INFECTIOUS DISEASES AND THE TRAVELLING ATHLETE

– Written by Yorck Olaf Schumacher, Qatar

INTRODUCTION

An athlete´s ability to perform at his/ her best is threatened by injuries and illnesses. Contrasting injuries, which rarely happen outside of training or competition, illnesses loom everywhere, every day. Illnesses occur when the body´s immune system cannot sufficiently handle the ubiquitous exposure to infective agents such as viruses or bacteria. While at home, in a "familiar" environment, the immune system of the athlete is likely adapted to potential infectious threats of this specific environment, this often changes when the athlete is travelling: The immune system is compromised due to (travel) fatigue, the new and changing environment is often prone to infections and possible countermeasures are limited. Travel is always preceding or following training camps or competitions and thus occurs during crucial times of any athlete´s preparation period. Very often, the time between travel and competition is short, thus limiting any therapeutic option for newly acquired infections.

The following article describes the infectious threats that can occur in connection with travel and outlines preventive measures in order to allow the athlete to arrive at the start line healthy.

RISK MANAGEMENT

Risk factors associated with infections in athletes can be divided into intrinsic and extrinsic risk factors. Intrinsic risk factors are factors that relate to the athlete himself, such as health status, sleep pattern, nutrition, training etc. Extrinsic risk factors relate to risks coming from the environment in which the athlete evolves, f.ex. surface contamination with bacteria, crowds or teammates with potential spread of infectious particles, perished/ infected food or water etc. Some of these risk factors can be mitigated, others cannot.

The most common intrinsic and extrinsic risk factors that athletes have to manage during travel are illustrated in the Table 1.

While the management of most of these risk factors is described elsewhere[1], some factors related to (air)travel and their mitigation is described below:

Health/ Immune status

The current health status of each athlete will affect his/ her vulnerability for illnesses. Health issues impacting the immune system, such as Vitamin D deficiency can have a significant effect on health and performance. "Hidden" health issues include incomplete immunization/ vaccination status (seasonal flu!) and dental concerns. Research has further identified psychological stress as a significant risk factor for the occurrence of upper respiratory tract infections[1]. Prior to competitions and training camps abroad, each athlete should undergo a brief screening assessing these factors. Such screening can be done prior to departure to a training camp or competition remotely via phone or email by asking specific questions related to the above and organising mitigation measures when necessary.

Training load

Training has a large influence on the immune function of the organism[2]. Training and competition are inherently connected to travel, either by going to training camps or by travelling to sites of competitions. The most well-known immunological phenomenon connecting physical activity and the immune system is the so-called "open window" period, a period of reduced immune competency that occurs immediately after hard training or competition, which makes the athlete more prone to catch illnesses. It lasts about 1-2h and needs to be considered mainly for post-

Table 1

Intrinsic risk factors	*Extrinsic Risk factors*
Health/ Immune status	*Destination environment*
Training load/ recovery	*Travel fatigue/ Jet lag*
Nutritional habits/ energy availability	*Destination specific infectious risks*
Sleep habits	*Crowd contact/ Team accommodation*
Psychological stress	*Discipline- specific risk (contact/ non-contact sport, indoor outdoor, skin contact, water contamination)*

Table 1: The most common intrinsic and extrinsic risk factors that athletes have to manage during travel.

competition activities and departure travel from competition sites.

On a more long-term basis, both training volume and monotony (i.e. the same training with little variation) are proven risk factors for illnesses. This has to be taken into consideration when planning travel to- and from training camps by reducing training volume and intensity before the end of the camp. The negative effects of hard training on the immune function are further amplified by altitude exposure, which is of importance in endurance athletes, as most elite athletes in these disciplines spend time at altitude.

Sleep

Sleep is an essential regulator of immune function and countless studies have demonstrated the negative effect of insufficient or poor sleep on the immune system[3,4]. For travelling athletes, there are several options to improve their sleep quality during travel and at the destination (training camp, competition):

Team officials might try managing the room allocation in the hotel at the destination beforehand and request rooms away from busy streets or other noisy areas (hotel restaurant, bar) during the booking process, then double checking the assigned rooms on floor plans or reviews of the destination hotel on the internet. As a next step, the team should try to make the sleep environment as "sleep prone" as possible for each athlete. This includes making sure that the room can be made dark, that the temperature in the room is adequate and that noise levels are reduced. In practise, this involves the provision of eye masks, earplugs, possibly additional blinds and duct tape to cover small (blinking) lights of fire alarms or light switches, which often "light pollute" hotel rooms. If logistical means (transport) are available, portable AC units are a worthy investment in warm environments, when accommodations are not adequately equipped (such as in many sports hostels and lower budget hotels). Another measure which is usually well accepted by the athletes is to ask them to bring their own bedding (duvet, pillow) to training camps or competitions. Room sharing between athletes might also be based not only on personality traits and friendships between athletes, but also on sleep patterns, i.e. room "early risers" and "late night owls" separately. Very often, such small measures can improve sleep quality, improve immune function and thereby reduce the risk of illnesses.

Travel arrangements

Contrasting the preceding topics, where the focus was on strengthening/ readying the immune system to fight potential threats, travel arrangements in view of infection risk mitigation aim at exposure prophylaxis, i.e. measures to reduce the contact of the athlete with potential infectious agents (viruses, bacteria, toxins). Such agents either come from other persons, through surface contamination or food/ drinks.

The first part of any journey is typically the planning of the travel. Here, several decisions which can reduce the likelihood of infections can already be made (see also above, management of training and sleep): On most occasions, travel will occur either by car/ bus or by plane. When planning car or bus travel, it should be checked before boarding the vehicle if any of the passengers (athletes, staff members) currently suffer from any type of upper respiratory tract infection (URTI). Since the SarS-COVID-19 epidemic, it is well known that droplet propagation in restricted spaces such as cars or buses is a major factor in the spread of viral disease. Persons with active URTI should be separated from the healthy members of the team during car or bus travel, f.ex. by grouping them in a separate vehicle. If this is not possible, they should sit as far away from the athletes as possible and wear a mask at all times.

During travel – In the plane

During air travel on commercial flights, isolation of potentially infectious individuals is obviously not possible, as these persons might be normal passengers not linked to the team. It has been well documented that in airplanes, the distance to an infected person and the duration of a flight directly correlate with the risk of infection for most pathogens that are airborne or spread through droplets[5-7]. Therefore, it is recommended to limit the contact of the travelling athletes with the other passengers as much as possible and to put as much distance as possible between these groups. The easiest way is obviously traveling in business class, where the individual space is much larger than in economy class, thus reducing potential exposure. It is clear that this strategy, while popular among athletes and staff, will likely not be realistic in most settings for financial reasons.

If travelling in Economy class, window seats towards the front of the plane should be preferred: There is good evidence that aisle seats represent a greater risk due to passengers walking in the aisle and touching the headrest of many seats for balance, further spreading potential surface -bound pathogens. If possible, (healthy) team staff members should be seated between the athletes and "normal" passengers to increase the distance between them and thereby potentially reducing the risk of contamination: research has suggested the "2 row rule", which states that infectious passengers on a plane usually spread germs

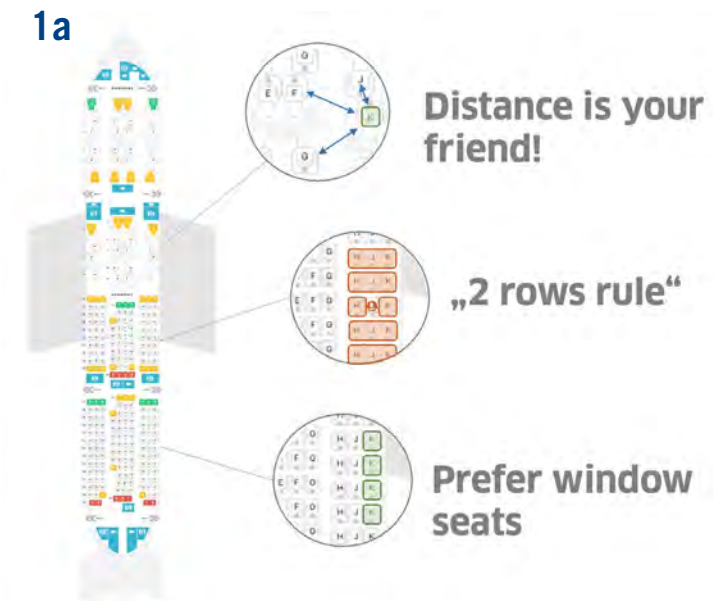
over 2 rows in front and behind them. Figure 1 a and b show recommendations for typical seat arrangements when travelling with a team by plane in different settings.

The next possibility to reduce the risk of infection is the boarding process, where passengers usually queue and stand close to one another as they enter the plane, find their seats and store their luggage. Here, it is advisable to wait with the boarding until the last minute (if possible), even if the plane is boarded by zones. The team then boards together with no other, potentially infectious, passengers around them and an empty aisle, as the other passengers have found their seat already. If the boarding process involves a bus transfer to the plane, it is recommended to wait until the very last bus, where there are usually much less passengers. During the boarding process, masking is recommended, due to the close proximity of other passengers.

Once on board and when seated in the assigned (window) seat, it can be debated if the mask can be removed. Modern passenger airplanes have a carefully controlled air management based on HEPA filters (filters that eliminate airborne infectious agents such as viruses, bacteria or fungi and are also used in operating theatres) and frequent air exchange. The air in airplanes is typically a 50%/50% mixture between filtered ("recycled") cabin air and "fresh" air from the plane´s exterior. The airflow is vertical, i.e. the air comes out of the vents above the passenger seats and is then "aspirated" near the floor, filtered and (in parts) recirculated. By these means, the entire air in the cabin is renewed every 2-3 minutes. Therefore, the air quality in airplanes, in view of the presence of infective agents, is superior to many other enclosed environments, where there is little air exchange. Thus, masking during the entire flight might not be necessary.

The same procedure as described above for boarding the plane should be applied when leaving the plane: Given that most athletes will (hopefully) sit near the front of the cabin, the plane can be left early, i.e. before all other passengers. If that is not possible, it is recommended to remain seated until the other passengers have vacated the plane. Here again, masking is recommended.

When seated, there are several other potential risks for infections: These mainly stem from surface contamination of appliances such as the head rest, the tray table, the entertainment system (touch screen), seat control unit, air vent regulators etc.[8]. Research has shown high numbers of colony forming units of relevant pathogens in these locations. It is therefore recommended to wipe the tray table as well as other appliances at the seat with an alcohol wipe prior to departure (see "Bug Bag") below. Furthermore, lavatories and the pantry/ kitchen have been identified as infectious "hotspots" and should be avoided as much as possible.



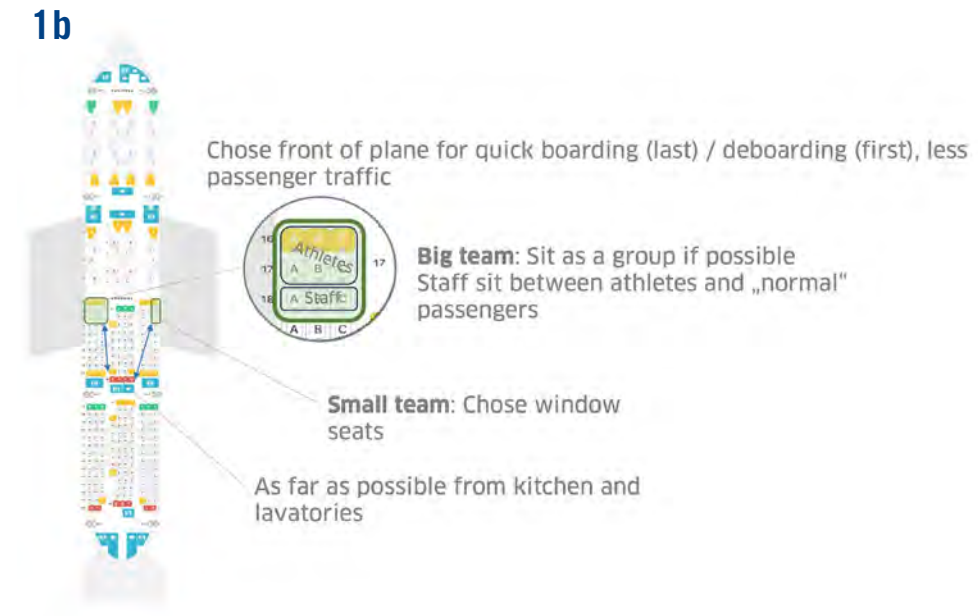


Figure 1a and b: Seating recommendations for athletes during air travel.

Food + Drinks

The food served in airplanes is usually prepared several days in advance, shock-frozen and then re-heated in the plane before consumption. It is submitted to strict regulations regarding the cold chain, which exceeds "normal" regulations for restaurants. Given the large number of airplane meals served every year, reported food poisonings or similar issues caused by airplane food are not very common. It can thus safely be assumed that meals served in airplanes are safe to eat for athletes and represent a low risk. This risk can further be mitigated by selecting the least "vulnerable" food options: Salads (i.e. non-heated food) should be avoided. Among the warm meal options, vegetarian or pasta options are usually less prone to contamination compared to options containing meat[9,10].

Drinks should generally be consumed only from closed containers.

Figure 2: The "Bug Bag" – Recommended content (examples).

The „Bug Bag"

Infection risk mitigation requires both knowledge from the athlete as well as some tools, such as masks, hand rub etc. For this purpose, the so called "Bug Bag" was developed. The "Bug Bag" is a simple, transparent plastic bag, which contains essential items for infection prevention during a training camp or a competition. The first item is a printed sheet with the most important information on infection control measures, specifically adapted to the planned trip. The essentials of infection control are explained again in simple words, as well as basic procedures to adopt, f.ex. while in the plane, at the hotel etc. (see above). Specific recommendations regarding the destination itself are also included. It is important to tailor the information to the ability and motivation of athletes to read and understand. Further, the bag contains basic infection prevention equipment, such as face masks, alcohol hand rub, disinfectant wipes etc., which can be used throughout the trip as well as other suitable products, such as membrane protectors or supplements. The best moment to hand out a bag to each athlete and staff member is at the meeting point when starting the travel. Here, there is little risk that the athletes lose or forget the bag and given the usual waiting times during international air travel, there is a good chance that the information sheet will be read. Figure 2 illustrates some of the recommended contents of a "Bug Bag".

Team management

For all the proposed measures, buy-in from the team management/ coaches is necessary, as an effective implementation often requires modifications in the training schedule and changes in logistics/ operations. Therefore, a risk management plan to reduce the risk of infectious diseases needs to be presented and discussed in advance, focussing on specific tasks which might be requested from the team management. Some key points in such discussion would be standard procedures for various scenarios such as an outbreak of a highly contagious infective disease (f.ex. Norovirus) or the logistics to isolate infected athletes (requiring additional hotel rooms) etc.

SUMMARY

Travelling athletes are exposed to intrinsic and extrinsic risk factors for infectious diseases. Mitigation strategies include adaptation of the training schedule in view of upcoming travel, early management of travel logistics such as seat plans or hotel rooms and education about infectious risks specific to the destination. Such strategies should be discussed among the team and involve coaches and team management. Standard infection control measures such as hand hygiene, surface disinfection and masking also apply.

Box 1

Health check for athlete

- ☐ *Risk mitigation plan discussed with team management*
- ☐ *Destination analysis in view of infectious risks*
- ☐ *Accommodation management*
- ☐ *Travel arrangements (seat plan plane, bus, car)*
- ☐ *"Bug Bag"*

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Yorck Olaf Schumacher MD

Head of Medicine & Emergency Services

Head of Infection control

Aspetar Orthopaedic and Sports Medicine Hospital

Doha, Qatar

Contact: yo.schumacher@aspetar.com