

BIOLOGICAL THREATS IN DIVING LOCATIONS

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ABSTRACT

Diving locations can pose various risks to divers. Health problems can be caused by, among other things, pathogenic microorganisms as well as flora and fauna endemic to the region. This paper discusses the consequences of exposure to biological pathogens endemic to the Red Sea region and possible preventive measures that can be taken before and during a diving expedition.

Keywords: diving, Red Sea, biological threats.

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INTRODUCTION

Interest in scuba diving as a form of physical activity is growing every year. It is estimated that there are more than 6 million active divers worldwide, who practise the sport as recreational or professional activity. The Red Sea region, and Egypt in particular, ranked second place on the list of most visited countries in 2021 [1,2]. In addition to beautiful beaches and numerous historical sites, it is one of the most popular diving destinations in the world (especially for Europeans).

Being exposed to a hyperbaric environment poses a number of risks to the diver. Physiological ones may include the state of health, water pressure, toxic effects of hyperbaric gases or the effects of temperature on the human body [3,4].

Among the psychological risks associated with being in a different environment are emotions such as fear, panic or euphoria. Other aspects relate to the equipment - its reliability, quantity, weight - and especially the ability to handle it in emergency situations [3,5].

The environment (both the geographical region and the dive site) can also pose diving hazards. The dangers include the possibility of getting lost (e.g. in underwater caves), the effects of strong currents, the possibility of getting entangled in nets or caught in other underwater obstacles, dangerous wrecks, as well as dangerous marine animals and pathogenic microorganisms endemic to the site/region [6].

Many authors believe that international travel is one of the main causes of the spread of infectious diseases, including so-called emerging infectious diseases (EIDs). It has been estimated that as many as 43-79% of travellers from European or North American countries may experience travel-related health problems during or after travel to a developing country [7].

People travelling to tropical and subtropical countries should take particular care of their health safety. It is extremely important to be aware of potential biological hazards, especially those typical of a particular diving site. The tour operator is obliged by law to inform the customer of the specific health and life risks in visited destinations and of the possibility of taking precautions against them (Act on Hotel Services and Tourist Guides of 29 August 1997, Article 13) [8]. However, regardless of whether the expedition is organised by a tour operator or individually, travellers should be aware of preventive measures both before the trip and at the dive site.

THREATS FROM FOODBORNE AND WATERBORNE PATHOGENS

Foodborne and waterborne diseases, mainly diarrhoeal ones, pose the greatest risk to travellers. They are caused by bacteria (*Escherichia coli*, *Salmonella*, *Shigella*, *Campylobacter*) and less commonly by viruses (HAV, Norwalk, adenoviruses and rotaviruses) [9].

TRAVELLERS' DIARRHOEA (TD)

Travellers' diarrhoea includes signs and symptoms caused by a digestive track disorder. It is the most common health problem experienced during travels to poor hygiene countries. Estimates suggest that TD may affect between 40% and 60% of travellers [10].

Enterotoxigenic *Escherichia coli* is the most common pathogen of travellers' diarrhoea. Other infectious agents include bacteria (*Salmonella*, *Shigella*, *Campylobacter*), viruses (Norwalk, adeno- and rotaviruses), and protozoa (*Entamoeba histolytica*, *Giardia intestinalis*, *Cryptosporidium parvum*). Symptoms are usually acute gastrointestinal infections such as diarrhoea (bloody or watery), dehydration, abdominal pain, nausea, vomiting and fever. The first symptoms usually appear within 2-3 days after arrival at the destination. Diarrhoea persists for 3-4 days, occasionally it can last for more than a week. Episodes of TD are usually mild and self-limiting, but dehydration can lead to fever, fatigue, malaise, cravings for sweets, and headaches and can be fatal [11].

Pre-travel chemoprophylaxis is not recommended. Exceptions are those at high risk of developing severe diarrhoea (e.g. patients with hypochlorhydria, diabetes, mobility impairment, or patients with inflammatory bowel disease) [12]. Only bismuth subsalicylate (BSS) can be considered for any traveller to prevent travellers' diarrhoea [13].

In acute diarrhoea, short-term (usually one day) fasting is recommended and drinking rehydration fluids. During this period, it is advisable to avoid vegetables and fruit (elimination of fibre), stimulants, milk, and fluids containing caffeine [14].

HEPATITIS A VIRUS (HAV)

It is transmitted mainly by the faecal-oral route, from person to person and by eating contaminated food or drinking contaminated water. In rare cases infection can be transmitted through blood. HAV is responsible for approximately 1.5 million reported cases and tens of millions of infections per year. HAV infection rates are high in developing countries due to lack of sanitation and hygiene practices [15,16].

The incubation period for hepatitis A is usually 14-28 days. Typical clinical signs of hepatitis A infection include jaundice, fever, malaise, nausea and abdominal discomfort [17].

Travel-related HAV accounted for almost 30% of reported hepatitis A cases in Europe between 2009 and 2015. The destinations most at risk for European travellers were Turkey, Egypt and Morocco; they accounted for more than 30% of all hepatitis A infections acquired abroad. Egypt is considered an HAV endemic country. 50% or more of the Egyptian population is already exposed to HAV infection by the age of 15 [18,19].

Hepatitis A infections can be prevented by vaccination as safe and effective vaccines have been available for decades.

TYPHOID

Typhoid is an acute infectious disease caused by *Salmonella typhi* bacteria. The only reservoir of the bacteria is humans who can carry it in their intestines for a very long time (chronic carriers) and transmit the bacteria to others (directly or through contamination of food or water). Other established risk factors include eating ice cream, flavoured frozen drinks or food from street vendors, and raw fruit and vegetables grown in fields fertilised with sewage [20].

After a 1-2 week incubation period, the disease is characterised by gradually progressive fever, fatigue, loss of appetite, abdominal pain, diarrhoea or

constipation, rash and enlargement of the spleen. Serious complications such as intestinal perforation, peritonitis, septicaemia, encephalitis or neuropsychiatric disorders may develop [21,22].

There are an estimated 26 million cases of typhoid fever worldwide each year, causing 215, 000 deaths [22]. The highest risk is involved in travelling to parts of Asia, its major southern countries and their neighbours, Africa, and some South American countries. A study conducted in Fayoum province and reported in 2006 estimated the incidence of typhoid fever at 59/100 000 people per year, with the highest incidence among school-aged children. Of 128 children and adult patients at Benha Fever Abd El-Ghany-Hospital, 34 were infected with typhoid fever [23,24].

The high incidence of salmonellosis in Egypt may be related to insufficient information on the significance and spread of the disease, behavioural, environmental and socio-economic factors, as well as a lack of information on possible routes of transmission and appropriate control measures. Antibiotic therapy has radically changed the prognosis of typhoid fever, which, untreated, has a 10% mortality rate [25].

Preventive measures include good personal and food hygiene. An effective vaccine is also available.

FEVERS OF UNKNOWN ORIGIN (FUO)

Fevers of unknown origin are characterised by a temperature $\geq 38.3^{\circ}\text{C}$ persisting for at least three weeks, the cause of which cannot be established despite inpatient diagnostic work-up for a minimum of one week. It is also defined as a fever that does not resolve spontaneously within the timeframe provided for self-limiting illnesses, the cause of which cannot be established despite extensive diagnostic investigations [26].

Along with gastrointestinal disorders, respiratory infections and skin diseases, FUO are one of the most common health problems diagnosed in travellers returning from tropical and subtropical countries. They can be a symptom of various diseases, most often of infectious or invasive aetiology [27].

The most common cause of FUO in people returning from tropical and subtropical climates is malaria. In Egypt, only in the province of El Faiyûm the risk of malaria caused by *Plasmodium falciparum* and *Plasmodium vivax* is low from June to October. But no indigenous cases have been reported since 1998 [28].

Other conditions with persistent fever include dengue fever, typhoid fever, hepatitis A, bacterial diarrhoea and rickettsioses. Fever can also be a symptom of cosmopolitan diseases common in temperate climates, such as respiratory or urinary tract infections. It may also accompany other conditions or injuries (skin rashes, burns) [21].

A study by Gautret et al. showed that dengue was the second most common cause of fever among travellers after malaria [29].

DENGUE

A disease caused by a virus that is spread by mosquito bites (mainly *Aedes aegypti*). In most cases, the disease is asymptomatic (80%) or mild (10-15%). A severe form of dengue (with haemorrhagic symptoms) is rare and usually occurs with repeated infection (usually 3rd or 4th time). After an incubation period of 8-10 days,

mild flu-like symptoms initially appear. The disease also progress to an acute form, which begins with a fever above 38°C . There is also a headache, extraocular eye pain, muscle pain, bone pain, joint pain, weakness, rash. Dengue does not occur in areas above 1,500m above sea level.

Currently, dengue is endemic in 128 countries, mainly in developing ones (Africa, South-East Asia, South and North America), threatening an estimated 3.97 billion people annually [30]. A 30-fold increase in the incidence of the disease has been observed over the past 50 years [31]. According to data from Egypt, there was a dengue outbreak (253 cases) in the Dayrout district of Assiut province in 2015 [32]. In 2017, a total of 110 people were confirmed to have dengue fever (DF) in the city of Quseir on the Red Sea coast and in the province of Qena in Upper Egypt [33]. As a result, Egypt has been identified as a country with an intermediate probability of dengue infection on the global dengue map. The outcome results of Mostafa's study showed that the Red Sea Governorate has a high prevalence of *Ae. aegypti* and consequently a potentially increasing incidence of dengue fever [34].

Currently, there is no vaccine and no preventative medicine. Prevention of the disease consists in protecting against mosquito bites by using repellents and mosquito nets, wearing loose clothing to cover parts of the body exposed to bites at all times of the day and checking the room in which we sleep for the presence of insects, especially immediately before going to bed.

WEST NILE FEVER

West Nile fever is a viral disease transmitted by mosquitoes, which, along with wild birds, are the reservoir of the virus. Human infection occurs through mosquito bites. Transmission of the virus during organ transplants and blood transfusions, from mother to child during pregnancy and through breast milk has also been confirmed. It is estimated that about 80 % of infections are asymptomatic. Symptoms, such as fever, fatigue, headaches, muscle weakness and difficulty concentrating may appear 1-6 days after the mosquito bite. Between 5 and 12 days after the onset of symptoms, maculopapular rash may appear.

The severity of symptoms depends on the age of the infected person. In children it is often mild fever and malaise, in adolescents there is high fever, redness of the conjunctivae, headache and muscle pain, while the elderly may develop encephalitis and meningitis and general emaciation as a result of the infection.

Incidence is observed in many regions of the world, including East and West Africa, North America, South and South-East Asia, and Europe [35]. The prevalence of WNV-IgG antibodies in the Egyptian population is 24% [36]. The low incidence and hospitalisation rates, together with the high WNV seroconversion rate suggest that the disease is widespread in Egypt, but probably for the country's population its course is mild [37]. However, there are no widely available data on cases imported by travellers.

No specific therapy is available for the treatment of West Nile fever nor there is vaccine against the disease. Non-specific prophylaxis is necessary. The main method of preventing the disease consists in reducing exposure to mosquito bites.

LEPTOSPIROSIS

The disease occurs all over the globe, but is most common in temperate or tropical climates. It is estimated to affect more than 1 million people worldwide every year, with mortality rate ranging between 5 and 10%.

Infection occurs in contact with animals that excrete spirochetes with urine or other excretions (except saliva). The bacteria can pass through the skin (mainly damaged skin) or through the eyes, nose and mouth [38].

The incubation period of leptospirosis lasts 5-14 days. In 90% of patients, its course is mild with sudden flu-like symptoms such as headache, muscle aches, sore throat, fever, chills, cough, which may be accompanied by nausea, vomiting, loss of appetite, diarrhoea and skin lesions in the form of a rash. Symptoms usually last 5-7 days and then resolve spontaneously. In about 50% of patients, features of meningitis with headache and neck stiffness may persist for 1-2 weeks, but they also resolve spontaneously. After a few days of improvement, the disease may progress to severe hepatic and renal failure, sometimes with multiple organ failure. This form is referred to as Weil's disease.

The risk of contracting leptospirosis can be significantly reduced by not swimming or wading in water that may be contaminated with animal urine, or by eliminating contact with potentially infected animals [39].

There is no vaccine available. Travellers who may be at increased risk of infection should consider chemoprophylaxis. Wearing protective clothing, especially footwear, and covering cuts and abrasions with occlusive dressings are recommended. Limited studies have shown that chemoprophylaxis with doxycycline (200 mg administered orally once a week), started 1-2 days before and continued throughout the exposure period, can be effective in preventing clinical disease in adults and may be considered in high-risk individuals and those with short-term exposure [40].

THREATS FROM PARASITIC DISEASES

Parasitic diseases are a common health problem for travellers to countries in the hot climate zone. Some carry the risk of dangerous complications, e.g. strongyloidiasis, schistosomiasis, invasive amoebiasis, and filariasis [41]. Parasitic infections can persist for many months with no or only mild symptoms. In some parasitoses, however, the infected person can infect others (in intestinal parasitoses, e.g. amoebiasis, giardiasis).

SCHISTOSOMIASIS

Schistosomiasis has plagued the Egyptian population since ancient times. Although its incidence exhibits a downward trend, the disease continues to be a public health issue in Egypt. Before the HCV epidemic, schistosomiasis was one of the major public health problems in Egypt [22,42].

It is a systemic parasitic disease caused by trematode worms of the genus *Schistosoma*, which live in certain types of freshwater snails. Human infection occurs by active penetration of cercariae through the skin while bathing in contaminated water. The incubation period lasts from three to seven weeks. Maculopapular rash, erythema, pruritus may develop minutes after exposure and disappear within 24-72 hours of infection. Fever, chills, cough and muscle aches may begin within one to

two months of infection. Most people have no symptoms at first, but untreated schistosomiasis can cause more serious health problems, e.g., kidney and bladder symptoms such as haematuria [21].

Although the salty waters of the Red Sea are free of this parasite, one needs to bear in mind that being in freshwater can expose one to infection.

In a study by Hammam et al, the prevalence of *S. haematobium* infection was observed among fishermen working on Lake Nasser. The decrease in the prevalence of *S. haematobium* infection from 67% reported in 1974 and 1975 to 18% in 1980 and 20% in 1981 was attributed to the widespread use of metrifonate in Upper Egypt from 1975 onwards [43].

There is no vaccine against the disease and treatment of schistosomiasis consists in taking antiparasitic drugs.

To avoid an infestation of flukes of the genus *Schistosomiasis*, swimming and wading in natural bodies of water such as rivers, lakes, ponds and various wetlands should be avoided, as well as drinking unboiled water from these sources. Water becomes drinkable after using filters with a pore size of 30 micrometres or less, heating the water at 50 degrees Celsius for 5 minutes, or leaving the water collected in a container for at least 24 h (during this time, in standing water, the parasites die) [44].

DANGEROUS MARINE ANIMALS OF THE RED SEA BASIN

Being in an aquatic environment in the Red Sea region exposes humans to many dangers from the flora and fauna that live there.

Stinging invertebrates (cnidarians) are the most common dangerous marine animals. Less common than stinging invertebrates and easier to recognise are venomous marine vertebrates which, however, can be much more deadly. Although sharks pose the greatest threat to divers, bites from other marine animals can be painful, infectious and require extensive treatment.

Many fish (e.g. stonefish, rockfish), coelenterates (including jellyfish), sea anemones, corals, snails, worms, sea urchins or sponges are armed with venom spikes or nematocysts. Toxic substances produced by venomous animals belong to one of three groups: neurotoxins, cytotoxins or enzymes. The amount of venom to which a person is exposed is not always life-threatening, however, contact with toxins almost always causes pain.

COELENTERATES – JELLYFISH, SEA ANEMONES, CORALS

Jellyfish species are found in all warm seas. Many of them may inflict burning pain on the victim when human body comes into contact with their tentacles. Experienced symptoms can be local and sometimes, under the influence of the venom of some species, general. Locally, erythema, burning sensation, pain of varying degrees of severity, rash, itching, blisters filled with serous fluid or subcutaneous petechiae are noticeable. There is swelling and redness around the site of contact with the tentacles, which may persist for up to several days. Rarely, skin ulceration and necrosis occur. General symptoms include dyspnoea, abdominal pain, muscle twitching, and rarely loss of consciousness or respiratory distress. In individual cases, especially in the elderly, those with circulatory failure or those with allergies, acute circulatory failure, pulmonary oedema

and death can occur [45].

The Portuguese man o'war (*Physalia physalis*) venom burn is particularly dangerous. It has a distinctive bladder that floats it on the surface of the water, which also acts as a sail. The Portuguese man o'war has got very potent nematocysts, which can be dangerous to humans. Its venom includes protein neurotoxins, histamine and enzymes. Depending on the amount of venom injected and the area of the burn, redness and a maculopapular rash occur, accompanied by severe pain and burning, followed by blistering. The central effects of the venom lead to nausea, vomiting, muscle spasms, acute renal failure, coma and death. In cases of massive contact, only the administration of a specific serum can save the diver's life [46].

Sea anemones have similar skin irritating properties to jellyfish. A mixture of several toxins (thalassine, congestin, tetramine) has been found in their nematocysts. Contact with such an anemone causes itching, a burning sensation, blisters followed by skin necrosis may occur. The skin lesions are accompanied by general symptoms, which include weakness, high fever, muscle tremors and severe headaches.

Some types of coral, from the family *Milleporidae*, can cause skin irritation making them dangerous for divers. In the Red Sea a particularly well-known coral is the so-called 'fire coral' [47,48].

ECHINODERMS – SEA URCHINS

The most common representatives of this group are sea urchins. They inhabit the bottom zone of saline waters with salinities above 20‰ of all geographical zones. They are found in the coastal zone, from a few centimetres to several metres.

Thorn-like spikes provide an apparatus for movement and defence against intruders. They penetrate the skin very easily, break off, and the residues remaining in the wound are difficult to remove, causing inflammatory reactions. In the zone between the normal spikes, there are shorter ones supplied with venom glands. In some sea urchin species, venom is found in all types of spikes. If the venom enters human body, it causes immediate burning, redness, swelling and then blisters. Stinging by many sea urchins can result in limited muscle paralysis or general inflammation. The handling of sea urchin stings is analogous to that of other venomous animals, however, surgical removal of spike fragments is necessary [49].

SEA SNAILS

Some sea snails can be dangerous to humans. Venomous marine gastropods include cone snails and terebrids. They have a venom gland, connected by an excretory duct to a sharp spike located at the end of a flexible funnel that serves as a sensory organ; when they feel threatened, the sharp spike, extends from the funnel and the venom enters the body of the prey. The action of the venom blocks nerve conduction. The local injury is often a small, unnoticeable wound, around which cyanosis, sensory and muscular mobility abnormalities occur in rapid succession, accompanied by acute radiating pain. Severe cases can result in paralysis, visual and auditory dysfunction, cardiac arrhythmias, drop in blood pressure, respiratory muscle paralysis, unconsciousness and death. In view of the absence of specific serums, the

correct emergency management consists of tourniquet application and conservative treatment [50].

BIVALVE MOLLUSCS

Tridacna (maxima clam) is a genus abundant in the Red Sea. These particularly large bivalves, reaching weights of up to 300 kg and diameters of more than 1 m, react to even the slightest ripple in the water, and their snapping lids can trap a human limb [51].

TRIGGERFISH

Triggerfish are considered to be the most aggressive fish inhabiting coral reefs, living at depths of 0-50 metres. They attack humans when they feel threatened. Interaction with this fish can result in injury from blows with the spiny dorsal fin and biting with large teeth embedded in a strong jaw [52].

SCORPAENIDAE

The best-known species among them are the scorpionfish, reef stonefish and red lionfish (*Pterois volitans*). Scorpaenidae have a demersal lifestyle, while lionfish swim in shallow, well-lit waters. Common features are a body covered with papillary protuberances, large spiny fins and the ability to change colouration. Red lionfish is often referred to as the 'flower of the Red Sea'. Reef stonefish, on the other hand, is considered the most venomous fish in the world. Venom spines are found not only in the dorsal fin, but also in the ventral and anal fins. There are longitudinal grooves on the surface of the spines, which facilitate penetration of the venom into the body of the prey. The venom is a peptide substance. The local symptoms of paralysis are similar to those of other toxins. However, inflammation of the lymph nodes and general symptoms such as muscular paralysis, pulmonary oedema and cardiopulmonary failure may occur simultaneously and may result in death. The correct rescue procedure is the administration of anatoxin made from horse serum [53,54].

MURAENIDAE

The Red Sea region is home to the giant moray eel. It is a predatory fish that leads a nocturnal lifestyle. They rarely attack humans, only in self-defence, biting with their strong teeth. The moray eel's very strong jaws result in deep bites. In addition, it has glands on its palate that produce a weak venom. Getting the blood of a moray eel into a human wound can also be a danger, due to its toxic properties. Symptoms associated with the effects of the poison include limited inflammation. If more venom enters the bloodstream, circulatory and respiratory distress may occur, accompanied by severe radiating pain [55,56].

ACANTHURIDAE

In defence of their territory, they may attack a diver. In the Red Sea, the most common is the sohal surgeonfish (*Acanthurus sohal* or sohal tang), which has a spike at the base of its tail equipped with a venom gland. A blow with the tail or accidental rubbing against a fish can cause a cut to the skin, rarely a puncture wound. The venom has a localised effect accompanied by erythema,

swelling and pain [57].

WHIPTAIL STINGRAY (DASYATIDAE)

It is a family of cartilaginous fish common in warm seas around the world, comprising more than 70 species, including venomous ones. It has a flat shape, broad pectoral fins similar to wings, lacks a dorsal and caudal fin and has a spike, very often venomous, on its long tail. A potentially dangerous one in the Red Sea is the bluespotted ribbontail ray, which, like the shark, is cartilaginous. When it feels threatened, it can inflict painful wounds. The venom causes swelling and redness in the sting area accompanied by several hours of severe pain. Treatment is symptomatic, the wounding does not usually cause further complications [58].

PREVENTIVE HEALTHCARE TIPS BEFORE AND DURING DIVE TRIPS TO THE RED SEA REGION

PRE-TRAVEL PROPHYLAXIS

Between 4 and 8 weeks before departure, you should see a tropical disease or travel medicine doctor. He or she will advise on recommended vaccinations and other preventive measures to protect against contracting dangerous infectious diseases.

According to the International Health Regulations adopted under the auspices of the World Health Organisation (WHO), the only vaccination required when travelling to some North African countries is the yellow fever vaccine [59].

In situations of exceptional health emergency, the World Health Organisation may make it compulsory for travellers to be vaccinated against other infectious diseases as well. On top of that, irrespective of international regulations, individual countries may require immunisation against major infectious diseases in a particular region of the world on the basis of their own visa laws and regulations. This is currently the case in Saudi Arabia where a meningococcal vaccination is a condition of entry into the country.

According to the latest WHO recommendations, a yellow fever vaccination certificate is required when travelling to Egypt for anyone over nine months of age arriving from countries at risk of spreading the disease, this includes those in transit (at least 12 hours in transit) in countries of North Africa: Libya; Central Africa: Chad, Equatorial Guinea, Cameroon, Sudan, Zambia; East Africa: Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Reunion, Rwanda, Seychelles, Somalia, Tanzania, Zanzibar; West Africa: Benin, Burkina Faso, Gambia, Guinea, Mauritania, Nigeria, Senegal, and islandic countries Sao Tome and Principe, and Cape Verde; South Africa: Botswana, Eswatini, Lesotho, Namibia, South Africa, Zimbabwe; South America: Bolivia, Brazil, Guyana, Colombia; Europe: Albania and Malta [60].

In the absence of a vaccination certificate, a person is detained in quarantine for up to 6 days upon arrival from an area at risk of yellow fever [60].

In addition, an international polio vaccination certificate issued within the last 12 months and at least 4 weeks prior to departure is required in Egypt for travellers from the following countries: Afghanistan, Indonesia, Myanmar, Nigeria, Pakistan, Papua New Guinea and Somalia Angola, Benin, Cameroon, Central

African Republic, China, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Mozambique, Niger and Philippines [61].

Thus, there are no compulsory vaccinations for those travelling directly from Poland, but it is worth immunizing against certain diseases as part of recommended vaccinations. Among the routine vaccinations are vaccination against: chickenpox, diphtheria-tetanus-pertussis, measles-mumps-rubella, polio, and hemiplegia. For these vaccinations, make sure that you are up to date with the recommended doses to guarantee immunity.

Vaccinations recommended before travelling to Egypt include:

1. hepatitis A - for everyone over 1 year of age, even if they plan to stay in good sanitary conditions,
2. hepatitis B - in accordance with the Polish Immunisation Programme, vaccination is recommended for adults not previously immunised against this disease,
3. typhoid fever - vaccination is recommended especially for persons who may be exposed to eating contaminated food during travel, travelling for a long time and going to rural areas of this part of the world, and
4. rabies - vaccination recommended mainly because dogs with rabies are common in Egypt and options for post-exposure prophylaxis are very limited.

PREVENTION WHILE STAYING ABROAD

In addition to immunization-based prevention, non-specific prevention is very important to reduce the risk of contracting various diseases.

Prevention of foodborne diseases, regardless of the disease, is similar unless there is specific immunisation against it in the form of a vaccine.

These diseases are prevented by following basic hygiene rules, such as washing hands before meals and disinfecting with liquids containing no less than 60% of alcohol, and avoiding the consumption of food and water from unknown sources. It is recommended to avoid eating food served at room temperature, fresh vegetables, still water, ice cubes, unpeeled fruit, meals from street vendors, raw or lightly cooked food (meat, fish, salads, eggs, unwashed fruit and vegetables), unpasteurised dairy products. It is considered relatively safe to eat hot foods (cooked in at least 60 degrees, except for jams, syrups and honey), bread and other dry foods, and to drink warm liquids or carbonated drinks. Drinking and touching well water can also be dangerous. It is also recommended to avoid touching the eyes, nose and mouth unless you are sure your hands are clean. It is necessary to cover the mouth and nose with a handkerchief or sleeve (not the hands) when coughing or sneezing, and to avoid close contact such as kissing, hugging, or sharing food.

CONCLUSION

When planning a diving trip to the Red Sea, it is important to be aware of the biohazards present in this geographical region.

During your stay, it is advisable to: observe food hygiene, choose safe drinks and food to prevent traveller's diarrhoea and other gastrointestinal diseases; take protective measures against insects that may

transmit e.g. leishmaniasis; avoid contact with animals that may transmit e.g. rabies; avoid casual sexual contacts, and bathing in unsafe bodies of water.

One needs to bear in mind that the main danger to people diving in warm waters are venomous animals with the ability to produce toxic substances.

The basic treatment and rescue procedure for contact with a venomous marine organism is the use of

a suitable serum or antitoxin. Unfortunately, an antidote is not known for every venom. Conservative treatment should then be applied, depending on the condition of the victim.

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