

CHAPTER 18 - TROPICAL AND TRAVEL MEDICINE

1 Introduction

1.1 Definition of the tropics

The sun, spherical shape and rotation of the earth result in characteristic meteorological phenomena. Because the transmission of solar energy to the earth depends on geographical latitude (the higher the latitude the lower the transmission), air circulation systems build up. At the equator, air is lifted up, resulting in areas of low pressure. The humidity precipitates as heavy rain. With higher latitudes less energy reaches the ground, the dry air sinks down, and areas of high pressure are formed.

The areas of low pressure around the equator (between 23,5 ° North and 23,5 ° South) are described as the tropics, the areas of high pressure to the North and South as, Subtropics. With high solar radiation (as in summer) the continents are warmer than that of the oceans, areas of low pressure and sea wind are typical, the latter transporting humid maritime air resulting in monsoon rains. The tropical and subtropical climates result from these conditions. Where there is high temperature and high humidity, high precipitation results, giving rise to rain forests in the tropics. Very low precipitation with a dry and desert climate is typical for the subtropics. To the North and South more temperate climates result.

1.2 Medical stress factors in the tropics

Not only geographic location and climate relate to possible health effects in areas outside the temperate zones. Therefore, the standard of development and life standard have to be considered as well. Regarding these facts medical advice given here is not restricted to the tropics proper but to Subtropics as well. On the other hand, some tropical countries have health systems similar to industrial countries and pose much less risk.

Medical stress factors in the tropics can be caused by the climate, factors related to travel (jet lag, means of transport etc.), and insects (because of the warm climate). These insects can act as vectors of diseases. Other factors can be the low standard of hygiene, infectious diseases, socio-economic problems and psychosocial stress.

The **climate** – a humid and hot tropical, more than a dry and hot subtropical climate – can be a significant stress factor. Sufficient fluid intake, protection against solar radiation, suitable clothing etc. should be recommended.

Because of economic constraints **the standards of hygiene** are mostly lower than in temperate climates. The means for treatment of drinking water and sewage are very often not adequate.

High humidity and warm to hot temperatures are favourable conditions for a large variety of **insects**. These can act as vectors of several diseases.

The unfavourable conditions caused by the environment, can result in a host of **infectious diseases** typical for, or very common in the tropics. The worldwide mortality from tropical diseases is estimated as 22 million people.

The risk of acquiring infectious disease is more likely whilst travelling abroad, but it depends on the kind of travel and activities undertaken. This also applies to the kind of disease acquired. Of the various health problems that may occur in some tropical zones, 15 - 25 %, may be caused by diseases, specific to the particular zone. Certain other types of infectious diseases are more common in the tropics than in temperate zones. The most frequent infection acquired is traveller's diarrhoea. Next come infections of respiratory tract, malaria, and Hepatitis A. Giving advice to flight crews about malaria, Hepatitis A and B, yellow fever and travellers diarrhoea, is most important.

There are a lot of **psychosocial stress** factors that can affect people who are travelling abroad. One is staying away from home for long time (e.g. flight crews stationed abroad). Other types of stress may result even from being away only for a short time. There may be intercultural conflicts, unfamiliar working situations, living in strange surroundings, being in the company of strangers from an unfamiliar cultural heritage (socio-cultural factors), foreign languages, a bad infrastructure plus the problems that can occur in every-day-life. These may result in anxiety and phobic disorders. Cumulative stress may result in burnout, alcohol abuse etc. Alcohol consumption is easier abroad

because the normal social control is absent. Where a longer stay abroad is intended, addiction disorders, alcohol abuse, psychiatric disorders etc. should be excluded.

Psychiatric disorders have to be considered in any counselling. Up to 25 % of the population, could possibly experience, at least one relevant psychiatric disturbance in a lifetime. Being confronted with a host of stress factors, may lead to such an event being more likely to happen. Anxiety and psychotic disorders may often appear together. "Abroad" neurosis and psychosis can manifest itself as well. When a depressive disorder or psychosis is diagnosed, the side effects of Mefloquin medication (malaria chemo-prophylaxis and/or treatment) have to be excluded. In divers, a similar disorder may be caused by decompression sickness. Anoxia can also cause similar symptoms. Exogenous psychosis has to be taken into account. Alcohol abuse can also be a clinical sign of an underlying anxiety disorder.

2 Medical Travel Advice

Medical Travel Advice for Flight Crews

- Information about the relevant risks in the proposed area to be visited
- Information about,
 - General precautions
 - Hints for behaviour abroad
 - Malaria prophylaxis
- Information about vaccination
- Information about personal protection
 - Information about medication for self therapy

Those who are physically and mentally fit, acclimatise more easily for service in tropical climates. The traveller should abstain from visiting the tropics, if they have any existing disease, which the tropical climate may exacerbate.

The medical travel advice has to minimize the risks of staying in the tropics by informing the traveller of the problems and possible precautions. If possible, 4 to 6 weeks should be allowed to start any prophylaxis. This will allow a build up of sufficient immunization status. **Flight crew should be informed about the risks in tropical areas and have the appropriate vaccinations before starting any flight duties in these areas.**

The medical travel advice should be individual and not schematic. It is primarily intended for flight crew and is directed to cockpit and cabin crew. It has to differentiate depending on the kind of duties and activities undertaken such as, staying in the tropics for short layovers, or for a long-time stationing, staying in crew hotels or compounds, undertaking adventure trips of short or long duration etc. Furthermore, individual factors such as intelligence, readiness for risks, general views (e.g. aversion against remedies), experience, individual disposition (age, diseases etc.) have to be taken into account. The doctor giving the advice has to find out about the persons planned activities such as cross country walking, climbing, diving, actual health state, possible allergies possible immune defects, vaccination state, previous malaria chemo-prophylaxis including tolerance, possible or even planned pregnancy etc. Epidemiological data, the time of travel (rainy or dry season), the climate at the destination, have also to be considered. The possibility of a lower standard of medical care being available at the tropical destination should also be taken into account.

Risks and prophylaxis must be objectively presented, with matter-of-fact information about the possible dangers, so that the traveller can decide. Exaggeration should be avoided. The "need to know", has to be differentiated from the "nice to know". Written information can complete, but not replace the spoken information.

Medical travel advice depends on

- Destination
- Time of travel
- Duration of travel
- Character of stay (short layover/long stay), short or long adventurous trips, or only staying in crew hotel, Close contact with local population)
- Climate
- Epidemiological data

Individual Factors in medical travel advice

Personality, general view, intelligence, readiness for risks
Experience
Particular activities planned
Age, physical and mental condition, individual disposition (previous or actual diseases, allergies, medication)
Vaccination state
Tolerance of previous malaria chemo-prophylaxis
Actual or even planned pregnancy

3 Medical Travel Prophylaxis

Medical Travel Precautions:

- | | |
|----------------------------|--|
| 1. Exposure prophylaxis | - General recommendations
- Protection against sun and climate
- Food and beverage hygiene
- Protection against insects |
| 2. Vaccination Prophylaxis | - Active (and passive) vaccinations |
| 3. Medical prophylaxis | - Malaria chemo-prophylaxis
- Prophylaxis against traveller's diarrhoea (only exceptionally!) |

3.1 Exposure prophylaxis – general recommendations

Exposure Prophylaxis is avoiding those factors, which may cause or deteriorate health problems. It is the basis of all the precautions and prophylactic means against any disease, which can exist in the tropics and subtropics.

In the context of exposure prophylaxis, swimming and wading in tropical ponds, lakes or rivers should be discouraged (there is a danger of infection with schistosomiasis) as well as walking barefooted on beaches etc. (infection with ankylostoma). Wearing adequate footwear on the ordinary beach, or in the calm waters of exotic beaches, can protect against such infections such as ankylostoma, and the stings of maritime fauna (sea-urchin, stingray, corals). The inexperienced traveller may fear snake-bites. These and bites of scorpions are extremely rare, under normal travel arrangements.

Respiratory Tract Infections are often underestimated. Nevertheless, they remain the second-most common health disorder contracted abroad after travel diarrhoea. The reasons can include the change of climate, moving between hot and humid conditions outside, to the cool air in rooms with air-conditioning, cool draughts in cars and public transport, as well as temporary immune suppression due to sunburn. Dust and dirt from city streets are also main contributory factors. Exposure prophylaxis can be very important, if this type of problem is to be avoided.

Intensive **solar radiation** in low latitudes and altitude, reflection from water and snow surfaces, can result in significant UV exposure to the skin and eyes (More care is required in the southern hemisphere, where there is greater UV exposure due to the ozone gap). Acute dangers are photo-dermatitis, which causes sunburn, and can lead to meningeal irritation. In extreme cases, cerebral oedema may occur, in combination with excessive heat emission. Sunstroke can occur, with keratitis, conjunctivitis, snow blindness in mountain areas, and temporary immune suppression. The chronic consequences can result in skin tumours, accelerated aging of skin (due to destruction of elastic fibres), chronic photo-dermatitis and cataract. Adequate sun protection must be afforded, especially during the strongest exposure around noon time, by using the appropriate clothing, by wearing sensible headgear and by using sun cream with a high sun protection factor (at least factor 20) and minimizing the time of exposure. The so-called sun blockers should be water resistant and contain a high percentage of micro-pigments). The use of sunglasses is important.

There are many **skin disorders** that can occur abroad due to the climate. Increased sweating may result in Pityriasis versicolor, intertriginous excema and mycosis (fungal infections) of the skin. Therefore, cotton underwear and clothing, frequent cold showers and possible local therapy with anti-mycotics should be recommended. Superficial skin injuries, insect stings and bites can lead to super infection and inflammation etc. Ulcers can occur due to bad hygienic conditions, or contact with sea-water. Local therapy with anti-mycotics, antibiotics etc. may be helpful.

Some travellers suffer from constipation at the beginning of their stay abroad. This is mainly due to the fluid intake being too little or changing the nutrition. Stool consistency decreases with continued residence. The use of laxatives is not usually necessary („Travelling can expand the mind and loosen the bowel.“).

Furthermore, an appropriate **medical kit** should be recommended. The contents depend on the duration, the destination and the kind of travel, as well as on the traveller's individual situation.

After a certain time, or after termination of a longer stay abroad, or on clinical indication, a **Routine medical examination** should be carried out. This should include an examination for intestinal parasites

The **teeth** should be checked and made good, especially before longer stays abroad. On one hand dental care is not guaranteed everywhere, on the other hand, tooth pain may greatly reduce the well being of a person. Inflammation or infection of a tooth may result in barodontitis. This condition can be very painful and can occur when the pressure of the cabin changes. **Inflammation or infection of the teeth makes aircrew unfit for flying duties.**

General recommendations when staying in the tropics

- Protection against solar radiation (sun blocker, sun protection factor at least 12), sunglasses, headgear/hats
- Fair coloured, light, loose fitting clothing out of natural fibres
- Appropriate fluid intake (at least 2 to 3 litres daily,) a good guide may be the colour of urine. The colour should be a pale yellow and not dark yellow.
- Air conditioning (bedrooms should be cooled down before entering, switch off A/C at night)
- No skin penetrating procedures (piercing, tattoo, chiropody)
- No swimming in freshwater (lakes, ponds, rivers) and sea- water, near settlements and sewage dumps
- No barefoot walking at beaches
- No touching of animals
- The advice of local people should be taken.
- Do not believe advisers who trivialize the potential dangers
- Care must be taken to avoid violent crime (no open valuables or money, “low profile” clothing, no jewellery or very expensive watches should be displayed
- Make enquiries from local people about safety issues. Do not go out alone. Avoid provocative behaviour, only small amounts of money should be carried.
- Do not play the “hero”, have a small bill at hand for possible assailants, better losing some money than your life
- Take care with food, beverage and general hygiene
- Ensure local protection against insects
- **Always take care. Never relax!**

3.2 Special considerations for Flights on short notice

Flights on short notice, can pose special problems. Frequently, the time until departure is too short for the appropriate preparation, because flight and destination may have been planned at the last-minute. Often, travel advice is totally ignored. Furthermore, the time for immunizations is often too short. Therefore, all prophylactic means may become disregarded.

This possible outcome has to be prevented. For flights on short notice a thorough briefing has to be carried out. General preventative means, food, beverage and personal hygiene as well as malaria precautions can be followed even on these kinds of flights. Boosters of most vaccinations and appropriate immunization may be possible as well.

Where there is a possibility that flight crews may have many of such types of flight, they should be briefed and immunized before they should be engaged in flights to tropical areas. Maintaining vaccination status and carrying sufficient Chemo-prophylaxis for malaria can be delegated to crew members themselves

4 Vaccinations

4.1 General Considerations

Vaccination is the most efficient means of prophylaxis for a number of infectious diseases. Vaccination is generally effective and well tolerated. Therefore it is one of the most efficient medical measures to hand. The individual is protected and the public are protected, because the vaccinated person cannot transmit the respective disease any more.

Flight crews are unfit for flight duties for at least 24 hours after a vaccination.

4.1.1 Information and Documentation

Vaccination requires personal informed consent. The person to be vaccinated has to be fully informed about the vaccination in sufficient time prior to a planned vaccination. The information should include a description of the disease to be prevented, and its treatment (What kind of vaccine is it? What if any, are the benefits, both individually and collective. What are the contraindications, possible side effects and what could be the complications. What is the duration of immune protection being given by the vaccination? What boosters will be required? What is the recommended behaviour after the vaccination?). All the information given should be documented and show that written consent has been given.

After any vaccination, the date, type, manufacturers-number, stamp and signature of the vaccinating physician has to be written down on the appropriate document (The international vaccination certificate of the WHO is one recommendation.). Any missing documentation of any former vaccination, prior to a booster vaccination, should not delay or even exclude a planned vaccination. A probable booster vaccination over and above the basic scheme does not normally have any side effects.

4.1.2 Side effects and complications

Slight erythema, swelling and pain are not uncommon at the site of the inoculation. There may be a slightly elevated body temperature in the first three days after vaccination. This is common and of no consequence. An antipyretic can be prescribed, where this might be anticipated.

Allergic reactions and anaphylactic shock are only rare complications. Nevertheless, these reactions should be anticipated. Emergency equipment and emergency drugs (injections such as Adrenaline injections of 1 -1000, Glucocorticoids, H1 and H2 blocking agents, Aminophylline, as well as Beta-agonist aerosols) should be on hand to manage anaphylactic reactions. Those who have been vaccinated should stay under medical supervision for 30 minutes after vaccination.

4.1.3 Scheduling vaccinations

The immune protection afforded by vaccinations, should be completed prior to flights into tropical areas. The onset of the effect of the respective vaccination has to be taken into account. The briefing and vaccinating physician, has to check whether a basic immunization or a booster immunization is required. For a **basic primary immunization schedule**, a certain number of inoculations have to be performed, over a certain period of time. **Booster immunizations** have to be performed at certain intervals after a basic programme, to prolong the immunization protection. Should the interval between the inoculations of the primary schedule, or the maximal interval between basic and booster immunization be exceeded, a new basic schedule should **not** be started all over again, the required booster can be given **without any profound side effects**. There are no maximal intervals between vaccinations either. Every inoculation counts. Every tropical medicine briefing, should be used to check the immunization status for Tetanus, Diphtheria and Poliomyelitis, etc. With children, the immunization status for measles, rubella, mumps etc should also be checked.

Scheduling inoculations, of a primary immunization programme, the minimum interval, until onset of effectiveness of the respective vaccination, has to be taken into account. The immunization schedule should be completed in good time, prior to the flight to tropical area. A sufficient **protection** builds up about 10 – 14 days after last booster inoculation, or the last inoculation of a basic schedule. The vaccination programme has to be scheduled respectively. A certain minimum time for a programme, prior to the flight, has to be taken into account. This should not be misinterpreted. No vaccination

should left out or missed. If there is any doubt, it is better to travel having been given a vaccination, which is not yet fully efficient, rather than not having been vaccinated at all.

Minimum interval between vaccination and departure into tropical areas for important vaccinations (modified after Hartmann, P. MMW 20/2000)

Kind of vaccination	Time interval prior to departure*
Tetanus, Diphtheria	Possible until departure
Polio	Possible until departure
Hepatitis A	Possible until departure
Hepatitis B	3 – 4 weeks
Typhoid	1 – 2 weeks
Yellow Fever	10 days

* Flight operations should not be carried out for 24 hours after vaccination

If different vaccinations have to be given at the same time, live vaccines can interfere with one another. Therefore live vaccines should be given either on the same day or with a minimum interval of four weeks. The vaccinations for Yellow Fever, Measles, Mumps, Rubella, Oral Poliomyelitis Vaccine and the BCG, are in this group. The oral live vaccine for Typhoid does not require any minimum interval. Live vaccine status, can however be jeopardized by immuno- globulins. Therefore live vaccines should not be given before 90 days after the inoculation of immune globulins. Vice versa after live vaccines, a certain minimum interval must be allowed before an inoculation of immuno- globulins; i.e. 7-10 days after vaccination against Yellow Fever, and 14 days after vaccination against Measles, Mumps and Rubella. With inactivated vaccines no intervals are necessary when given with other vaccines either live or inactivated.

If surgical operations are necessary after vaccinations, they should not be performed in the first three days after inactivated vaccines have been given, and not in the first 14 days after live vaccines have been given, such as Yellow Fever, Measles, Mumps, Rubella, Oral Poliomyelitis Vaccine, Oral Typhoid Vaccine and BCG. Urgent operations can be done right away.

For Booster immunizations the effective period of the respective vaccination has to be taken into account.

The effectiveness and the effective period of vaccinations (modified after Steffen, R., von Sonnenburg, F. in W. Lang, T. Löscher, Tropenmedizin in Klinik und Praxis, 3. Auflage, Thieme, 2000). This schedule is up to date as of Jun 2004, it should be checked periodically to see if there have been any changes.

Vaccination	Application	Effectiveness (%)	Effective from	Effective period
Cholera parenteral	i.d., s.c., i.m.	< 50	d 6 (first immunization), d 1 (booster *)	Officially 6 m Effective 3 – 6 m
Cholera oral (WC-BS)	p.o.	60 - 86	d 6 (first vaccination), d 1 (booster *)	Officially 6 m Effective 3 – 6 m
Cholera oral (CVD-103 HgR)	p.o.	13 - 100	d 6 (first immunization), d 1 (booster *)	Officially 6 m Effective 3 – 6 m
Diphtheria	i.m.	~ 80	4 w	5 (-10) yrs
ESME (Tick borne Encephalitis)	i.m.	99		> 3 yrs
Hepatitis A	i.m.	> 99	d 14 (evtl. d 0)	10 (- 30) yrs
Hepatitis B	i.m.	~ 90	d 30 – d 60	Responder lifelong
Influenza	i.m.	70 - 90		> 1 yr
Japanese Encephalitis	s.c.	> 90		> 4 yrs
Meningococcal Meningitis	s.c.	70 -90	d 7	1 – 3 yrs
MMR (Measles, Mumps, Rubella)	i.m.	90 - 95		lifelong
Pest	i.m.	?	A couple of d	6 m
Poliomyelitis (IPV)	i.m.	> 99	4 – 6 w	10 yrs
Poliomyelitis (OPV)	p.o.	> 99	4 w	Life-long
Tetanus	i.m.	> 99	4 w	10 yrs
Rabies	i.m. (s.c.)	> 99	~ 7 d	2 – 3 yrs
Tuberculosis (BCG)	i.c.	0 -80	Not sure	10 yrs
Typhoid F. Ty 21 a	p.o.	~ 70	d 14	1 – 3 yrs
Typhoid F. Vi	i.m.	~70	d 14	2 – 3 yrs
Yellow Fever	s.c.	> 99	d 10 (first immunization) d 1 (booster *)	Officially 10 yrs Effective lifelong ?

* If vaccinated within effective period of former immunization

4.1.4 Combination vaccines

In order to promote the compliance of vaccinations, a couple of combination vaccines have been developed in the past years. Different studies have shown that the immuno-genicity of the individual components are not reduced by such a combination, but actually enhanced. The combination vaccines for Hepatitis A and B (Twinrix®) and for Tetanus, Diphtheria and Poliomyelitis (Revaxis®) are of special interest for frequent travellers.

4.1.5 Contraindications

General Contraindications of Vaccinations (modified after Zieger, Flug-u. Reisemed.5, 1/98)

Acute febrile diseases (A Common cold or a sub-febrile temperatures below 38,5 °C are not a contraindication!). A time interval of up to 2 weeks after recovery should be allowed. A post exposure vaccination against Rabies should be given right away.
 During incubation of infectious diseases
 Purulent infections of skin and the mucosa
 Severe acute allergic conditions
 Allergies against the components of a particular vaccine
 Acute diseases of CNS
 Epilepsy (except for febrile convulsions and seizures some years ago)
 Pregnancy if applicable, especially with live vaccines
 Live vaccines where there is immunodeficiency or immune suppression (e.g. due to steroids, Immuno-suppressive agents, chemotherapy, radio-therapy) etc. note 1.
 I.m. injection during oral anticoagulation therapy

Note 1. Under certain circumstances it may be possible where there is a real indication. The serologic control of a successful vaccination is recommended

4.2 Vaccinations in Travel Medicine

When briefing flight crews and other people who travel, a distinction has to be made between mandatory vaccinations, generally recommended vaccinations and specific travel vaccinations.

Mandatory vaccinations according to the WHO, used to be the vaccinations against Smallpox, Cholera and Yellow Fever. Smallpox was eradicated in the 70's of the last century. The injection type of vaccination against Cholera showed no sufficient effect, and was omitted from the list of mandatory vaccinations. Nevertheless one should be aware, that the vaccination against Cholera might be demanded by certain border controls. This is against the general practice and scientific findings. It is often done in order to extract money dishonestly, by exaggerating the risk.

The vaccination against Yellow Fever is now the only mandatory vaccination, when travelling to certain countries. Some countries (16 countries in tropical Africa and French Guyana) demand the vaccination for every person entering that particular country. Other countries require YF, only for those who have visited an endemic area within the last 6 days. The vaccination against meningococcal meningitis is mandatory for pilgrims who are travelling to Mecca. For flight crews taking pilgrims to Saudi Arabia, this vaccination is also mandatory.

The **generally recommended vaccinations** against Tetanus, Diphtheria and Poliomyelitis are also recommended as a matter of principle. The immunization status should be checked and a booster given if necessary. The combination vaccines are generally recommended. If a tetanus immunization is necessary because of an injury, a combination vaccine with diphtheria vaccine, or diphtheria and poliomyelitis vaccine, should be used.

The indication for **specific travel vaccinations** depends on the areas to be visited, the time (rainy or dry season etc.), the duration and the style of travel (staying in the hotel or travelling around during the layover). These vaccinations should ensure an optimal protection for the flight crew or the traveller. For members of flight crew, immunization for Hepatitis A and Yellow Fever are recommended in general, others depend on each and every situation.

Specific Travel Vaccinations

1. Hepatitis A
2. Hepatitis B
3. Typhoid Fever
4. Meningo-coccal meningitis
5. Rabies
6. Japanese Encephalitis
7. Cholera
8. ESME (Tick Borne Encephalitis)

4.2.1 Tetanus

Spores of *Clostridium tetani* can be found world wide, especially on or within the soil. The soil in the tropics in particular, contains high concentrations of these spores. The infection can occur after almost any injury. There is a higher risk of this type of infection in tropical areas. Under such anaerobic conditions (as in necrosis, deep wounds, with foreign bodies or infected wounds) the spores transform into vegetative stages, multiply and produce the neurotoxins, tetanospasmin and tetanolysin. Only tetanospasmin has clinical effects. The neurotoxin is transported within the neurons, in a retrograde way into the CNS, where it blocks the inhibitor neurotransmitters at the pre-synaptic neurons. The classic syndrome then develops, with muscle spasm, risus sardonicus, trismus and opisthotonus.

As a prophylactic it is sensible for this vaccination to be given. In the case of an injury, careful wound toilet should be undertaken, as well as checking the vaccination state, and where applicable a booster should be given.

The basic immunization schedule consists of three inoculations with tetanus toxoid (Tetanol®) (0 – 4 to 8 weeks – 6 to 12 months). Boosters are necessary every ten years. As mentioned before, there are no intervals too long between inoculations, every inoculation counts. Therefore, an incomplete or complete basic immunization does not have to be started again from the beginning, if the intervals mentioned above are exceeded. **The vaccination is generally recommended, especially for flight crew. Before entering tropical zones at least two inoculations should have been given.** If applicable the occasion should also be used to immunize against diphtheria, or even diphtheria and poliomyelitis simultaneously, with the respective combination vaccines.

Should, in case of an injury, an incomplete immunization status be detected, a basic immunization schedule should be completed or should be started. Under certain conditions an **additional passive immunization** with tetanus antitoxin (tetanus immuno-globulin) has to be applied (see table).

Tetanus Vaccination in Case of Injury (after STIKO-Recommendations, Epidemiology Bulletin 28/01)

Number of previous inoculations	Clean, minor wounds		All other types of wounds ¹	
	Td or DT ²	TIG ³	Td or DT ²	TIG ³
Unknown	Yes	No	Yes	Yes
0 - 1	Yes	No	Yes	Yes
2	Yes	No	Yes	No ⁴
3 or more	No ⁵	No	No ⁶	No

1 - Deep and / or dirty (with dust, soil, saliva, stool contaminated) wounds, injuries with damaged/open tissue and reduced oxygen supply or foreign bodies (i.e. contused, ruptured, bite, stabbing or shooting injury)

- Severe burns or coagulation
- Tissue necrosis
- Septic necrosis

2- Children under 6 years DT, older persons Td (i.e. Tetanus-Diphtheria) Vaccine with reduced amount of diphtheria toxoid in comparison with DT

3- TIG = Tetanus Immuno-globulin, in general 250 IE are given, the dose can be elevated to 500 IE; TIG is used with Td/DT-if necessary simultaneously.

4 - Yes, if injury happened longer than 24 h ago.

5 - Yes, if more than 10 years since last inoculation have passed.

6 - Yes, if more than 5 years since last inoculation have passed.

4.2.2 Diphtheria

Diphtheria occurs as a result of an infection by an organism, which is called *Corynebacterium diphtheriae*. In temperate zones it affects mainly the respiratory system, and is transmitted by droplet infection all the year round, with a higher number of infectious cases during the cold season (be careful of asymptomatic carriers!). A highly effective exotoxin is the pathological agent. After initial general symptoms the main infection starts with the development of pseudo-membranes involving the pharynx, the nose, the larynx and trachea and bronchi. Eventually the highly potent toxin may cause complications such as myocarditis and polyneuritis, which may be lethal. (In tropical areas, wound diphtheria is common, but does not have such an insidious course.)

Because the therapy has to be started urgently, the diagnosis has to be established by the clinical appearance (pseudo-membranes and Caesar's neck, due to enlarged cervical lymph nodes). The definitive diagnosis follows by a bacteriological demonstration of *C. diphtheriae*.

The basic immunization consists of three inoculations with diphtheria toxin, which is inactivated by formol. These should be given at (0 – 4 to 8 weeks – 6 to 12 months). The vaccine for adults contains only 5 (at least 2) IE diphtheria toxoid (in contrast to the children's vaccine which has the greater amount). This should be used after age 6 or 7. Boosters are necessary every ten years. As mentioned before, there are no intervals too long between inoculations, every inoculation counts. An incomplete or a complete basic immunization schedule does not have to be started again from the beginning, if the intervals mentioned above are exceeded. **The vaccination is generally recommended, especially for flight crew. Before entering tropical zones at least two inoculations should have been given.** If applicable the occasion should be used to immunize against tetanus, or even tetanus and poliomyelitis simultaneously with the respective combination vaccines. Even after having had the diphtheria infection, there is no protection against another infection without proper immunization.

Adverse side effects of the vaccination can be local reactions at the site of inoculation, febrile general reactions, rarely thrombocytopenia or neurological complications, such as neuritis.

Contraindications, apart from the general contraindications against vaccinations, can be haematological and neurological side effects after a former inoculation.

4.2.3 Poliomyelitis

Poliomyelitis is caused by three strains of poliomyelitis virus. It is normally transmitted by, the oral-faecal route. A transmission by droplet infection is also possible. There is a risk of infection from poor levels of hygiene, large crowds of people etc. The clinical course can vary from an abortive infection to a pre-paralytic, or to a paralytic poliomyelitis. The latter shows a case fatality rate of 5 – 10 %. Vaccination is usually carried out using an oral poliomyelitis vaccine (OPV, Sabin) or an inactivated poliomyelitis vaccine (IPV, Salk). Both vaccines contain all three strains of virus. There is an epidemiological situation in some European countries, with a very low risk of infection on the one hand, and the certain risk of vaccine associated paralytic poliomyelitis (VAPP) and of contact poliomyelitis (risk < 1: 4 million, < 1: 15 million respectively) on the other. In these countries OPV has been omitted in favour of IPV from the vaccination schedule (e.g. Germany). These countries recommend a vaccination for poliomyelitis for patients above 18 years of age, with a former basic immunization, only for travels into endemic areas. **The vaccination is generally recommended for all flight crew therefore**, immunizations that have been started with OPV can be completed with IPV.

Vaccination against Poliomyelitis

Indication	All persons with missing or incomplete basic immunization
	In some countries: after age of 18 years a booster is only necessary when exposure is possible. No more boosters need be given as a routine
Vaccine	Inactivated vaccine IPV Live vaccine OPV
Vaccination Scheme	Depends on Which producer: - 2 x 1 ml with interval of 8 w better 6 m i.m. (IPV-Virelon®) - 3 x 0,5 ml (0 - 4 to 8 w - 12 m) i.m. (IPV-Mérieux®) - 3 x 0,5 ml (0 – 4 to 8 w – 6 m) (OPV) (care must be taken with the interval of OPV with other live vaccines)
Effective Period	IPV: 10 yrs (?), after that booster OPV: 10 yrs (lifelong), after that booster
N.B.	IPV: no intervals with other vaccinations required
	In certain countries OPV is not used any more because of the risk of VAPP (only for containing epidemics)
	Immunizations begun with OPV can be completed with IPV

4.2.4 Yellow Fever

Yellow Fever is endemic in the tropical rain forest zones of South America and Africa and is caused by a Flavivirus. Endemic and infectious zones can be readily distinguished. In **endemic zones** the virus circulates within a so-called sylvatic cycle between monkeys as reservoir and mosquitoes as vectors (Haemagogus and Sabethes mosquitos in South America, Aedes in Africa). In **infectious zones** (found within endemic zones) transmission to man occurs due to an urban cycle with anthropophilic Aedes mosquitoes as vectors. Epidemics can be caused in the same way.

Yellow Fever is a viral haemorrhagic fever. The severity of the disease varies from a virtually unnoticeable or mild course (especially found in endemic zones) to severe and even lethal, classic or

haemorrhagic yellow fever. In the latter cases the general condition rapidly deteriorates, with failure of the liver and the kidneys. There is generalized haemorrhagic diathesis with haematemesis, melaena, metorrhagia, haemorrhages in the skin and mucosa. Involvement of heart and CNS are common. 7 to 10 days after onset of symptoms the patients may die. The mortality of yellow fever in general is 10 to 20 %, and up to 50 % with classical yellow fever.

Vaccination against YF is recommended when visiting endemic zones. It is mandatory when entering certain countries of the endemic zones and, after having visited endemic zones within the last 6 days, when entering certain other countries of the endemic zones and outside. The vaccination may also be necessary when travelling within countries of the endemic zones, e.g. Brazil and Ecuador. **Flight Crews should be vaccinated even if they only fly over endemic areas, because an immunization might be required after a diversion to an airport, which is in the endemic zone. Therefore all flight crew operating in Africa or South America should be vaccinated against Yellow Fever.**

The vaccine consists of a highly effective, attenuated live vaccine. The substantial residual virulence of the vaccine should be taken into account when vaccinating patients who are immuno-suppressed (HIV positive patients can be immunized with a CD4-count > 400 / µl.). The vaccine virus is bred on eggs or chicken fibro-blasts, therefore chicken protein allergy might be a contraindication or at least relative contraindication. On the day of vaccination, and for the three successive days after the vaccination, those who have had a vaccination, should not do anything requiring muscular exertion or exposure (e.g. sport, sauna or being out in the strong sun and receiving UV exposure). **Side effects** can be slight, local reactions at the site of inoculation (up to 10 % of those vaccinated). After, 4 – 6 days there may be more general reactions, such as an elevated body temperature and malaise (about 10 % of those vaccinated). The malaise, headache and muscle pain usually lasts for about 24 hours (2 – 5 % of those vaccinated).

Contraindications are acute febrile diseases within the last two weeks, immuno suppression and immune defects (see above), corticoid medication, allergy against chicken protein and age < 6m.

Only Authorized Vaccination Centres may give the Yellow Fever vaccine. These Centres only, certify the vaccination on the official vaccination certificate. The stamp is valid from ten days until 10 years after inoculation. In case of contraindications, an exemption certificate has to be given (The text should state that “No vaccination was possible on medical grounds”). One should be aware that the health authorities of certain countries might not acknowledge the exemption certificate.

Yellow Fever Vaccination

Indication	Travel into infection zones According to health regulations of certain countries for every visitor or after visits of endemic zones within the last 6 days
Vaccine	Live Vaccine of attenuated virus of 17 D - strain
Vaccination Scheme	<i>1 x 0,5 ml sub.cut or im.</i>
Effectiveness	Reliable, probably lifelong
Validity	As mandatory vaccination: from d₁₀ until 10yrs after vaccination
N.B.	Vaccination only by authorized vaccination centres Intervals to be observed with other live vaccines Care must be taken with the chicken protein allergy and HIV infection!

4.2.5 Hepatitis A

Hepatitis A is an acute viral infection affecting the liver. The infection is predominantly self-limiting. In children the clinical course is mostly unnoticed. Even though the case fatality rate is overall only about 0,2 %, it increases by age (> 40 a: 2 %, > 50 a: 2,7. Moreover, recovery may take a couple of months, because of a protracted course or a delayed recovery.

Hepatitis A is acquired by faecal-oral transmission (especially in children by smear infection) by contaminated food and beverages. Raw seafood and oysters are a predominant source of infection. For exposure prophylaxis, good hygiene is effective because of the high resistance of Hepatitis A-virus against the environmental influence. In spite of this, vaccination is very effective because of the low hygiene standards and high rate of infectivity in the tropics.

A very effective, and inactivated type of vaccine, has existed since 1992. The effective period is 10 years. The new vaccine only needs two inoculations with an interval of six months in between. Even after the first inoculation an immune protection of six months to one year, can result. At the latest, two weeks before departure to tropical areas, the first inoculation should be given. Nevertheless, a later inoculation should not be omitted, because the immune protection will have built up a couple of days after arrival. Because of the high infection rate in children, even in first world areas in former days, a lot of the older aircrew might have had hepatitis A as a child even without knowing about it. Therefore, the titre of Anti-HAV of patients born before 1950-1960, with otherwise unexplained jaundice, or after a longer stay in third world areas, should be checked prior to the vaccination. Only patients with no titre (the threshold of immune protection being around, 20 IU/l) need a vaccination. Nevertheless, a vaccination of patients with titre of Anti-HAV is not harmful.

Hepatitis A Vaccination

Indication:	Wide indication, travels overseas and to the Mediterranean and Eastern Europe Patients born before 1950-1960 depending on titre of Anti-HAV
Vaccine:	Inactivated vaccine (formalin activated virus) (HAVRIX®, VAQTA®, Epaxal®, HAVpur®)
Vaccination Scheme:	0 - 6 (to 12) months, i.m. Immune protection starts after 2 – 4 w for 6 to 12 m
Booster:	After 10yrs
N.B.:	Testing of titre of Anti-HAV in patients born before 1950-1960

4.2.6 Hepatitis B

Hepatitis B is transmitted parenterally (blood, blood products and body fluids like sperm, vaginal fluid). 10 % of infected persons develop chronic hepatitis with complications such as cirrhosis of liver or hepato- cellular carcinoma. Whilst staying in the tropics, sources of Hep B infection are, unprotected sexual contacts, close contact to local population, acupuncture, piercing, tattooing, dental treatment, and contact with blood, in or after traffic accidents. The % risk depends on the length of stay.

Beside exposure prophylaxis, an effective recombinant vaccine exists. Flight crews need this vaccination only under particular circumstances. Indications are long or frequent stays, as well as close contact to local population in areas which are highly endemic, adventure trips, sport with high risk of injuries, possible sexual contacts, possible medical or dental treatment, tattoos or piercing. Only in high- risk groups does a titre control need to be done, about 6 weeks after completing the vaccination. The patients should be advised that even after a successful vaccination, unnecessary exposure could still result in infection with Hepatitis C or HIV. Prior to departure two inoculations should have been completed.

In Non-Responders (4 – 8 w after the last of 3 inoculations titre < 10 IU/l) another inoculation should be given. An inoculation with a double or fourfold dose (e.g. vaccine for patients under dialysis), or in combination with influenza vaccination can be administered, probably sub-cutaneously, to enhance the effect. If the titre of Anti HBs has risen once above 100 IU/l the immune protection will last for 10 years.

Hepatitis B Vaccination

Indication:	long time stay, close contact to local population, adventure tours, bad hygiene
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Vaccine:	Recombined vaccine (Engerix B®, Gen H-B-Vax®)		
Vaccination Scheme:	0 - 4 w - 6 (to 12) months, i.m.		
	Rapid scheme d₀ - d₇ - d₂₁ - 12 m i.m.		
Booster:	Depending on titre of Anti HBs		
	< 100 IE/ml	®	another inoculation
	> 100 IE/ml	®	booster after 10 years

4.2.7 Combination vaccine Hepatitis A and B

A combination vaccine of Hepatitis A and B (Twinrix®) exists, reducing the number of inoculations for those who need both vaccinations (0 - 4 w - 6 (to 12) m). The effective period is identical with the single vaccinations. As with the single vaccination against Hepatitis B at least two inoculations should have been completed prior to departure. A rapid scheme (d₀, d₇, d₂₁, 12 m) is possible. An immunization begun with mono vaccines can be completed with the combination vaccine.

4.2.8 Typhoid Fever

Typhoid fever (enteric fever) occurs worldwide. It is rare in industrial countries (0,24 - 3,7 cases/100.000),. It is more widespread in the third world (up to 540/100.000 with a mortality world-wide of 66.000/a). The areas of high risk are Latin America, Africa except Tunisia, and the Indian subcontinent. Most of the cases diagnosed in temperate areas have been infected whilst travelling. The risk of infection whilst staying in endemic areas varies between 2 – 12: 100.000, depending on the style of travelling. The case fatality rate is below 1 %. A well-known victim was aviation pioneer Wilbur Wright.

Typhoid Fever is a highly febrile infection caused by certain kinds of Salmonella, due to the contamination of food and beverages, by faeces. Life-threatening complications are intestinal haemorrhage and intestinal perforation. Paratyphus runs a similar slightly milder course.

Beside exposure prophylaxis, a vaccination is indicated in areas of high risk for low budget travellers, where there may be lower hygienic standards and the traveller may come into close contact with the local population. This does not apply for flight crew. However, flight missions visiting epidemic areas may warrant immunization. Two kinds of vaccines exist. A live vaccine consists of an apathogenic defect mutant of Salmonella typhi (Typhoral L®). The inactivated vaccine is administered parenterally i.m., as a single inoculation. Antibodies can be found up to three years after vaccination.

Vaccination against typhoid fever

Indication:	Travelling under simple conditions, with close contact with local population, Where there are lower standards of hygiene, stays > 4 w, epidemics or catastrophes
Vaccines:	- Oral live vaccine (Typhoral L®, Vivotif®) - Injectable inactivated vaccine Typherix®, TyphimVi®)
Vaccination Scheme:	- Live vaccine: d₁, d₃, d₅ 1 capsule - Inactivated vaccine: a single inoculation i.m. or s.c. into deltoid muscle
N.B.:	During vaccination with the oral live vaccine there should be no chemo-prophylaxis against Malaria or the administration of antibiotics

4.2.9 Meningococcal Meningitis

Meningococci exist worldwide, permanent epidemic areas reach from Brazil in the west to the sub-Saharan Sahel Zone in Africa, to the Arabian Peninsula and to the Indian subcontinent. The African Meningitis belt is located in the Sahel Zone and south of it. Particularly during the dry periods (December to June) epidemics occur in intervals over several years, e.g. pilgrims to Mecca. The infection is spread by large groups of people, such as Mecca pilgrims and high density of housing, such as in shantytowns, slum or mass tented areas.

The causative agents are gram-negative diplococci, *Neisseria meningitidis*. Eight serogroups A, B, C, X, Y, Z, W 135 und W 29 exist. Within the Meningitis belt infections with serotype A can be found, whereas in middle Europe, Australia and North America, infections with serotypes B and C occur. Meningococci are transmitted face to face by droplet infection. The reservoir is the nasopharyngeal area of healthy carriers. During an epidemic, up to 10 % of the population are carriers that can infect mainly susceptible non-immune children. The clinical course varies between an asymptomatic infection of the nasopharyngeal tract, (this is the most frequent type) to an acute meningococcaemia with light fever and petechiae. This may develop in 10% of those with the asymptomatic infection. The more serious infection has a case fatality rate of about 10 %, especially in children and juveniles and leaves long time residuals in up to 20 %. **If close contact with infected persons has occurred over a period of several hours (> 8 h) such as within an aeroplane, a prophylactic dose of Rifampicin is recommended.**

The polysaccharide vaccine protects against sero-groups A and C or additionally sero-groups W 135 und Y. The immunization is effective 10 to 14 days after the last inoculation and lasts at least for three years. Those vaccinated should be older than two years.

Beside exposure prophylaxis, the vaccination is indicated for travel in rural basic areas and where there is close contact with the population in these areas. It is mandatory for pilgrims to Mecca (Art. 84, International Health Regulations). Serotype W 135 is responsible for the most infection in this group. Therefore, the vaccine protecting against this serotype is recommended and is mandatory from 2002 onwards. **For flight crews transporting pilgrims to Saudi Arabia on pilgrim flights the vaccination might be mandatory, whether entering the country or not.**

Vaccination against Meningococcal Meningitis

Indication	Long-time stay in risk areas. Travel into rural areas under basic conditions and with close contact with the local population in these high risk areas Mandatory for pilgrimage to Mecca or flight crew transporting pilgrims upon entry to Saudi Arabia Under certain circumstances probably required by certain countries upon entry from risk areas
Vaccine	Inactivated vaccine, depending on producer -Tetavalent vaccine with serotypes A, C, W 135, Y (Mencevax ACWY®)
Vaccination Scheme	1 x 0,5 ml s.c.
Effectiveness	Reliable immune protection from 1 - 2 w after vaccination lasting 3yrs
N.B.	Mandatory vaccination valid from 10 d after until 3yrs after vaccination No protection against serotype B (Europe, South America)

4.2.10 Rabies

Rabies occurs worldwide, especially in Latin America, Africa, and Asia. The reservoir and main source of infection are stray dogs, in America also blood sucking bats. The worldwide mortality is 35.000 to 50.000 per year, 85 % of them in Asia, particularly India. In Europe only Romania, Russia and Turkey are risk areas. After the disease has been contracted it is 100% lethal, unless the traveller has been vaccinated or can reach medical assistance where the vaccine is available.

After bites from animals suspected of having rabies there are some local things that can be done which might be lifesaving. These consist primarily of meticulous sterilisation of the wound, plus to follow, an active and probably additional passive immunization schedule.

A pre travel vaccination is necessary only for those staying for a long time, or planning adventure trips into the countryside where there is a high risk and where an effective and well-tolerated vaccination (vaccine from India has serious adverse effects!) cannot be obtained within 24 hours. This does not apply to flight crew.

At days 0, 7 and 21 (alternatively 0, 28, 56) the inoculation is administered i.m. To maintain the immunization, if the risk continues, a booster is recommended after one year and subsequently at 5 years.

4.2.11 Japanese Encephalitis

Japanese Encephalitis is the most common viral encephalitis worldwide. The frequency differs between the Eastern Asia from Siberia, Korea and Japan to South East Asia and the Indian subcontinent as well as Taiwan, Philippines, the Mariane Islands and Guam. The disease has been spreading further worldwide in more recent years.

Birds are a reservoir, with an augmenting reservoir in pigs. The infection occurs in areas with rice paddies, where the vectors breed. The vector is the Culex mosquito, which is active from dawn to dusk. The virus circulates between these vectors and the reservoirs. Humans get infected when the density of the mosquito increases. Birds may carry the infection from the rural to the urban areas. Sporadic infections can occur all through the year. During the monsoon season the mosquito population can expand a great deal, causing epidemics.

In travellers Japanese Encephalitis is very rare. Nevertheless, an infection may be lethal. Beside exposure prophylaxis, the vaccination is indicated for individual travellers, who spend more than 4 weeks during the summer monsoon (May to October) in rural areas in endemic zones or who do extensive cross-country expeditions. This does not normally apply to flight crew. Only with extensive outdoor activities in endemic areas longer than 4 weeks duration is a vaccination warranted for flight crews. The inactivated vaccine contains inactivated virus from mouse brains (Producers Biken or Connard). It is not licensed in every European country, but can be obtained by international pharmacies. In case of adverse side effects the immunizing physician is liable. Those to be vaccinated should be informed about this situation.

Vaccination against Japanese Encephalitis

Indication:	Individual travels >4 w in rural areas of endemic zones
Vaccine:	Inactivated vaccine with inactivated virus from mouse brain
Vaccination Scheme:	1 ml s.c on days 0 - 7 - 28 An alternative rapid scheme at days: 0 – 7 - 14 A booster after 1 – 2 years
Effective period:	4 years
Side effects:	local at site of inoculation (rare).

4.2.12 Cholera

Cholera is neither a typical travel nor a typical tropical disease. It occurs as epidemics in third world countries because of the insufficient cleansing treatment of drinking water and sewage. Occasionally cases do occur in travellers, where there has been neglect in food and beverage hygiene.

The causative agents are different serovars of Vibrio Cholerae. The disease is characterized by diarrhoea with vomiting. Therapy consists of fluid replacement. Antibiotics hamper the toxin formation of V. Cholerae and may thus shorten the course of the disease.

The parenteral vaccine of inactivated Vibrio is given (2 x 0,2 – 2 ml s.c. with an interval of 1 – 2 w). It was once a mandatory vaccination. It does not give effective protection and is not recommended any more. Oral live vaccines, which are not licensed in several countries, are well tolerated and effective over a period of 6 to 12 months. Indications are for journeys under basic conditions with a high infection risk. This does not apply to flight crew. The best protection against cholera is appropriate food and beverage hygiene.

4.2.13 Tick Born Encephalitis

Tick born Encephalitis is a viral disease. The central European variant, is also known as ESME, and occurs in Central and Eastern Europe, from Southern Germany and Switzerland to the Urals, and to the south of Sweden and Finland. The Far East or Russian variant, also known as RSSE, occurs from the Baltic States in the west, throughout Russia to the Pacific Ocean.

The causative agent is a flavivirus, transmitted by ticks. In endemic areas the virus circulates between ticks and wild animals. Humans staying in forests areas, walking through long grass etc. can be infected due to tick bites. Infections often have a clinically unnoticeable or uncomplicated febrile course. Overall the prognosis is good, apart from the rare (5 %) who may develop the severe meningo-encephalitic type of the disease, which if not fatal, may leave long term residual neurological damage (in 30%), up to 2% may be lethal.

Beside exposure prophylaxis, a vaccination is indicated for repeated, long-time and professional stays, in forest areas in endemic zones, or for those living or with extensive outdoor activities in rural areas of endemic zones. This does not apply to most flight crews. The vaccine consists of inactivated FSME virus, by cross immunity it protects against RSSE virus infections as well. The inactivated vaccine is well tolerated. Occasional side effects are only local or febrile general reactions. Special contraindications do not exist. Pre-existing diseases of CNS or immune system and severe allergies are relative contraindications. The vaccine Encepur® is licensed for persons over 12 years of age.

Vaccination against Tick Born Encephalitis

Indication:	Repeated, long-term or occupational stays in forest areas of endemic areas (Or living in rural areas of endemic zones)
Vaccine:	Inactivated vaccine with inactivated virus
Vaccination Scheme:	3 x 0,5 ml i.m. , 0 - 1 to 3 m - 9 to 12 m Booster after 3 to 5 years Alternative rapid scheme d₀, d₇, d₂₁ Booster after 1 year
Effectiveness:	Sero-conversion in 99 %, protection rate 60 to 70 %
N.B.:	If applicable active or passive immunization (hyper-immuno-globulin) is possible up to 96 hr after tick bite (not suitable for children)

4.2.14 Vaccination Schemes for Flight Crews

Vaccination Schemes for Flight Crews: Recommended Vaccinations

Missions in Europe and North America	
Generally recommended vaccinations	Tetanus
	Diphtheria
	Poliomyelitis
	Hepatitis A ¹

¹ if operating to Mediterranean destinations or Eastern Europe

Missions in Tropical and subtropical Zones	
Generally recommended vaccinations	Tetanus
	Diphtheria
	Poliomyelitis
	Hepatitis A
Additionally recommended vaccinations	Yellow Fever ³
Recommended under certain circumstances ²	Meningitis ⁴
	Typhoid Fever
	Hepatitis B
Malaria prophylaxis	Exposure prophylaxis
	Chemoprophylaxis ⁵
	Making sure of early diagnosis and treatment ⁶

² Recommended if crews perform adventurous trips or live under probably lower levels of hygiene during layover, or stay longer than four weeks in a tropic area

³ Mandatory upon entry into certain countries, mandatory upon entry in to certain other countries after having visited endemic zones

⁴ Mandatory upon entry into Saudi Arabia, especially if transporting pilgrims, the tetravalent vaccine has to be used and is recommended otherwise, too

⁵ Recommended according to actual national and WHO recommendations during layover in high risk destinations in West Africa or East Africa or during longer layovers in risk areas

⁶ An early diagnosis and treatment of Malaria should be available at all destinations and at the home base in case of symptoms suspicious of malaria for all flight crews operating in tropical and subtropical areas

5 Malaria

Malaria is a febrile, potentially lethal infection. The causative agents are plasmodia, a kind of protozoa transmitted by the evening/night active, female Anopheles mosquito. Four kinds of plasmodia are pathogenic in humans, of which three can cause a variety of severe clinical conditions.

Plasmodia and malaria

Causative agent	Type of malaria	Incubation Period	Type of Fever	Prognosis
Pl. malariae	Malaria quartan	16 – 50 (longer possible)	Fever attacks every 3 d	No spontaneous recovery
Pl. vivax	Malaria tertian	12 - 20 d (up to 10 months. possible)	Fever attacks every 2 d	Spontaneous recovery possible
Pl. ovale	Malaria tertian	12 – 20 d (longer periods are possible)	Fever attacks every 2 d	Spontaneous recovery possible
Pl. falciparum	Falciparum Malaria	7 – 30 d (longer periods are possible)	Irregular fever attacks	Without treatment mostly lethal

Malaria occurs in the tropics and subtropics, depending on the habitats of the vector mosquito Anopheles. In Asia and South America a risk of infection exists up to an altitude of 1.800m, in Africa it can go up to 2.600m. The main risk areas (in order of decreasing risk) are West Africa, East Africa (particularly Kenya), and South Africa. Without the proper precautions, the risk is as follows (example West Africa):

2.500 Travellers (= 5 Jumbos) → 60 cases of malaria → 1 Fatality

The risk of malaria varies by the season. (There is a higher risk, during and immediately after the rainy season). In urban centres of the tropics, malaria transmission is occurring with increasing frequency. This is especially noticeable in the western African cities of Lagos, Accra, Abidjan, Dakar and Banjul. **Flight crews staying in these cities during their layovers (even short layovers) have a significant risk of being infected unless all the precautions are taken.**

Falciparum Malaria, the most dangerous form of malaria (case fatality rate 2 to 3,5 %), makes up the majority of malaria cases imported to Europe. It is mostly picked up in tropical Africa.

Even with meticulous malaria prophylaxis, it is not always 100 % safe. **In any patients with fever or other suspicious symptoms after staying in risk areas, malaria has to be suspected before anything else, and diagnostic measures must start immediately.**

In any case of fever, malaria has always to be suspected.

In any case of fever, always do a thick and thin blood film. It must be done to exclude malaria.

5.1 Malaria Prophylaxis

- 1. Exposure prophylaxis**
- 2. Chemo - prophylaxis (drug prophylaxis)**
- 3. Establish an early diagnosis and therapy.**
If applicable standby therapy (probably malaria quick test)

There are three elements of malaria prevention, which are based on each other. The kind of prophylaxis (only exposure prophylaxis), or exposure prophylaxis with standby therapy, or exposure prophylaxis plus chemo-prophylaxis, probably in combination with standby therapy). This all depends on the destination, season, style and duration of stay, as well as individual factors such as previous diseases, probable medication and probable intolerance of anti-malarials. Furthermore, the risks of the adverse side effects of chemo-prophylaxis, have to be weighed up against how effective is the method of prophylaxis and how great is the risk of getting malaria. General recommendations for relevant malaria areas may be a great help for physicians giving advice for malaria prophylaxis.

The relevant recommendations have been worked out by several scientific organisations, adapted to the actual epidemiological situation and published. The recommendations of the WHO are published in the brochure "International Travel and Health" (WHO Library, Genf 2003 ref. <http://www.who.int/ith/english/index.htm>). A couple of national recommendations exist, too. The Swiss and German and some other National recommendations for example differentiate for countries, travel areas and seasons. Therefore, the preventative measures can be adapted to the local epidemiological situation.

5.1.1 Exposure Prophylaxis

Exposure prophylaxis of Malaria is to protect against mosquito bites. It has to be carried out throughout the active time of the vectors – from dusk throughout the night to dawn. Local Area prevention can reduce the risk of malaria by 90 %.

1. **Cover as much as possible of the body surface by fair-coloured, loose-fitting cotton clothes (Long trousers, long sleeves).**
2. **Uncovered skin should be treated with insect repellents (e.g. Bayrepel, DEET. Permethrin is not favoured in some countries). These products should not be used on damaged areas of skin or children < 2 yrs**
3. **Staying inside with closed rooms during evening and night. Rooms should be mosquito-proof: use mosquito screens, air conditioning, and if applicable insecticides.**
4. **Mosquito nets are recommended (they should be big enough not to be touched while sleeping, loose ends should be fixed under mattress). If applicable mosquito nets impregnated by Permethrin.**

Electric vaporizers, mosquito coils and insecticides reduce the number of mosquitoes, but can produce possible irritating and toxic substances. Insecticides containing pyrethroids are often considered inappropriate for the same reason.

5.1.2 Chemo-prophylaxis

The decision for an **additional** medical prophylaxis has to take into account, the risk of infection, the efficacy e.g. the resistance situation, and the adverse side effects. This is especially so for long-term prophylaxis where the side effects have to be balanced against the possible benefit. Therefore, the decision to use chemo-prophylaxis, and to use certain anti-malarials, has to be based on a meticulous risk-benefit-calculation. Chemo-prophylaxis does not replace, but supplements, exposure prophylaxis. However, it has to be taken into account that no prophylactic drug is 100 % effective.

As with antibiotics, the sub-therapeutic levels of an anti-malarial as used in chemo-prophylaxis, can result in resistance. Resistance exists using Chloroquine and other antimalarials, especially with *Pl. falciparum* and *Pl. vivax*. According to the resistance situation the WHO has defined **resistance areas (A, B, C)**, for which certain prophylaxis regimes are recommended. These areas are not defined according to transmission of malaria. Therefore, the malaria risk does not depend on the resistance zone.

If a mission into an endemic area has to be started so early, that a sufficient blood level of the anti-malarial chosen cannot be achieved, a rapid saturation is possible with Chloroquine or Mefloquine.

Mefloquine is not approved for pilots. However, chemo-prophylaxis with **Atovaquone + Proguanil (Malarone®)** has to be started only the day before entering the malaria risk area and **is recommended instead.**

a) **Chloroquine (e.g. Resochin®) + Proguanil (e.g. Paludrine®)**

The effectiveness of this combination of two anti-malarial medications is only about 60 % (West Africa) and should not be recommended any more if a more effective alternative drug like Atovaquone + Proguanil (Malarone®) is available. It can be used over long periods continuously (Up to 100 g of Chloroquine, corresponding to continuous intake over 5 years, is harmless. For continuous intake – which normally does not apply for flight crew – an ophthalmological control is recommended every 2 years. The combination of Chloroquine and Proguanil used to be the only anti-malarial approved for pilots before Atovaquone + Proguanil (Malarone®) was approved. Severe adverse **side effects** do not exist, for Chloroquine, short term stomach discomfort, flickering of eyesight, light dizziness, sleep disturbance occur rarely. For Proguanil reversible loss of hair, ulceration of the mouth and stomach discomfort may occur rarely. For Proguanil reversible loss of hair, ulceration of the mouth and stomach discomfort may occur rarely. The medication should always be taken with food and with plenty of fluid. **Contraindications** for Chloroquine are psoriasis, retino-pathology, visual field defects, myasthenia gravis, glucose-6-phosphate dehydrogenase deficiency, hepatic porphyria, severe liver disorders, renal insufficiency and intolerance of 4-Aminochinolins. Contraindications for Proguanil are, severe renal insufficiency (reduction of dose necessary). A **rapid saturation** for chloroquine can be achieved by the intake of a weekly dose (2 Tablets) on 2 subsequent days. Subsequently, the chemo-prophylaxis has to be continued in a regular way. It has to be continued for 4 weeks after leaving the risk area.

Chloroquin + Proguanil (e.g. Resochin® + e.g. Paludrine®)

- Generics:** - 150 mg Chloroquine-Base resp. 100 mg Proguanil
- Intake:** - 2 Tbl. Resochin / w (with body weight > 80 kg: 3 Tbl), starting 1 week before mission, continuing for 4 weeks after leaving risk area
- 2 x 1 Tbl. Paludrine / d, starting 1 day before mission, continuing for 4 weeks after leaving risk area
- N.B.:** - for better compatibility intake with lots of fluid at meal times.
- With continuous intake > 2 a ophthalmological control every 2 years
- In New Guinea there is resistance against Proguanil
- Chemo-prophylaxis is possible for children and in pregnancy
- Rapid saturation with Chloroquine using: 2 Tbl/d for 2 d

b) Mefloquine (Lariam® or Mephaquine®)

Mefloquine is not approved for pilots! If a pilot should take it by mistake, then that pilot must remain unfit for flying duties for four weeks, and then be observed to see if any neuro-psychiatric side effects have occurred. Mefloquine in special circumstances can be used for flight attendants. The discussion about mefloquine for flight crew has not yet come to any fixed conclusions. Therefore until some conclusions have been reached, there is no reason why flight attendants should have to take the risk of using a less effective type of prevention, when this very effective anti-malarial for chemo- prophylaxis is available. Effectiveness is about 90 % in West Africa. Long-term intake is possible for up to 2 years. The **Side Effects** can include neuro psychiatric symptoms (0,1 to 1 %)[There are some reports of a higher percentage]. Visual blurring can occur. Epileptic seizures have been reported as well as psychotic symptoms. These effects can be dose related and occur more frequently with rapid saturation, or therapeutic intake, or in women (higher blood levels). Side effects are more likely to occur after a second intake. When the chemo-prophylaxis is taken for the first time, it should be started 3 weeks before onset of any exposure, therefore, in order to change the prophylaxis regime in case of side effects. **If side effects occur, Mefloquine should never be used again.** Vice versa, if side effects are absent, Mefloquine should be tolerated well in the future, although there is no guarantee or clinical evidence to prove this. The **Contraindications** include the first trimester of pregnancy when genetic abnormalities have been recorded. Three months after taking mefloquine, effective contraception is recommended. It should not be taken during the lactation period. It should not be given to children < 5 kg of body weight and / or < 3 yrs of age. It can cause cardiac conduction disturbances. It must not be taken with quinidine, or given to people with severe liver disorders, or with neuro psychiatric disorders, and of course, it must never be given to people with epilepsy. Interference with frequently used medicines such as beta-blockers, calcium antagonists and other anti arrhythmics should be considered. Even with diarrhoea Mefloquine can be sufficiently effective. A **rapid saturation** for mefloquine can be achieved by the intake of a weekly dose (1 Tablet) on 3 subsequent days. The prophylaxis with mefloquine should be started 1 week before the onset of a mission and continued for 4 weeks after leaving the risk area.

****Mefloquine should only be considered, where the risk of infection outweighs the probability of severe side effects. Because of the risk of both short term and long-term neurological side effects, mefloquine is forbidden for use in pilots****

Mefloquine (Lariam®)

- Generic:** - 250 mg Mefloquine
- Intake:** - 1 Tablet. /w, starting 1 week before exposure, continuing for 4 weeks after leaving risk area
- N.B.:** - Intake with plenty of fluid
- For women 3 months of effective contraception is recommended after intake
- Rapid saturation 1 x 1 Tbl for 3 d
- Rapid resistance to mefloquine has occurred in SE Asia. Resistant cases have now been reported in Africa.

c) Atovaquone + Proguanil (Malarone®)

According to preliminary results of scientific studies about the interference of Atovaquone/ Proguanil with flight duties it seems likely, that there will not be any problems for aircrew. The combination of Atovaquone and Proguanil (Malarone®) is used by several airlines as Lufthansa and is approved for Pilots by the FAA. The effectiveness is about 90 %, like that of mefloquine. It can be used for adults and for stays up to 28 days (soon to be prolonged up to 56 days and probably longer) and for persons with body weight of more than 40 kg (These restrictions do not apply for the USA.). As with mefloquine, it is recommended for chemo-prophylaxis in areas, where there is chloroquine resistance and for treatment of uncomplicated malaria. This combination is much better tolerated than mefloquine. The combination is not associated with neuropsychiatric adverse effects, impairment of psychomotor performance, mood changes, sleepiness and fatigue, especially under hypobaric conditions. **Side effects** are minimal and do not last very long, they may include: cough, gastrointestinal disturbance (nausea, vomiting, abdominal discomfort and pain, diarrhoea) and headache. **Contraindications** are severe liver disorders and severe renal insufficiency (Creatinine-Clearance < 30 ml/min). **Due to the short time of administering (1 day before up to 7 days after staying in a malaria risk area) the combination is particularly suitable for flight crews.** Acceptability of the drug by the compliance of patients proved to be very high.

Atovaquone + Proguanil (Malarone®)

Contents: - Atovaquone (250 mg) + Proguanil (100 mg)
Intake: - 1 Tablet. / d, starting 1 to 2 days before mission, continuing for 7 days after leaving risk area
- Maximum stay in risk area 28 d (Longer term intake is under consideration.)
N.B.: - effectiveness as mefloquine (90 %), tolerability better

d) Doxycycline

The antibiotic doxycycline is not officially approved for pilots yet, but it is being used in military pilots in high- risk areas, because of the lack of an effective alternative. It is not licensed for chemo-prophylaxis of malaria in some European Countries, but is used in the UK and the U.S. It is used for prophylaxis in areas with multi-resistant plasmodia (resistance against chloroquine, and proguanil, and mefloquine). This applies to the border areas between Thailand and Myanmar and Thailand and Cambodia. For the time being Doxycycline is regarded as effective as Atovaquone + Proguanil (Malarone®) or Mefloquine (Lariam®) for chemo-prophylaxis by some Societies for Tropical and Travel Medicine in Europe. It can be used instead of them, where these are recommended.

Side effects can include gastrointestinal disturbances (nausea, vomiting, diarrhoea), photo-dermatitis (care must be taken with solar radiation in tropical areas), very rarely it can cause increased intracranial pressure. **Contraindications** are children < 8yrs, severe liver disorders.

Doxycycline (several brand names)

Content: - 100 mg Doxycycline
Intake: - 1Tbl. / d, starting 1 to 2 days before mission, continuing for 4 weeks after leaving risk area
N.B.: - Must be taken with plenty of fluid
- Contraindicated in children < 8 yrs and pregnant women
- Beware of photo-dermatitis (solar radiation!)

e) Other antimalarials

Halofantrin (Halfan®), Fansidar® (Sulfadoxin + Pyrimethamin) and derivatives of Artemisin are **not** suitable for prophylaxis.

5.1.3 Standby Emergency Treatment

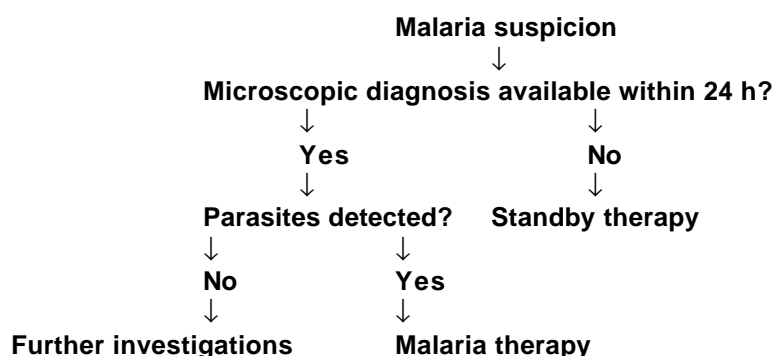
In Standby Emergency Treatment patients take an anti-malarial with them. This should be used if symptoms suspicious of malaria (e.g. fever > 38,5 °C, pain in the head and limbs, nausea and malaise) should occur, at least one week after having entered a risk area. Standby Emergency treatment can be recommended in areas with low transmission risk, short stays, intolerance of anti-malarials or where side-effects of chemo-prophylaxis outweigh the malaria-risk. European recommendations, (e.g. Swiss and German Societies of Tropical Medicine, 2001) advise standby precautions. Furthermore, Standby Emergency Treatment should be recommended if chemo-prophylaxis with chloroquine / proguanil is used, particularly if a more effective prophylaxis cannot be used in pilots or where there is intolerance. It can be considered especially in case of frequent short stops in endemic areas over a prolonged period of time. However, it does not replace exposure prophylaxis, which should be carried out meticulously.

If fever or other symptoms suspicious of malaria occur and no doctor is available, the standby drug should be taken by way of self medication. As soon as possible a physician trained in tropical medicine should be consulted. **After having taken the standby drug as therapy, flight crew are not fit for flying duties for four weeks.**

Procedure if malaria is suspected

Requirements:

symptoms suspicious of malaria
Stay in risk area for at least 7 d
No doctor available for next 24 h



*If applicable microscopic investigations have to be repeated every 6 h or in fever attacks

Depending on the destination, different drugs have been recommended for standby prophylaxis. Halofantrin (Halfan®) and the combination of Pyrimethamin und Sulfadoxin (Fansidar®) are not now recommended by most European Societies of Tropical Medicine. This is due to a variety of serious side effects including cardiac arrhythmias.

In remote areas Standby Emergency Treatment can be appropriate, if malaria symptoms occur even though chemoprophylaxis has been taken and medical assistance is not available within the next 24 hours. The choice of drugs depends on the type of chemoprophylaxis taken before. Furthermore, a drug with no resistance in the respective area should be used. Because of lack of data no recommendation for Standby Emergency Treatment after chemoprophylaxis with Atovaquone/Proguanil can be given.

Choice of drugs for Standby Emergency Treatment according to previous chemoprophylactic regimen (International Travel and Health (2004), WHO, Geneva)

Prophylactic regimen	Standby Emergency Treatment
None	Chloroquine, for P. vivax areas only Mefloquine Quinine Artemether/Lumefantrine ^a Atovaquone/Proguanil ^a
Chloroquine alone / with Proguanil	Mefloquine Quinine
Mefloquine	Quinine ^b Quinine + Doxycycline/Tetracycline for 7 d ^b
Doxycycline	Mefloquine Quinine + Tetracycline for 7 d

a Limited experience of drug interactions with other antimalarial drugs, therefore these drugs not recommended if taking already other antimalarial

b Mefloquine to be resumed 7 days after last dose of Quinine

Dosages in Standby Emergency Treatment

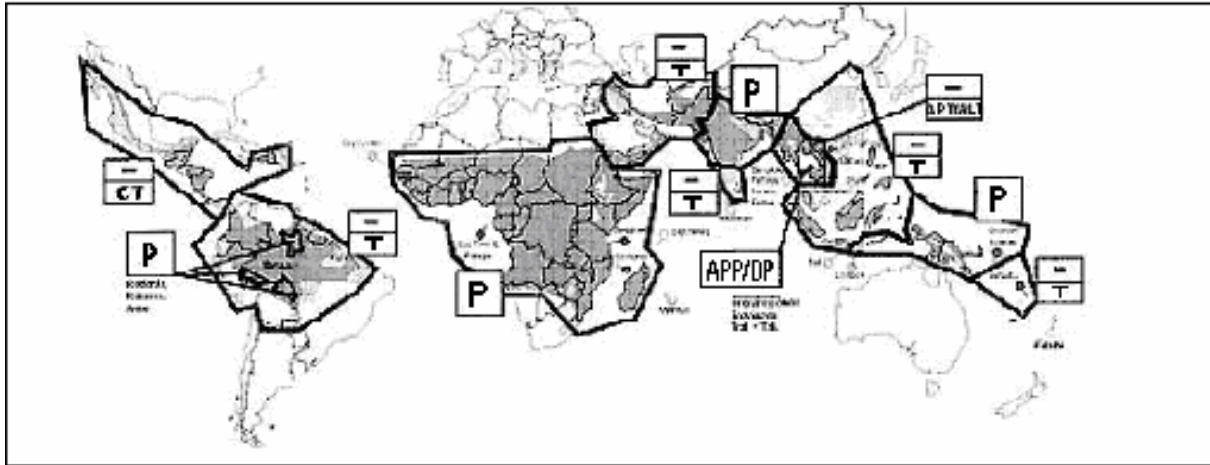
	Mefloquin (Lariam®) (Tbl. à 250 mg)	Atovaquon/Proguanil (Malarone®) (Tbl. à 250 mg/100 mg)	Artemether/Lumefantrin (Riamet®) (Tbl. à 20 mg/120 mg)	Chloroquine (Resochin®) (Tbl. à 150 mg)
d₁	Initially 3 Tbl. After 6 – 8 h 2 Tbl. After 6 – 8 h 1 Tbl.	Initially 4 Tbl.	Initially 4 Tbl. After 8 h 4 Tbl.	Initially 4 Tbl. After 6 h 2 Tbl.
d₂	-	4 Tbl.	2 x 4 Tbl.	2 Tbl.
d₃	-	4 Tbl.	2 x 4 Tbl.	2 Tbl.
Area	All malaria areas	All malaria areas	All malaria areas	Only in areas without chloroquine resistance

Guidelines for Standby Emergency Treatment (International Travel and Health (2004), WHO, Geneva)

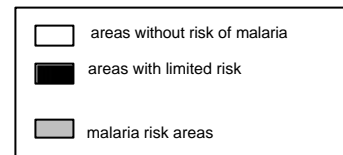
- Consult a physician immediately if fever occurs 1 week or more after entering an area with malaria risk.
- If it is impossible to consult a physician and/or establish a diagnosis within 24 hours of the onset of fever, start the stand-by emergency treatment and seek medical care as soon as possible for complete evaluation and to exclude other serious causes of fever.
- Complete the stand-by treatment course and resume antimalarial prophylaxis 1 week after the first treatment dose. Mefloquine prophylaxis, however, should be resumed 1 week after the last treatment dose of quinine.
- Vomiting of antimalarial drugs is less likely if fever is first lowered with antipyretics. A second full dose should be taken if vomiting occurs within 30 minutes of taking the drug. If vomiting occurs 30–60 minutes after a dose, an additional half-dose should be taken. Vomiting with diarrhoea may lead to treatment failure because of poor drug absorption.
- Do not treat suspected malaria with the same drugs used for prophylaxis, because of the increased risk of toxicity and resistance.

5.1.4 Special recommendations

An example for special recommendations are those of the Swiss/ German Societies of Tropical Medicine and various other Organisations, which differentiate their recommendations by countries, and even travelling areas within countries, seasons and duration of stay.



(after WHO International Travel and Health 2003, and SAR and DTG)



- P** Mefloquine (Lariam®), or Atovaquone / Proguanil (Malarone®), or Doxycyclin for Chemoprophylaxis
- APP/DP** Atovaquone / Proguanil (Malarone®), or Doxycyclin for Chemo-prophylaxis
- APT/ALT** no Chemo-prophylaxis but Atovaquone / Proguanil (Malarone®) or Artemether/Lumefantrin (Riamet®) for Standby-Therapy
- T** no Chemo-prophylaxis but Mefloquine (Lariam®) or Artemether/Lumefantrin (Riamet®) for Standby-Therapy
- CT** no Chemo-prophylaxis but Chloroquine (Resochin®) for Standby-Therapy

Recommendations for malaria prophylaxis (after DTG, 2003)

Geographic Region	Prophylaxis
Tropical Africa, Eastern Indonesia, Papua-New Guinea, Salomon Islands, Amazonian-Provinces	P
Indian Subcontinent north of line, Goa-Madras	P
Thailand (Provinces Trat and Tak)	APP / DP
Thailand (other provinces)	APT / ALT
Central America	CT
Other risk areas	T
In all malaria areas	Exposure prophylaxis

5.1.5 Frequent missions or long-term stay

Prior to long-term stays (stationing of flight crews and their families) meticulous medical advice must be given. The recommendations have to consider the individual situation. In principle, the use of chemo-prophylaxis is recommended. WHO recommends chemo-prophylaxis at least for the first 1 to 3 months of a long-term stay. Further medical advice, should be given by a local specialist. This specialist should be experienced in malaria prophylaxis of non-immune patients. Chemo-prophylaxis is particularly important where the risk is higher (e.g. rainy season, insufficient exposure prophylaxis). Even more so with tourists, a thorough risk-benefit-calculation is necessary. For long-term stays and

where chloroquine is taken, the WHO recommends an ophthalmological review of the retina every six months to see if there have been any changes, beginning five years after the onset of uninterrupted prophylaxis (with intake of 100 mg/week), and after three years (with intake of 100 mg/day).

For frequent missions, which apply particularly for flight crews – The European Authorities recommend some form of chemo-prophylaxis, whereas the WHO favours a standby prophylaxis. For pilots, only chemo-prophylaxis with chloroquine / proguanil is approved.

Checklist for malaria advice (after DTG, June 2001)

1. **Information about malaria risk.**
2. **Pregnant women and children under 5 years should abstain from stays in risk areas.**
3. **Information about local area prophylaxis (avoiding insect bites and stings).**
4. **Information that malaria may occur even with thorough prophylaxis.**
5. **Information about symptoms of malaria and necessity to consult a doctor.**
Information about the potential lethal course in case of delayed diagnosis and therapy.
6. **Consider previous diseases, intake of medicine, allergies, existing or intended pregnancy, tolerance of previous chemo-prophylaxis.**
7. **Consider intended activities during stay (diving, mountain climbing).**
8. **Information about necessity of regular intake of chemo-prophylactic drugs before, during and after staying in risk area. If applicable information about mode of intake of standby therapy.**
9. **Information about side effects of anti-malarial medication.**
10. **Written information should be given as a handout.**
11. **If medicine is purchased abroad, only those approved in Europe should be bought.**

5.2 Diagnosis and Therapy

Early diagnosis and immediate treatment of malaria is essential. The most insidious form of malaria, Falciparum Malaria, caused by *Plasmodium falciparum* can be lethal within a couple of days, because the complications can occur so rapidly. Often, a delay in the diagnosis and therapy by the patient and / or the doctor may result in a fatal outcome. A mistaken diagnosis for example, can include an illness like influenza, which can be fatal. Flight crews have to be informed about incubation periods, symptoms, diagnostic and therapeutic possibilities, both at the tropical destination and at home.

Every febrile disease, from 7 days after up to several months, (cases even after one year are known) **after staying in risk areas, malaria should be suspected until the opposite has been proved.** Even without a typical course of fever, malaria has to be suspected. In cases of malaria breaking through despite proper prophylaxis, the symptoms may be atypical. The course of the disease can be protracted. Malaria (especially insidious Falciparum Malaria) can be ruled out if the thick film is negative. This is furthermore confirmed by negative fluorescence-micro-haematocrit enrichment (quantitative buffy coat or QBC) absence of anaemia and haptoglobin reduction, thrombocytopenia and splenomegaly.

The diagnosis is established by thick and thin film. This has to be repeated every 6 hours for 24 hours. The thick film is a method of enrichment. If the type of plasmodia has not been determined by thick film, the thin film reveals this information. Immuno-chromatographic **quick tests** are only supplementing these tests. They are not feasible as “Do it yourself”-tests for flight crews.

After a diagnosis of malaria has been made, therapy has to begin immediately. In case of doubt it is better to start therapy, rather than to wait for time consuming additional tests. In Europe even

uncomplicated cases of malaria should be treated in hospital. **If a member of a flight crew contracts malaria he / she is unfit for flying duties until 4 weeks after successful treatment.**

6 Intestinal or food-borne infections

6.1 Traveller's diarrhoea

Traveller's diarrhoea is the most frequent disorder encountered in tropical and sub-tropical regions (at least 30 to 50 % of travellers). Risk and incidence increase with poor hygienic conditions. Eating with local people and food purchased from street vendors pose a special risk. Ice produced from unknown water sources is a common cause of travel diarrhoea.

The infection is acquired by faecal-oral transmission and is caused by contaminated food, beverages or smear/saliva infection. Causative agents are bacteria (e.g. enteric salmonella, pathogenic Escherichia coli, especially ETEC, Shigella, Yersinia and Campylobacter), their toxins (which can cause the food poisoning), several viruses (e.g. Rota and Norwalk virus) and protozoa. The most common are Amoeba and Giardia, and with increasing frequency Cryptosporidia. In acute diarrhoea, bacteria is the most common cause. In chronic diarrhoea, parasites are the most common cause.

Risk factors for traveller's diarrhoea

Destination

Season (in subtropical destinations)

Duration of stay

Style of stay (Hotel during Layover < circular tour < adventure trip)

Lodging, low standard of hygiene

Neglect of food and beverage hygiene

Reduced gastric acid (H₂-Blockers, Proton Pump Blockers, previous gastric resection)

Reduced immune response

Previous stay in third-world country (> 6 m before)

6.1.2 Clinical features and diagnosis

Normally traveller's diarrhoea starts on the third day of stay. **The incubation period** can be only some hours, or up to several days. Bacterial and viral infections are usually of 6 to 12 hours. A shorter incubation (frequently only 30 minutes) is normally caused by food poisoning. Typical symptoms are, more than three liquid stools. Every type of diarrhoea can cause dehydration and a reduction of the electrolytes, potassium and bicarbonate. **The mean duration** is 3 to 4 days, 10 % may take more than one week, and only 1 % may result in a chronic form of diarrhoea (duration > 3 weeks).

Uncomplicated diarrhoea is common, presenting as gastroenteritis or entero-colitis with watery diarrhoea, rarely covered by mucus, diffuse abdominal pain, vomiting and temperatures of maximum 38,5°C. Typical for dysentery (up to 10 % of travel diarrhoea) are stools mixed with blood or pus (resulting from invasion of the colonic mucosa), intestinal cramps and fever up to > 40°C.

Most patients suffer a self-limiting disorder, and often by the time a visit is made to the physician, the symptoms have subsided. Therefore, a **diagnosis is not necessary** in most cases. If further diagnostic is intended, Salmonella, Shigella, Yersinia and Campylobacter should be checked for. Negative results do not rule out an infectious cause, because travel diarrhoea is almost always of an infectious origin. Many leukocytes detected by stool examination may indicate dysentery or invasive enteritis. However, in case of a fever > 38,5 °C and / or blood or pus, further diagnostic tests are mandatory.

6.1.3 Therapy

Symptomatic treatment – mostly as self-therapy (This information has to be given to flight crew) - and is usually sufficient. Fever > 38,5 °C and / or blood or pus, makes it necessary for a consultation with a doctor and the fever will require specific therapy.

a) Symptomatic Therapy

Fluid loss resulting from diarrhoea requires urgent fluid replacement. Motility inhibitors may be used as a supplementary measure:

Rehydration

- Mild cases: fruit juice, tea with sugar, broth, juice of coconut, in children, cola and salt sticks.
- More severe cases: solution recommended by WHO (sodium chloride 3.5 g, sodium bicarbonate 2.5 g, potassium chloride 1.5 g, glucose or sugar 40.0 g, water ad 1000 ml, available also as ready mix e.g. Elotrans®, Oralpädon®, Rehdtrat, Dioralyte, etc or a do it yourself solution with a 10ml spoonful of glucose or sugar, a 5ml teaspoon of salt or half salt/ half baking powder plus one litre of fluid.
- Fluid loss of > 10 % body weight: infusion therapy.

Motility Inhibitors

- Loperamid (Imodium®): initially 2 cps (4 mg), then 1 cps (2 mg) after every subsequent loose bowel movement
- Max. 12 mg/24 h, not to be used for more than 48 hr, not to be used for children < 2 a or dysentery (fever or bloody diarrhoea).

b) Specific Therapy

In case of cholera or infection with Shigella, parasites, typhoid fever or para-typhus a specific treatment by specific antibiotics is required. Otherwise a calculated antibiotic treatment can be prescribed for 3 to 5 days. Antibiotics do not replace fluid replacement! **Whilst taking antibiotic therapy, flight crew are unfit for flying duties, until they are fully recovered and the antibiotic therapy has been stopped.**

Antibiotic therapy for traveller's diarrhoea

Disease	Therapeutic Options
Diarrhoea without knowledge of the causative agent (calculated antibiosis)	Ciprofloxazin 2 x 500 mg/24 h for 3 – 5 days Norfloxazin 2 x 400 mg/24 h for 3 – 5 days Ofloxazin 2 x 200 mg/24 h for 3 – 5 days
Cholera	Tetracycline 2 x 500 mg/24 h for 5 days
Shigella	Ampicillin 2 - 4 x 500 mg/24 h for 5 days Trimethoprim/Sulfamethoxazol 160 mg/800 mg 2 x 1/24 h for 5 days
	Ciprofloxazin 2 x 500 mg/24 h for 3 – 5 days Norfloxazin 2 x 400 mg/24 h for 3 – 5 days Ofloxazin 2 x 200 mg/24 h for 3 – 5 days
Campylobacter	Azithromycin 1 x 500 mg for 3 days Erythromycin 4 x 500 mg/24 h for 7 days
Giardia	Tinidazole/Metronidazole 2 g as a single dose

6.1.4 Prophylaxis

Food and beverage hygiene act as a exposure prophylaxis against traveller's diarrhoea and other intestinal infections

Only use fresh boiled (tea, coffee) or originally bottled and sealed beverages
In the field, use water filters, iodine etc. for water treatment
No ice into drinks, no ice cream
No raw milk or dairy products
Only well-done or well-boiled meat or fish
Avoid raw fish and raw seafood
No raw salad only fruits, that can be peeled by oneself or under one's own supervision
No dishes with cold dressings (e.g. ketchup), mayonnaise or products of raw eggs
No sandwiches with salad or mayonnaise
Avoid dishes that have been kept warm for long periods of time. The fresh and thorough preparation of food is essential.
Thorough hand and body hygiene
Use mineral water for brushing teeth
Avoid tableware and cutlery that may have been cleaned in dirty water (if applicable drinking from bottle or can)

Peel it, boil it or forget it!

Medical prophylaxis is only indicated in very rare cases (e.g. high-ranking business travellers, sportsmen prior to competition, patients with chronic inflammation bowel disease or gastric resection. Ciprofloxacin-1x 250/500 mg/daily).

This is not approved for flight crews.

6.2 Amoebiasis

Amoebiasis occurs in tropical and subtropical areas. Most cases seen in temperate zones are imported. Amoebae are rarely a cause for travel diarrhoea. The causative agent in Amoebic dysentery is a pathogenic protozoa called *Entamoeba Histolytica*, which is potentially invasive. About 10 % of the world population is infested with *Entamoeba Histolytica*. Nevertheless, most of those infested with *Entamoeba* exhibit the apathogenic type called *Entamoeba dispar*, which appears and behaves like *E. histolytica*. The two can be differentiated by molecular genetic and protein chemical measurements. Both species infest the lumen of the colon, but only *E. histolytica* can invade the bowel wall. Only the pathogenic *E. histolytica* results in the formation of antibodies. Proteins, which have a particular pattern of iso-enzymes, the (so-called zymodemes), are responsible for the pathogenic effects of *E. histolytica*.

The infection is acquired by faecal-oral transmission. Cysts are ingested in contaminated water and food. The risk of infection depends on the hygienic standards of the person excreting the cysts and the potential recipient. Cysts are resistant against gastric acid and go through a development to trophozoites, so-called minuta forms in the small intestine. These multiply and colonize the upper colon. In the lower colon cysts are developed and excreted. Only in the case of accelerated intestinal passage (diarrhoea) are the minuta forms excreted. Magna forms develop from minuta forms and are characterized by phagocytized RBC, which may invade the wall of the colon. **Amoebic cysts are frequently found in flight crew.**

6.2.1 Clinical features

The **asymptomatic luminal infection** shows excretion of cysts without clinical symptoms. **Invasive amoebic disease** starts with invasion of the bowel wall. It shows different clinical features: In **amoebic dysentery** abdominal pain, tenesmus, diarrhoea with blood and mucus (raspberry jelly stool) develop within 2 to 3 weeks. The clinical course may vary between common diarrhoea with only occult blood, to more than 20 bloody bowel movements a day. Complications such as perforation, peritonitis, and toxic mega-colon may occur. An **Amoebic liver abscess** develops after the invasion of the blood vessels and is the most frequent extra-intestinal complication. Severe pain in the right upper abdomen, fever and severe malaise are typical. Complications are hepatic failure, perforation into abdominal

cavity or thorax, causing diaphragmatic pain and severe shortness of breath. The most severe complication can be a brain abscess. Rigors are common and may be mistaken initially for malaria

6.2.2 Diagnosis

Luminal infection is diagnosed by laboratory's specialising in tropical diseases. This requires studying fresh stools or by using enrichment methods. Using **zymodeme** (isoenzyme analysis), *E. histolytica* and *E. dispar* can be differentiated as well as by **Stool culture** and **PCR**. **PCR** or **Stool Antigen ELISA** can detect *E. histolytica* directly. Invasive amoebiasis, is proved by **specific antibodies** (mostly by the beginning of clinical symptoms or at least 1 week after).

Procedure if amoebic cysts have been detected

- Asymptomatic excretion of cysts ? serology (test for specific antibodies)
- Negative serology ? asymptomatic luminal infection, probably <i>E. dispar</i>
- Positive serology ? PCR / Zymodeme to differentiate <i>E. dispar</i> / <i>E. histolytica</i>
- Symptomatic excretion of cysts ? serology and PCR / Zymodeme to differentiate <i>E. dispar</i> / <i>E. histolytica</i>

Amoebic liver abscess is diagnosed by ultrasound (CT or NMR), supplemented by serology.

6.2.3 Therapy

Therapy of amoebiasis (Lunzen, Tannich, Burchard, Dt. Ärzteblatt 93, 51 - 52)

Diagnosis	Drug	Dosage	Time of treatment
Luminal infection	Paromomycin Diloxanidfuroat	25 - 35 mg / kg / d, tid 3 x 500 mg p.o.	7 days 10 days
Amoebic dysentery	Metronidazole Tinidazole	3 x 10 mg/kg KG p.o. or i.v. 2 g / d p.o.	10 days 5 days
Amoebic liver abscess	Metronidazole Severe cases additionally Chloroquine	3 x 10 mg/kg KG i.v. Initially 600 mg p.o. Then 300 mg p.o.	10 days 2 days 2 - 3 weeks

In invasive amoebiasis, a luminal infection is present as well and should be treated with diloxanidfuroat (available in the U.K.). Success of intestinal eradication should be checked after about 6 weeks by microscopic stool diagnosis. **During medication with either drug, members of flight crew are not fit to fly.** The **side effects** of the medication can include extra-pyramidal tremors and a **severe reaction with any form of alcohol. In asymptomatic luminal infection, fitness for flying is not restricted. Flight crew are not fit for flying duties with amoebic dysentery or with liver abscess or other manifestations. 2 weeks after successful treatment (proved by ultrasound, CCT, NMR, EEG depending on clinical manifestation), flight crew may return to duty.**

6.3 Giardiasis

Giardiasis (Lambliasis) occurs worldwide. In temperate areas up to 10 % of diarrhoea, and in the third world up to 20 % is caused by *Giardia*. The causative agent is the protozoa *Giardia lamblia*. Humans are a source of infection, particularly children, who can excrete very many cysts. Transmission is via the oral faecal route, or by smear infection or from contaminated food and water.

The **course of disease** varies between the asymptomatic excretion of cysts, to heavy diarrhoea and malabsorption. Early symptoms include diarrhoea, nausea, vomiting, intestinal hurry and abdominal pain. This can continue for about 1 to 2 weeks. Chronic Giardiasis may develop, even without the previous acute phase. Symptoms appear continuously or intermittently with intestinal hurry, diminished consistence of stool, sometimes diarrhoea, and a loss of weight. Severe cases show malabsorption, reduced growth rates in children, dehydration, and very rarely, a fatal outcome.

Cysts and trophozoites can be detected in fresh stool analysis by naked eye microscopic **diagnosis** or in conserved stool by enrichment methods in specialized laboratories. Antigenic stool tests are a new development. Sometimes diagnosis has to be more invasive by taking biopsy specimens from the jejunum.

Tinidazole (Simplotan®) 2 g as single dose is used for **therapy**. If necessary, this treatment can be repeated after 7 days. Alternatively, Metronidazole (Clont®, 2 g/d for 3 d or 3 x 400 mg for 5 – 7 d) can be used. During pregnancy Paromomycin should be used. During medication with either of the drugs **members of flight crew are not fit for flying duties**. Success of intestinal eradication should be checked after about 6 weeks by microscopic stool diagnosis.

6.4 Cryptosporidia

Intestinal infections by cryptosporidia are occurring with increasing frequency. Cryptosporidia are now resistant against chlorides. Therefore the usual chloride treatment of drinking water cannot now prevent this type of infection.

Transmission is via the oral-faecal route. In immuno-competent persons a self-limiting course of 1 to 4 weeks can be found with diarrhoea, fever and febrile symptoms. A specific therapy is not necessary. Severe disease occurs in immuno-deficient patients. In these cases Paromomycin (Humatin®, 4 x 500 mg/d p.o. for 14 – 28 d, then 2 x 500 mg/d p.o. as suppression therapy for long-time) is used for treatment. **Whilst taking such medication, flight crew are not fit for flying duties**. Exposure prophylaxis should ensure that all drinking water should be filtered.

7 Patients with symptoms after visits to tropical areas

A host of other tropical diseases occur outside of Europe, most are of little significance for flight crews. Nevertheless, they may be of significance in the differential diagnosis of patients who complain of symptoms such as fever, diarrhoea, exanthema, and jaundice, after visits to the tropics. In patients presenting with fever or even unspecific symptoms, malaria should be suspected after staying in endemic areas. Diarrhoea with fever and / or bloody stools, or chronic diarrhoea should be should also be diagnosed meticulously. Diagnosis should be performed in hospitals and treatment given by physicians, who specialise in tropical medicine.

Differential Diagnosis for Fever after staying in tropical areas

Malaria Infections of upper respiratory tract Acute Hepatitis Typhus / Para-typhus Amoebiasis, Liver abscess Acute phase of helminthic infections e.g. Katayama Fever Dengue Fever and other Arbo-virus Infections Campylobacter Enteritis Borreliosis Rickettsiosis Visceral Leishmaniasis

Differential Diagnosis of Diarrhoea

Amoebiasis Giardiasis Shigellosis Enteric Salmonellosis Campylobacter Enteritis

Differential Diagnosis of Exanthema and other skin conditions

Pyodermia
Dermatomycosis
Ektoparasites
Larva migrans
Cutaneous leishmaniasis
Filariasis
Myiasis

Dengue Fever is a common diagnosis for febrile patients who have stayed in endemic zones. Where flight crews are concerned this disease represents an important differential diagnosis with malaria. Infections occur worldwide in the tropics and subtropics and have spread in the past years, especially into conurbations. The disease is caused by a flavivirus (4 Serotypes) and transmitted by *Aedes* mosquitoes (active day and night). After an incubation period of 2 – 7 days patients complain of a biphasic fever up to 40 °C, severe muscle and limb pain (break bone fever), headache, malaise, and generalized exanthema. After malaria has been ruled out, the diagnosis is established clinically and can be verified by an increase of antibodies. The only treatment required is symptomatic. The administration of antipyretics and analgesics such as Paracetamol can be used. Acetylsalicylic Acid should however be avoided. The complications of **Dengue Haemorrhagic Fever** and **Dengue Shock Syndrome** are very rare in travellers. Treatment requires intensive care medicine.

Apart from Hepatitis A and B, Hepatitis C, D, E, can be encountered in tropical areas as well as in Europe. This depends on the local epidemiology. Clinical diagnosis and treatment do not differ either. Exposure prophylaxis include, avoiding contact with blood and body fluids (Hepatitis C and D) and the practice of good food hygiene (Hepatitis E) is recommended.

Bacterial diseases like Borreliosis (Relapsing Fever), Rickettsiosis (different febrile diseases presenting as atypical pneumonia or cyclic general infections are often accompanied by exanthema). Protozoal diseases like visceral leishmaniasis or trypanosomiasis, are fairly rare in travellers and in flight crews.

Haemorrhagic Fevers such as Lassa, Marburg and Ebola Fever are very rare and of little significance for flight crews. When patients suffering from these particular fevers or any other type of infectious disease have been transported by air, the flight surgeon has the responsibility to inform any member of the crew that flew that particular aircraft. The Flight Surgeon should offer the crew an examination or a transfer to a specialized institution. The Flight Surgeon is also obliged to report the matter to the health authorities according to the local health regulations.

8 Other Tropical diseases and Infections

There are some tropical diseases that are rarely encountered by flight crews. In this context it should be mentioned, that a lot of diseases occurring in tropical and subtropical areas are not typical tropical diseases. This applies to diseases that may occur even in temperate zones, but having a much higher prevalence in the tropics than in Europe where they may have been eradicated.

Helminthic diseases can be avoided by good food hygiene or by exposure prophylaxis. Rare infections and complications such as Hydatid disease caused by *Echinococcus granulosus* or Cysticercosis caused by *Taenia solium* with intracerebral symptoms renders flight crews unfit for flying duties.

The infection **Schistosomiasis** (Bilharziosis) is marked by an initial period of fever (Katayama Fever) and then an infection of wall of bladder and the colon. This causes haematuria and bloody stools. One of the complications can be portal hypertension. The infection can be avoided in tropical areas by not swimming or walking in lakes and rivers. Helminthic infections that are transmitted by insect vector's are not of any real significance for flight crews.

A further disease transmitted by ticks is Borreliosis, which is caused by different species of *Borrelia*. It appears in three stages with skin, joint, cardiac and neurological symptoms. There is no vaccination

for the European form of the disease. Antibiotics are given as therapy. **Flight crew are unfit for flying duties until successful treatment has been documented.**

Sexual transmitted diseases as well as HIV infection can be avoided by sensible sexual hygiene and precautions. The flight surgeon should not hesitate to advise flight crew on this subject.

Flight crews may encounter many types of skin disease, when they are operating in tropical areas. **Larva migrans. (Creeping Eruption), is one type of this condition.** This can be diagnosed by seeing lines like threads appearing on the skin that are slightly raised above the skin level. The disease is caused by, the larva of ankylostoma. This is found in dogs. It is common after skin contact with sand on beaches that is contaminated by dog faeces. Walking on beaches with bare feet can also result in another disease caused by the sand flea called **Tunga Penetrans**. This can present as a severe irritation, with secondary infection and ulceration in the inter-digital, sub-ungual and genito-anal areas. Tetanus and gangrene are occasional complications. The developing larvae of the dipterous flies cause **Myiasis** after the eggs have been deposited under the skin. This is a relatively uncommon in humans. It often occurs by accident. Sweating and poor hygienic conditions encourage fungal infections. This is encountered more readily in the tropics. Good hygiene and cotton clothes can prevent these diseases. **Ectoparasitic infections** such as scabies, lice, fleas, and bed bugs are more likely to be encountered where there are poor living conditions and where there is poor personal hygiene amongst the flight crew. **Prickly heat** is a condition of the sweat glands caused by heavy sweating, more so in tropical areas. It can be avoided by using the correct clothing and by using the appropriate body hygiene.

Other food borne diseases like **Ciguatera, tetrodotoxin, and paralytic shellfish poisoning** present with light to severe neurological symptoms, nausea, vomiting and diarrhoea, and can be prevented by not eating certain fish. When flight crews are operating in areas where these diseases occur, and they present with typical symptoms, they can be treated by symptomatic therapy. The symptoms normally subside after a couple of weeks.

Haemoglobinopathies such as sickle cell anaemia (drepanocytosis) or thalassaemia are common in people originating from tropical areas. These conditions have to be taken into account by flight surgeons examining applicants from tropical areas or of African origin. These genetic abnormalities are of significance because the homocytotic form will make someone unfit for the flying environment and for flying duties. Fitness with the heterocytotic form depends on the actual haematological variables. **The Haematocrit values should be > 32 % for flight crews on duty.**

Venomous fish. There are over 100 fish species that have proved dangerous to man. Most are found in tropical areas. Great care must be taken when handling any fish dead or alive. Unnecessary contact with fish should be avoided in the vicinity of Coral Reefs. This is important for scuba divers and those who snorkel.

9 Medical Fitness for Air Crews after Infectious Diseases (Guidelines for Medical Assessment)

Disease	Condition	Period of Unfitness	Notes
African Tick Typhus			See Rickettsial Diseases
African Trypanosomiasis			See Trypanosomiasis
AIDS			See HIV
American Trypanosomiasis			See Chagas Disease
Amoebiasis	Asymptomatic Luminal Infection	No restriction	
	Amoebic Dysentery	Unfit until therapy and full recovery	
	Liver Abscess	2 w after therapy and full recovery	No residual mass in ultrasound
	Other manifestation	2 w after therapy and full recovery	In case of brain abscess or meningoencephalitis if no residual mass in CCT or NMR and normal EEG
Anaemia	HK < 32 %	unfit	
Ancylostoma duodenale			See Helminthic Diseases
Angiostrongyliasis			See Helminthic Diseases
Anthrax	All forms of disease	2 w after therapy and full recovery	No spores or vegetative forms of B. anthracis in bacteriologic studies
Antibiotics		Until cessation of therapy	
Arboviral Encephalitis		4 w after therapy and full recovery	In case of normal EEG and absence of convulsive periods. In case of symptomatic epilepsy on discretion of AMS
Arbovirus Fever	Chicungunya (CHIK)	4 w after therapy and full recovery	No restriction of joint mobility
	O'Nyong Nyong (ONN)	4 w after therapy and full recovery	No restriction of joint mobility
	Oropouche Fever	2 w after therapy and full recovery	
	Ross River Fever (RR), Epidemic Polyarthritis	4 w after therapy and full recovery	No restriction of joint mobility
	Sandfly (SF) Fever, Pappataci Fever, Phlebotomus Fever	2 w after therapy and full recovery	
Argentinian Hemorrhagic Fever			See Haemorrhagic Fever
Ascariasis			See Helminthic Diseases
Aspergillosis			See Fungal Pulmonary Infections
Bacillus anthracis			See Anthrax
Bacterial Meningitis			See Meningitis

Disease	Condition	Period of Unfitness	Notes
Balantidium coli	Asymptomatic Infection	No restriction	
	Symptomatic infection	After therapy and full recovery	
Bartonella henselae			See Cat Scratch Disease
Bartonella bacilliformis	Oroya Fever		See Bartonellosis
	Verruga peruana		See Bartonellosis
Bartonellosis	Cat Scratch Disease	2 w after therapy and full recovery	Normal liver function tests and normal neurological examination
	Oroya Fever	2 w after therapy and full recovery	
	Verruga peruana	No restriction	
Beta Thalassaemia			See Thalassaemia
Blastocystis hominis	Asymptomatic Infection	No restriction	
	Symptomatic infection	Until therapy and full recovery	
Blastomycosis			See Fungal Pulmonary Infections
Bolivian Hemorrhagic Fever			See Hemorrhagic Fever
Borreliosis	Lyme Disease , skin, joint and peripheral enurologic manifestation	Until therapy and full recovery	Individual assessment by serodiagnostic
	Lyme Disease , cardiac manifestation	Until therapy and full recovery	Echocardiogram must demonstrate normal contraction and ejection and 24 h ECG must demonstrate absence of significant arrhythmias
	Lyme Disease , encephalitis and meningitis	Until therapy and full recovery	Neurological examination and EEG must be normal
	Relapsing Fever	4 w after therapy and full recovery	Normal ECG, 24 h ECG, Echocardiogram, liver function tests and normal neurological examination
Burkholderia			See Melioidosis
Buruli Ulcer		No restriction	Normal function of limbs, sufficient local therapy and sufficient hygienic conditions
Campylobacter			See Travel Diarrhoea
Carrion Disease	Oroya Fever		See Bartonellosis
	Verruga peruana		See Bartonellosis
Cat scratch Disease			See Bartonellosis

Disease	Condition	Period of Unfitness	Notes
Chagas Disease	American Trypanosomiasis	Unfit	Unless assessed fit by AMS in absence of cardiac and gastrointestinal complications after meticulous tests (e.g. normal ECG, 24 h ECG, Echocardiogram, gastrointestinal studies)
Chicungunya (CHIK)			See Arbovirus Fever
CHIK Virus	Chicungunya (CHIK)		See Arbovirus Fever
Cholera		2 w after therapy and full recovery	
Ciguatera			See Seafood Toxins
Clonorchis sinensis			See Helminthic Diseases
Clostridium perfringens			See Travel Diarrhoea See Gas Gangrene
Clostridium tetani			See Tetanus
Coccidioides immitis			See Fungal Pulmonary Infections
Coxiella burneti			See Rickettsial Diseases
Creeping eruption		No restriction	
Crimean Congo Haemorrhagic Fever			See Haemorrhagic Fever
Cryptococcus		Unfit	Infection is sign for impaired immunity in HIV Infection
Cryptosporidium parvum	Unspecific Diarrhoea		See Travel Diarrhoea
	In HIV Patients	Unfit	Infection is sign for impaired immunity in HIV Infection
Cutaneous Leishmaniasis			In case of absence of functional sequelae (i.e. no restriction of joint movement by scar formation etc.)
Cyclosporida			See Travel Diarrhoea
Cysticercosis			See Helminthic Diseases
Cytomegalia (CMV-Infection)	Mostly asymptomatic in immuno-competent hosts	No restriction	
	In HIV Patients	Unfit	Infection is sign for impaired immunity in HIV Infection
Dengue Virus	Dengue Fever	2 w after full recovery	Rule out Malaria!
	Dengue Shock Syndrome	4 w after therapy and full recovery	
	Dengue hemorrhagic Fever	4 w after therapy and full recovery	
Dracunculus medinensis			See Helminthic Diseases
East American Equine Encephalitis (EEE)			See Arboviral Encephalitis

Disease	Condition	Period of Unfitness	Notes
Ebola Virus.			See Hemorrhagic Fever
Ebstein Barr Virus (EBV)			See Mononucleosis
Echinococcus			See Helminthic Diseases
EEE Virus	East American Equine Encephalitis (EEE)		See Arboviral Encephalitis
Ehrlichiosis			See Rickettsial Diseases
Encephalitis		4 w after therapy and full recovery	In case of normal EEG and absence of convulsive periods. In case of symptomatic epilepsy on discretion of AMS
Endemic Syphilis	Early Lesions	2 w after therapy and full recovery	
	Late Lesions	Unfit	Unless rendered fit by AMS
Entamoeba histolytica			See Amoebiasis
Enterobius vermicularis			See Helminthic Diseases
Epidemic Polyarthrits			See Arbovirus Fever
Epizoonosis		Unfit until infestation has been eradicated	
Escherichia coli			See Travel Diarrhoea
Falciparum Malaria			See Malaria
Fasciola			See Helminthic Diseases
Fasciolopsis buski			See Helminthic Diseases
Fièvre Boutonneuse			See Rickettsial Diseases
Filariasis			See Helminthic Diseases
Fleas			See Epizoonosis
Framboesia			See Yaws
Fungal Skin Infections		No restriction	
Fungal Pulmonary Infections, Systemic Fungal Infections	Fungal Pulmonary Infections	2 w after therapy and full recovery	Successful treatment must be demonstrated by Chest X-ray
	Other systemic manifestations	2 w after therapy and full recovery	Successful treatment must be demonstrated by ultrasound (liver), EEG (meningitis)
Gas Gangrene	Clostridial Myositis	4 w after therapy and full recovery	
Giardiasis	Asymptomatic Disease	No restriction	
	Symptomatic Disease	Until therapy and full recovery	

Disease	Condition	Period of Unfitness	Notes
Glucose-6-phosphate dehydrogenase deficiency		No restriction	If oxidative stress due to antimalarials, antibiotics, analgesics, antihelminthic drugs and certain type of food (Fava Beans) are avoided. These Persons should obtain no missions to the tropics
Gonorrhoea		Until therapy and full recovery	
Granuloma inguinale		Until therapy and full recovery	
Guanarito Virus	Venezuelan Haemorrhagic Fever		See Haemorrhagic Fever
Haemorrhagic Fever		4 w after therapy and full recovery	Successful recovery has to be proved by meticulous clinical and laboratory examination, 24h ECG and echocardiography
Hantavirus Haemorrhagic Fever			See Haemorrhagic Fever
Helminthic infections	Asymptomatic or unspecific Disease	No restriction	
	Anaemia	Unfit	HK < 32 %
	Portal Hypertension	Unfit	Unless rendered fit by AMS
	Cysticercosis	4 w after therapy and full recovery	No residual mass in CCT or NMR and normal EEG, normal extended ophthalmologic examination (no mass)
	Filariasis (Lymphatic)	Unfit	In case of Elephantiasis. See also Onchocerciasis
	Cystic Hydatid Disease	2 w after therapy and full recovery	Successful treatment must be demonstrated by ultrasound (liver), CT (lungs, peritoneal cavity)
	Alveolar Hydatid Disease	Unfit	Unless definite healing is demonstrated
Hemoglobin, abnormal, Hemoglobin Disorder	Homocytotic	Unfit	
	Heterocytotic	No restriction	HK < 32 %
Hepatitis	Hepatitis A	After therapy and full recovery	
	Hepatitis B acute	After therapy and full recovery	

Disease	Condition	Period of Unfitness	Notes
	Hepatitis B chronic	Unfit	Unless Chronic Persisting Hepatitis, no impairment of mental abilities, in regular testing AFP normal or after successful therapy (sero conversion, normal liver function tests)
	Hepatitis C acute	After therapy and full recovery	
	Hepatitis C chronic	Unfit	Unless Chronic Persisting Hepatitis, no impairment of mental abilities, in regular testing AFP normal or after successful therapy (sero-conversion, normal liver function tests)
	Hepatitis D acute	After therapy and full recovery	
	Hepatitis D chronic	Unfit	Unless Chronic Persisting Hepatitis, no impairment of mental abilities, in regular testing AFP normal or after successful therapy (sero-conversion, normal liver function tests)
	Hepatitis E	After therapy and full recovery	
	Hepatitis F	After therapy and full recovery	No clinical significance
	Hepatitis G	After therapy and full recovery	No clinical significance
Histoplasma capsulatum			See Fungal Pulmonary Infections
HIV		Unfit	Unless assessed fit by AMS
Hookworm			See Helminthic Diseases
Hydatid Disease			See Helminthic Diseases
Hymenolepis nana			See Helminthic Diseases
Immunization			See Vaccination
Influenza		Unfit until full recovery	
Intestinal Flukes			See Helminthic Diseases
Invasive Salmonellosis			See Typhoid Fever
Ippy Virus			See Haemorrhagic Fever
Isospora belli			See Travel Diarrhea
Japanese Encephalitis		4 w after therapy and full recovery	
Junin Virus	Argentine Haemorrhagic Fever		See Haemorrhagic Fever
Kala Azar	Visceral Leishmaniasis	4 w after therapy and full recovery	

Disease	Condition	Period of Unfitness	Notes
Kaposi Sarcoma		No restriction	In case of absence of systemic manifestations
Katayama Fever		Unfit in acute stage	See Trypanosomiasis
Kyasanur Forest Fever			See Haemorrhagic Fever
Larva currens	Strongyloides Infection		See Helminthic Diseases
Larva migrans		No restriction	Infection by ancylostoma pathogenic for dogs
Lassa Fever			See Haemorrhagic Fever
Legionella pneumophilia	Legionnaire's Disease	2 w after therapy and full recovery	
Leishmania aethiopica			
Leishmania braziliensis			
Leishmania chagasi			See Kala azar
Leishmania donovani			See Kala azar
Leishmania guyanensis			
Leishmania infantum			See Kala azar
Leprosy	Lepromatous Leprosy	4 weeks after therapy and full recovery	Normal ophthalmological findings, normal audiogram and, in case of meningitis, normal EEG and absence of convulsive periods and normal neurological evaluation
	Tuberculoid Leprosy	Unfit	Unless neurological, renal, ophthalmologic complications have been ruled out and in case of normal ophthalmological findings, normal audiogram and, in case of meningitis, normal EEG and absence of convulsive periods and normal neurological evaluation
Leptospira	Leptospirosis		See Leptospirosis
Leptospirosis	Weil's disease	2 w / 4 w after therapy and full recovery	Depending on severity of clinical course
Lice			See Epizoonosis
Loa Loa			See Helminthic Diseases
Loiasis			See Helminthic Diseases
Louse Borne Relapsing Fever			See Borreliosis
Louse Borne Typhus			See Rickettsial Diseases
Lung Flukes			See Helminthic Diseases
Lymphatic Filariasis			See Helminthic Diseases
Machupo Virus	Bolivian Haemorrhagic Fever		See Haemorrhagic Fever
Malaria	Malaria suspected or proved	Unfit	
	after therapy and recovery	4 w	

Disease	Condition	Period of Unfitness	Notes
	After chemoprophylaxis with Resochin/Paludrin	No restriction	
	After Chemoprophylaxis with Mefloquine or Atovaquon/Proguanil	4 w	
	After Standby Therapy with Chloroquine, Mefloquine, Atovaquon/Proguanil or Artemether/Lumefantrin	4 w	
Marburg Fever			See Haemorrhagic Fever
Marburg Virus			See Haemorrhagic Fever
Measles		Until full recovery	Infectious until 2 d after onset of exanthema
Melioidosis		Until full recovery	
Meningitis		4 w after therapy and full recovery	Normal EEG and absence of convulsive periods and normal neurological evaluation. In case of symptomatic epilepsy on discretion of AMS
Meningococci			See Meningitis
Microsporidia	Unspecific Diarrhea		See Travel Diarrhoea
	In HIV Patients	Unfit	Infection is sign for impaired immunity in HIV Infection
Mites			See Epizoonosis
Mite Typhus			See Rickettsial Diseases
Monkey Pox		4 w after therapy and full recovery	Extended ophthalmological examination must be normal
Mononucleosis		2 w after therapy and full recovery	Normal size of spleen (Ultrasound)
Mopeia Virus			See Haemorrhagic Fever
Mucocutaneous Leishmaniasis		No restriction	In case of absence of functional sequelae
Mucosal Leishmaniasis			See Mucocutaneous Leishmaniasis
Murray Valley Encephalitis (MVE)			See Arboviral Encephalitis
Murine Typhus			See Rickettsial Diseases
MVE Virus	Murray Valley Encephalitis (MVE)		See Arboviral Encephalitis
Mycobacterium leprae			See Leprosy
Mycobacterium tuberculosis			See Tuberculosis
Mycobacterium bovis			See Tuberculosis
Mycobacterium ulcerans			See Buruli Ulcer
Myiasis	Facial Manifestations		Normal extended ophthalmological and ORL examination
Necator americanus			See Helminthic Diseases
Neisseria gonorrhoeae			See Gonorrhoea

Disease	Condition	Period of Unfitness	Notes
Neisseria meningitidis			See Meningitis
Neurosyphilis			See Syphilis
Non-Veneral Treponematosi	Endemic Syphilis		See Endemic Syphilis
	Pinta	2 w after therapy and full recovery	
	Yaws		See Yaws
Norwalk Virus			See Travel Diarrhoea
Ocular Toxocariasi		Unfit	Unless rendered fit by AMS
Old World Tick Typhus			See Rickettsial Diseases
Onchocerca volvulus			See Onchocerciasis
Onchocerciasis	Cutaneous and subcutaneous manifestations	Until full recovery	
	Ocular manifestation	Unfit	Unless assessed fit by AMS
ONN Virus	O'Nyong Nyong (ONN)		See Arbovirus Fever
O'Nyong Nyong (ONN)			See Arbovirus Fever
Opisthorchiasis			See Helminthic Diseases
Opisthorchis			See Helminthic Diseases
Opisthorchis felinus			See Helminthic Diseases
Opisthorchis guayaquilensis			See Helminthic Diseases
Opisthorchis sinensis			See Helminthic Diseases
Opisthorchis viverrini			See Helminthic Diseases
Oropouche Fever			See Arbovirus Fever
Oropouche (ORO) Virus	Oropouche Fever		See Arbovirus Fever
Oroya Fever			See Bartonellosis
Pappataci Fever	Sandfly (SF) Fever, Phlebotomus Fever		See Arbovirus Fever
Paracoccidioides brasiliensis			See Fungal Pulmonary Infections
Paracoccidioidomycosis			See Fungal Pulmonary Infections
Paralytic Shellfish Poisoning			See Seafood Toxins
Pediculosis pubis			See Epizoonosis
Pediculosis capitis			See Epizoonosis
Phthirus pubis			See Epizoonosis
Pinta			See Non-Veneral Treponematosi
Pinworm			See Helminthic Diseases
Phlebotomus Fever	Sandfly (SF) Fever, Pappataci Fever		See Arbovirus Fever
Plague	Bubonic Plague	2 w after therapy and full recovery	
	Pulmonary Plague	4 w after therapy and full recovery	
Plasmodium falciparum			See Malaria
Plasmodium malariae			See Malaria
Plasmodium ovale			See Malaria
Plasmodium vivax			See Malaria

Disease	Condition	Period of Unfitness	Notes
Pneumocystis carinii		Unfit	Opportunistic Infection in HIV Infection
Pneumonia		2 w after therapy and recovery	
Pneumonic Plague			See Plague
Poliomyelitis		4 w after therapy and full recovery	
Pork Tape Worm			See Helminthic Diseases
Postvaccinal Encephalitis			See Encephalitis
Pubic Lice			See Epizoonosis
Pyomyositis			See Tropical Pyomyositis
Q-Fever			See Rickettsial Diseases
Rabies		Unfit	
Relapsing Fever			See Borreliosis
Rhabdomyolysis		Unfit	Until renal function has been normalized
Rhodesian Sleeping Sickness			See Trypanosomiasis
Rickettsia			See Rickettsial Diseases
Rickettsial Diseases	Epidemic Typhus (Louse Borne Typhus)	4 w after therapy and full recovery	
	Endemic Typhus (Murine Typhus)	4 w after therapy and full recovery	
	<i>Tick Typhus (Spotted Fever)</i> American Tick Typhus Old World Tick Typhus Rickettsial Pox	2 w after therapy and full recovery	
	Mite Typhus (Scrub Typhus)	4 w after therapy and full recovery	
Rickettsialpox			See Rickettsial Diseases
Rift Valley Fever			See Haemorrhagic Fever
Ross River Fever (RR)	Epidemic Polyarthritis		See Arbovirus Fever
Rota Virus			See Travel Diarrhoea
RR Virus	Ross River Fever (RR), Epidemic Polyarthritis		See Arbovirus Fever
Rubella		Until full recovery	Infectious until 2 w after onset of exanthema
Salmonella			See Travel Diarrhoea
Salmonella enteritidis			See Travel Diarrhoea
Salmonella Enterocolitis			See Travel Diarrhoea
Salmonella paratyphi			See Typhoid Fever
Salmonella typhi			See Typhoid Fever
Salmonella typhimurium			See Travel Diarrhoea
Sarcoptes scabiei			See Epizoonosis
Scabies			See Epizoonosis
Schistosoma			See Schistosomiasis
Schistosoma haematobium			See Schistosomiasis

Disease	Condition	Period of Unfitness	Notes
Schistosoma intercalatum			See Schistosomiasis
Schistosoma japonicum			See Schistosomiasis
Schistosoma mansoni			See Schistosomiasis
Schistosoma mekongi			See Schistosomiasis
Schistosomiasis	CNS Schistosomiasis	Unfit	Unless rendered fit by AMS
	Hepatoportal Schistosomiasis	Unfit	Unless rendered fit by AMS
	Intestinal Schistosomiasis	After therapy and full recovery	In case of absence of complications like rectal prolapsed or intersusception
	Pulmonary Schistosomiasis	Unfit	Unless rendered fit by AMS
	Urinary Schistosomiasis	After therapy and full recovery	In case of absence of urinary retention, stasis, renal failure or stone formation
Scrub Typhus			See Rickettsial Diseases
Seafood Toxins		2 w after therapy and full recovery	Absence of neurologic sequelae
Shigella			See Travel Diarrhoea
Shingles			See Varizella Zoster Virus
SLE Virus	St. Louis Encephalitis (SLE)		See Arboviral Encephalitis
Sleeping Sickness			See Trypanosomiasis
Snake Bite		Unfit	Unless any neurological, cardiac and haematological complication has been ruled out
Splenomegaly		Unfit	Unless only slightly enlarged with no danger of rupture
Spotted Fever			See Rickettsial Diseases
St. Louis Encephalitis (SLE)			See Arboviral Encephalitis
Strongyloides stercoralis			See Helminthic diseases
Syphilis		Unfit	Unless rendered fit by AMS in stage I or II
Systemic Fungal Infections			See Fungal Pulmonary Infections
Taenia saginata			See Helminthic diseases
Taenia solium			See Helminthic diseases
Tana Pox		2 w after therapy and full recovery	
Tapeworms			See Helminthic diseases
Tetrodotoxin Poisoning			See Seafood Toxins
Thalassaemia	Beta-Thalassaemia maior	Unfit	
	Beta-Thalassaemia minor	No restriction	HKT > 32 %

Disease	Condition	Period of Unfitness	Notes
	Alfa-Thalassaemia maior	Unfit	
	Alfa-Thalassaemia minor	No restriction	HKT > 32 %
Threadworm			See Helminthic diseases
Tick Borne relapsing Fever			See Relapsing Fever
Tick Typhus			Seen Rickettsial Diseases
Toxocara cani			See Heminthic Diseases
Toxocara cati			See Heminthic Diseases
Toxocariasis			See Heminthic Diseases
Toxoplasma gondii			See Toxoplasmosis
Toxoplasmosis	Asymptomatic or only generalized Lymphadenopathia	No restriction	
	Myocarditis, Hepatitis	Until therapy and full recovery	Complications ruled out by normal ECG, 24 h ECG, Electrocardiogram and normal liver function tests
	Cerebral Toxoplasmosis	Unfit	Infection is sign for impaired immunity in HIV Infection
Travel Diarrhea		Until full recovery	
Traveller's Diarrhea			See Travel Diarrhoea
Trench Fever			See Rickettsial Diseases
Treponema pallidum	Syphilis		See Syphilis
Treponema pallidum subspecies endemicum	Endemic Syphilis		See Endemic Syphilis
Treponema pallidum subspecies pertenue	Yaws		See Yaws
Treponema pallidum subspecies carateum	Pinta		See Non-Venereal Treponematosis
Trichuris trichiura			See Helminthic Diseases
Trichuris trichuria			See Helminthic Diseases
Tropical Pyomyositis		4 w after therapy and full recovery	In case of absence of functional sequelae (i.e. no restriction of joint movement by scar formation etc.)
Tropical Splenomegaly Syndrome			See Splenomegaly
Tropical Sprue		After successful therapy, substitution and full recovery	
Tropical Ulcer		No restriction	If local therapy can be performed and hygienic conditions are sufficient
Trypanosoma brucei			See Trypanosomiasis
Trypanosoma brucei gambiense			See Trypanosomiasis
Trypanosoma brucei rhodesiense			See Trypanosomiasis
Trypanosoma cruzi			See Chagas Disease

Disease	Condition	Period of Unfitness	Notes
Trypanosomiasis	Sleeping Disease	Unfit	Unless rendered fit by AMS after meticulous tests (ECG, 24h ECG, Echocardiogram, EEG, neurological evaluation)
Tuberculosis		4 w after therapy and full recovery	In case of normal ophthalmological findings, normal audiogram and, in case of meningitis, normal EEG and absence of convulsive periods and normal neurological evaluation
Tunga penetrans			See tungiasis
Tungiasis		No restriction	
Typhoid Fever		4 w after therapy and full recovery	
Typhus Fevers			See Rickettsial Diseases
Upper Respiratory Tract (URT) Infections		Until full recovery	If pressure of middle ear and sinuses can be equalized and the voice is clear enough for radio communications.
Urinary Schistosomiasis			See Schistosomiasis
Vaccination		24 hours	Parenteral immunization, provided that adverse side effects (anaphylactic reaction etc.) are absent, that may impair the ability to perform the duties
Varizella			See Varizella Zoster Virus
Varizella Zoster Virus		Unfit until full recovery	If blisters have disappeared
VEE Virus	Venezuelan Equine Encephalitis (VEE)		See Arboviral Encephalitis
Venezuelan Equine Encephalitis (VEE)			See Arboviral Encephalitis
Venezuelan Haemorrhagic Fever			See Haemorrhagic Fever
Verruga peruana			See Bartonellosis
Vibrio cholerae			See Cholera
Viral Haemorrhagic Fever			See Haemorrhagic Fever
Viral Hepatitis			See Hepatitis
Visceral leishmaniasis			See Kala Azar
Viral Encephalitis			See Encephalitis
Viral Meningitis			See Meningitis
Weil's disease			See Leptospirosis
WEE Virus	West American Equine Encephalitis (WEE)		See Arboviral Encephalitis
West American Equine Encephalitis (WEE)			See Arboviral Encephalitis

Disease	Condition	Period of Unfitness	Notes
West Nile (WN) Fever	Fever, myalgia, exanthema	After full recovery	
	Meningitis or Meningoencephalitis	4 w after therapy and full recovery	Normal EEG and the absence of convulsive periods and normal neurological evaluation. In case of symptomatic epilepsy at the discretion of AMS
West Nile (WN)Virus			See West Nile (WN) Fever
Whipworm			See Helminthic Diseases
Wuchereria bancrofti	Lymphatic Filariasis		See Helminthic Diseases
Yaws	Early Lesions	2 w after therapy and full recovery	
	Late Lesions	Unfit	Unless rendered fit by AMS
Yellow Fever		4 w after therapy and full recovery	
Yersinia			See Travel Diarrhoea
Zoster			See Varicella Zoster Virus