not common there.</li> <li>○ TMP/SMX + Doxycycline for 6 weeks</li> </ul>
	<b>Complicated</b>	<p>requires longer duration of treatment depending on the patient's response</p> <ul style="list-style-type: none"> <li>→ Endocarditis, meningitis</li> <li>→ No uniform agreement</li> <li>→ Usually 3 antibrucella drugs for 3 months</li> </ul>
<b>Relapse</b>	<ul style="list-style-type: none"> <li>- About 10% of patients relapse after therapy. <b>may be due to inadequate duration of treatment</b></li> <li>- Most relapses occur within three months following therapy and almost all occur within six months.</li> <li>- Relapse should prompt assessment for a focal lesion, especially hepatosplenic abscess</li> <li>- Most relapses can be treated successfully with a repeat course of a standard regimen.</li> </ul>	


**Treated Brucellosis**



Persistente IgG means the dis is active  
While if IgM appears it means the dis has been eradicated

<b>Gastroenteritis</b>		
<b>Case :</b> A 22 year old student presented with nausea, abdominal pain and diarrhea for 2 days. On examination, he was febrile with mild periumbilical tenderness.		
	<b>Intestinal Amebiasis</b>	<b>Giardiasis</b>
<b>Transmission</b>	By cysts (infective stage) → Excreted in stool	
<b>Presentation</b>	<ul style="list-style-type: none"> <li>- Asymptomatic</li> <li>- acute dysentery</li> <li>- chronic amebiasis</li> <li>- Causes invasive colitis</li> </ul> <p>*since it has unique ability to produce enzymes that lyses host tissue</p>	<ul style="list-style-type: none"> <li>- Mostly Asymptomatic</li> <li>- mild to moderate :abdominal pain , flatulence,since it Colonise upper small intestine.</li> <li>- May become chronic.</li> </ul>
<b>Complications</b>	May cause complications Since it has the ability to invade the tissue we should expect the "peritonitis" as one of the possible complication, also through perforation it can go to invade the liver and causes <b>liver abscess</b>	-
<b>Diagnosis</b>	stool microscopy( <b>diagnostic</b> ) , serology	stool microscopy( <b>diagnostic</b> )
<b>Treatment</b>	Metronidazole	






## Viral haemorrhagic fevers: (Dengue fever حمى الضنك)

<b>Dengue Virus</b>	<ul style="list-style-type: none"> <li>● Dengue is a febrile illness caused by a <u>arbovirus</u> transmitted by (<u>mosquitoes</u>: Aedes Aegypti)</li> <li>● Causes <b>dengue and dengue hemorrhagic fever</b></li> <li>● Dengue virus Composed of single-stranded RNA</li> <li>● There are four serotypes of dengue virus(DEN-1, 2, 3, 4), all producing a similar clinical syndrome.</li> </ul>	 <p style="text-align: center;"><u>Aedes aegypti Mosquito</u></p>
<b>Dengue Clinical Syndromes</b>	<ul style="list-style-type: none"> <li>● Undifferentiated fever</li> <li>● Classic dengue fever</li> <li>● Dengue hemorrhagic fever</li> <li>● Dengue shock syndrome</li> </ul>	
<b>Clinical Characteristics of Dengue Fever</b> <small>'acute onset 2-7 days incubation period'</small>	<ul style="list-style-type: none"> <li>● Fever ('break-bone fever')</li> <li>● Headache</li> <li>● <b>Muscle and joint pain</b> severe pain <span style="color: blue;">بيقول لك أحس عظامي قاعدة تتكسر</span></li> <li>● Nausea/vomiting</li> <li>● Rash</li> <li>● <b>Hemorrhagic</b> manifestations discussed below</li> </ul>	
<b>Hemorrhagic Manifestations of Dengue</b>	<ul style="list-style-type: none"> <li>● <b>Skin hemorrhages:</b> petechiae, purpura, ecchymoses</li> <li>● <b>Gingival bleeding</b></li> <li>● <b>Nasal bleeding</b></li> <li>● <b>Gastrointestinal bleeding:</b> hematemesis, melena.</li> <li>● <b>Hematuria</b></li> <li>● <b>Increased menstrual flow</b></li> </ul>	
<b>Danger Signs in Dengue Hemorrhagic Fever</b>	<p style="color: blue;">Warning signs Needs medical intervention eg:IV :</p> <ul style="list-style-type: none"> <li>● Abdominal pain - intense and sustained</li> <li>● Persistent vomiting</li> <li>● Abrupt change from fever to hypothermia, with sweating and prostration</li> <li>● Restlessness or somnolence</li> </ul>	
<b>Prevention</b>	<ol style="list-style-type: none"> <li><b>1. Elimination &amp; destruction of mosquitos and larval habitat:</b> <ul style="list-style-type: none"> <li>→ Space Spraying of insecticide is not usually effective.</li> <li>→ Spraying residual insecticides in-door.</li> <li>→ Larval source reduction : Cover water holding containers.</li> </ul> </li> <li><b>2. Personal protection against mosquito biting:</b> <ul style="list-style-type: none"> <li>→ Screening</li> <li>→ Protective clothing</li> <li>→ Repellents <span style="color: blue;">طارد الحشرات</span></li> </ul> </li> <li><b>3. Centralized, vertically-structured programs with military-type organization, strict supervision, high level of discipline.</b></li> <li><b>4. Vaccine not yet available, though human trials conducted</b></li> </ol>	
<b>Treatment</b>	<ul style="list-style-type: none"> <li>● No existing antivirals are effective.</li> <li>● Treatment is supportive, Symptomatic treatment <span style="color: blue;">treat it as early as possible to avoid complications</span></li> <li>● Hydration emphasising fluid replacement and appropriate management of shock</li> <li>● Avoid NSAIDS or Aspirin (<span style="color: blue;">Antiplatelets = more bleeding</span>), only acetaminophen for fever, headache or arthralgia</li> <li>● Platelet transfusion only if platelets &lt;10-20</li> </ul>	

## Viral haemorrhagic fevers:(Rift valley fever حمى الوادي المتصدع)

<b>What is rift valley fever?</b>	<ul style="list-style-type: none"> <li>Rift Valley fever (RVF) is an acute, fever-causing viral disease that affects domestic animals and humans.</li> <li>Reservoir: domestic livestock <b>الماشية المحليه</b> (such as cattle, buffalo, sheep, goats, and camels)</li> <li>Transmission: Contact with animals, mosquito or other insect bites → <b>RVF is most commonly associated with mosquito-borne epidemics during years of unusually heavy rainfall.</b></li> <li>The disease is caused by the RVF virus, a member of the genus Phlebovirus in the family Bunyaviridae. The disease was first reported among livestock by veterinary officers in Kenya in the early 1900s.</li> </ul>
<b>Clinical features of severe disease</b>	Haemorrhage, blindness, meningoencephalitis (complications only in a minority)
<b>outbreak of rift valley fever</b> <i>just Read it</i>	<ul style="list-style-type: none"> <li>On 11 September 2000, the Ministry of Health (MOH) of the Kingdom of Saudi Arabia (Riyadh) received reports of unexplained severe hepatitis in 7 patients from Jizan region. A team from the MOH started investigations within 24 h after notification. Clinical manifestations included low-to-moderate-grade fever, abdominal pain, vomiting, diarrhea, and elevated liver enzyme levels progressing to liver failure, encephalopathy or encephalitis, disseminated intravascular coagulation (DIC), renal failure, and, in 5 of the 7 patients, death.</li> <li>Next outbreak was reported in Yemen.</li> <li>Now Rift valley fever is considered to be at a low level of endemicity in Saudi Arabia</li> </ul>
<b>Treatment</b>	Symptomatic
<b>Vaccination</b>	Vaccines for veterinary use are available <a href="#">there is a vaccine for animals only</a>

## Leishmaniasis

<b>Definition</b>	Leishmaniasis is a <b>protozoal disease</b> caused by Leishmania parasite, which is transmitted by the <b>sand fly</b> .	
<b>Leishmaniasis in Saudi Arabia</b>	<ul style="list-style-type: none"> <li>It is known in the Kingdom since 1950. <b>Now, it is less common</b></li> <li>Ministry of Health established the Leishmaniasis unit in the 1980s to follow the disease in the country.</li> </ul>	
<b>Types</b> <a href="#">Video - 3:16 minutes</a>	<b>Cutaneous leishmaniasis</b>	<ul style="list-style-type: none"> <li>Geographic distribution in 2004: 26.6% in Qassim, 20.6% in Alhasa, 18.5% in Medina, 9.1% in Hail, 4.1% in Riyadh and aseer</li> <li>The incubation period is 2–3 mths (range 2 wks to 5 yrs).</li> <li>The characteristic lesions of CL are <b>ulcerated papules</b> that form at the site of a vector bite. They may be single or multiple</li> </ul> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p><b>Types of Cutaneous Leishmaniasis</b></p>  <p>Hyperkeratotic</p>  <p>Mucosal</p> </div> <div>    <p>Plaque      Recidivans      Erysipeloid</p> </div> </div>
	<b>Mucocutaneous</b>	<ul style="list-style-type: none"> <li>This is characterised by thickening, erythema and later ulceration of the <u>nasal mucosa</u>, typically starting at the junction of the nose and upper lip. The lips, soft palate, fauces and larynx may also be invaded and destroyed.</li> <li>There is no spontaneous healing, and death may result from severe respiratory tract infections due to massive destruction of the pharynx.</li> </ul>



	<b>Visceral (Kala azar= black fever)</b>	<ul style="list-style-type: none"> <li>- Most commonly seen in : Baha, Aseer and Jazan</li> <li>- VL can present unexpectedly, e.g. after blood transfusion, in immunosuppressed patients after transplantation and in HIV infection.</li> <li>- It is predominantly a childhood disease, except in adults with HIV</li> <li>- Clinical Features:<b>Pancytopenia is a common feature</b> ,<b>Splenomegaly</b> develops quickly in the first few weeks and becomes massive as the disease progresses. hepatomegaly&amp; Lymphadenopathy occurs later.</li> <li>- kala-azar (the Hindi word for 'black fever'), is a feature of advanced illness and is now rarely seen.</li> </ul>
--	--	---

<b>Middle East respiratory syndrome coronavirus (MERS CoV)</b>	
<b>Outbreak</b> just Read it	<ul style="list-style-type: none"> <li>● 2012 emerged in Saudi Arabia</li> <li>● 2014 March -April increased dramatically in Arabian Peninsula → declined sharply in ensuing months. → still detected cases</li> <li>● 2015 May -early July : in South Korea : large outbreak (the index case was an individual who had traveled to the Arabian Peninsula )</li> <li>● 2015: large outbreak began in a hospital in Riyadh, Saudi Arabia <a href="#">due to lack of infection control</a></li> </ul>
<b>Where Does the Virus Come From?</b>	<ul style="list-style-type: none"> <li>● Partial sequence found in <b>bat</b> in Saudi Arabia near location of human case</li> <li>● Growing evidence that <b>camels play an important role</b> in transmission across the region</li> <li>● Virus has been detected in dromedary camels in: Qatar, Saudi Arabia and Egypt</li> <li>● Antibodies have been found in camels in: (Cross reactivity) Jordan, Tunisia, Ethiopia, Nigeria, Egypt, Saudi Arabia, Canary Islands, UAE</li> <li>● <b>MERS-CoV likely widespread in camels throughout region</b></li> <li>● <b>Transmission likely occurring from camel to human</b></li> </ul>
<b>Diagnosis</b>	Real-time reverse-transcriptase polymerase chain reaction (rRT-PCR) for respiratory secretions.
<b>Treatment</b>	<ul style="list-style-type: none"> <li>★ <b>Treatment is mainly SUPPORTIVE.</b><a href="#">If pt stable does not have respiratory failure, let him stay at home no need to admit him</a></li> <li>★ <b>No vaccine available</b></li> <li><b>EXPERIMENTAL TREATMENT:</b> Read it just in case             <ul style="list-style-type: none"> <li>→ Convalescent plasma</li> <li>→ IVIG Intravenous immunoglobulin</li> <li>→ IFN Interferon</li> <li>→ Protease Inhibitors used In HIV infection</li> <li>→ Ribavirin</li> <li>→ Corticosteroids</li> <li>→ Nitazoxanide broad-spectrum antiparasitic and antiviral drug</li> <li>→ Cyclosporin A</li> <li>→ Combination therapy</li> </ul> </li> </ul>



## Other Endemic Diseases of Saudi Arabia:

- Malaria is endemic in Saudi Arabia
- Tuberculosis is endemic in Saudi Arabia
- These are amongst the most important of the endemic diseases.
- Malaria and Tuberculosis have been covered fully in lectures previously.

## MCQs

**1) A 40 year old farmer presented to the emergency room with fever and joint pain . your initial diagnosis was brucellosis. what is the most appropriate lab investigation to establish diagnosis ?**

- A. standard tube agglutination test
- B. brucella test less than 160
- C. serology test
- D. blood culture

**2) A 51-year-old man presents to accident and emergency with a lesion on his forearm. He mentions that he has spent the past three months travelling around South America and only returned home 3 days ago. While his lesion has been present for a few weeks he was reluctant to see a doctor in South America. On examination, there is a 3 × 3 cm erythematous ulcer on the left forearm with a raised edge. What is the most likely diagnosis?**

- A. Leishmaniasis
- B. African trypanosomiasis
- C. Herpes zoster
- D. Schistosomiasis

**3) Which of the following combinations should be used to treat a Saudi guy who has been diagnosed with Brucella infection?**

- A. Streptomycin + Doxycycline
- B. Rifampicin + Streptomycin
- C. Rifampicin + tetracycline
- D. Rifampicin + Ceftriaxone

**4) A 27-year-old woman, who has recently returned from holiday in Africa, presents to accident and emergency with a 7-day history of fevers, sweats, headache, malaise and lethargy. On examination, her temperature is 39°C. Cardio respiratory and gastrointestinal examinations are unremarkable. What is the most likely differential diagnosis?**

- A. Malaria
- B. Tuberculosis
- C. Typhoid
- D. Dengue fever

### Answer key:

1 (D) | 2 (A) | 3 (A) | 4 (A)