



EQUESTRIAN CANADA ÉQUESTRE

GUIDELINES FOR EQUINE COMPETITION AND TRAINING DURING EXTREME ENVIRONMENTAL CONDITIONS

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INTRODUCTION

There are three primary areas of concern for equines when competitions take place during adverse and potentially stressful environmental conditions: extreme heat, extreme cold and poor air quality. The focus of these guidelines is on the decision-making of officials and organizing committees at Equestrian Canada (EC) sanctioned events but the guidelines apply to training exercises both at events and at home.

EC Stewards and competition organizing committees, as well as competitors, have to make appropriate, evidence-based adjustments to competition in order to ensure that a fair test takes place while not excessively risking the health and welfare of both the equine and the human athlete. It is important that decisions to amend or cancel competitions are made with human and equine health as top priority.

These guidelines are based on human and equine studies and are focused on the average healthy, fit equine. A trainer or competitor whose equine would be considered in a higher risk population (older, younger or with pre-existing medical problems such as respiratory conditions) must be aware of the signs of distress and take additional precautions.

Stress levels and related concerns will vary between disciplines and the level of exertion. For example, a cross-country course is much more demanding because of distance, time and speed verses stadium jumping or reining. In addition to organizing committees and stewards being knowledgeable about the different disciplines, it is essential that competitors, coaches and trainers are educated on managing equines in extreme environmental conditions.

During the decision-making process for competition management, public optics and the perception of equine welfare must be taken into account. For example, if human competition or physical outdoor activities in the region have been postponed or reduced, the same considerations should be taken into account for equine competition.

Who Is Responsible

As outlined in detail in [Horse Welfare Code of Conduct](#) and the Statement of Principles – Horse Welfare, as found in EC's [Code of Conduct and Ethics](#), all participants of equestrian sport must treat equines “with kindness, respect, and the compassion that they deserve, and that they never be subjected to mistreatment”. Therefore, every equestrian participant is responsible for making informed decisions based on the individual equine.

Competition organizers, officials and veterinarians have a responsibility to both the human and equine athlete to make informed and precautionary decisions regardless of commercial/monetary influences or corporate repercussions. They are also responsible for ensuring or providing adequate facilities and conditions to safeguard the welfare of the equines. The ultimate responsibility for the equines, however, lies with the competitor. For all disciplines and at all temperatures, it essential that competitors, coaches and trainers are educated on managing their equines, particularly in extreme weather conditions.

Any failure to provide a safe environment and protect the welfare of the equine athletes will compromise equestrian sport's social licence and public trust.



EXTREMELY HOT WEATHER

Equines may develop heat stress or heat stroke when training or competitions take place in potentially thermally stressful conditions.

The Wet Bulb Globe Temperature Index

The best measurement to assess the risk of heat stress in equines is the Wet Bulb Globe Temperature (WBGT) Index. The WBGT Index is the only validated heat index for equestrian sport because it considers all the factors that determine thermal environmental load. It is a single index that takes into account the effects of air temperature, humidity, direct sun rays and wind. It is calculated from a measurement of a Wet Bulb temperature and the temperature inside a black globe.

The WBGT Index = $0.7 \times \text{Wet Bulb Temperature } (^{\circ}\text{C}) + 0.3 \times \text{Black Globe Temperature } (^{\circ}\text{C})$.

If WBGT equipment is not available, it can be measured with an inexpensive handheld device such as the ExTech HT30, which is widely available.

The following chart is a guide and should be used to estimate the index if no WBGT equipment is available.

Wet Bulb Globe Temperature Approximation

		Wet Bulb Globe Temperature (WBGT) from Temperature and Relative Humidity																				
		Temperature ($^{\circ}\text{C}$)																				
Relative Humidity (%)	0	15	16	16	17	18	18	19	19	20	20	21	22	22	23	23	24	24	25	25	26	27
	5	16	16	17	18	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	27	28
	10	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29	30
	15	17	17	18	19	19	20	21	21	22	23	23	24	25	26	26	27	28	29	30	31	32
	20	17	18	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	31	32	33
	25	18	18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32	33	34
	30	18	19	20	20	21	22	23	23	24	25	26	27	28	29	29	30	31	32	33	34	35
	35	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
	40	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	45	19	20	21	22	23	24	25	26	27	27	28	29	30	32	33	34	35	36	37	38	
	50	20	21	22	23	23	24	25	26	27	28	29	30	31	33	34	35	36	37	39		
	55	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35	36	37	38			
	60	21	22	23	24	25	26	27	28	29	30	31	32	33	35	36	37	38				
	65	21	22	23	24	25	26	27	28	29	31	32	33	34	36	37	38					
	70	22	23	24	25	26	27	28	29	30	31	33	34	35	36	38	39					
	75	22	23	24	25	26	27	29	30	31	32	33	35	36	37	39						
	80	23	24	25	26	27	28	29	30	32	33	34	36	37	38							
	85	23	24	25	26	28	29	30	31	32	34	35	37	38	39							
	90	24	25	26	27	28	29	31	32	33	35	36	37	39								
	95	24	25	26	27	29	30	31	33	34	35	37	38									
	100	24	26	27	28	29	31	32	33	35	36	38	39									

Note: This table is compiled from an approximate formula which only depends on temperature and humidity. The formula is valid for full sunshine and a light wind



Recommendations for Competitions

When the WBGT Index has been determined or estimated, the following chart can be used to guide decisions on modifying or cancelling a competition, precautions that should be taken and cooling methods that need to be considered.

Competitions are required to cancel or reschedule when the relative humidity is high, and the WBGT index is >33. See EC's [Competition Administration Policy](#) for National Safety Standards.

If a decision is made to continue with competition during extreme temperatures, it is imperative that decision-making is based on the outcome and equine-based measures (e.g., direct equine observations), in addition to the WBGT Index.

WBGT	Example °C:%RH	Recommendations for Competitions	Cooling Facilities/Methods
<28	30:45	No changes needed to the competition format or timing.	Access to wash bays with freely running water via hoses. Shaded areas/shelters. Note – each equine may need to be hosed with 2 hoses for 20-40 minutes if heat stressed.
28-30	29:60	Some precautions to reduce heat load on equines will be necessary. Supervise and inspect stabling/holding areas for management of heat and adequate resources (water, shade, fans, etc.). Provide facilities for cooling. Schedule competitions to avoid the most thermally stressful times of day. Use shaded areas for competition and warm-up areas. Time warm-up periods for each equine. Reduce overall effort (shorter distances, less jumping efforts, etc.). Avoid non-grassed riding surfaces where possible. Enhance steward and veterinarian supervision of schooling areas, warm-up areas and fields of play. Inspect equines prior to entering the field of play and post competition. Educate all onsite participants (e.g., posters). Frequently repeat competition PA announcements. Monitor the Wet Bulb Index as frequently as hourly and make changes when justified. Create contingencies for extreme conditions and equines with heat	Access to at least 2 wash bays with freely running water via hoses. Shaded areas/shelters. Note – each equine may need to be hosed with 2 hoses for 20-40 minutes if heat stressed.



		stress. Give special consideration to vulnerable equines and athletes.	
30-33	30:65	Additional precautions to limit overheating of equines will be necessary. Follow all recommendations listed above and: The timing of events/competition should be considered. Competitions should be held in cooler parts of the day: between 7:00-11:00 a.m. and/or after 4:00 p.m. Higher level competitions should be run in the coolest part of the day. Schedule the most demanding competitions/competition phases when it is cooler; lower level competitions generally are less demanding on equines.	1. Access to least 2 wash bays with freely running water via hoses. 2. Shaded areas/shelters. 3. Aggressive cooling measures may be compulsory for FEI CCI 2*/3* competitions. Provision of ad lib ice for use in cooling these equines after the cross-country phase.
>33	32:60	Competitions are required to cancel or reschedule when the relative humidity is high, and the WBGT index is >33. EC sanctioning will be revoked for events that run during conditions of WBGT index of >33.	

Concerns for High Humidity

High humidity creates thermoregulatory challenges for equine and human athletes. It can be safe to continue with competition at an ambient temperature of 40°C if the relative humidity is low. If the relative humidity is high, at typical summertime temperatures of between 25-30°C, precautions need to be taken. Relative humidity plays a pivotal role in the WBGT Index and, as the humidity rises, a key role in the decision on what level of exertion is safe. An equine's primary cooling mechanism is evaporation of sweat: at high relative humidity, very little evaporation and therefore very little cooling takes place, even if the equine is profusely sweating.

The Six Minute Threshold Rule

When the WBGT Index is high (above 30), over six minutes of continuous hard work can cause heat stress. This is referred to as the Six Minute Threshold. When adjustments are made to activity length at competitions, it is important that warm-up time is considered and monitored along with time in actual competition. For example, dressage equines may work extremely hard in both the warm-up and during their tests, exceeding the Six Minute Threshold, whereas show jumpers generally work continuously well under six minutes, despite appearing to exert tremendous effort.



Heat Stress/Stroke

At rest, the body maintains its normal temperature in hot weather mostly by moving heat from the muscles out through the skin. Blood also removes heat as it circulates through the body and releases it through lung tissue, skin and expanding blood vessels. This is why our own vessels or an equine's blood vessels may appear enlarged and distended during hot weather.

However, during exercise and exertion, by far the most important means of dissipating heat is the evaporation of sweat. This is why at higher relative humidity levels, humidity becomes a more significant consideration than temperature because the evaporation of the sweat becomes limited. Equines that cannot sweat (anhidrosis) can overheat very rapidly with a small amount of exercise, even in cooler weather. This overheating is known as heat stress, and as symptoms become extreme, it becomes heat stroke.

In addition to air temperature and humidity, there are some internal factors that may increase body temperature, such as digestion of food, but the major cause of an increase in body temperature is exercise/exertion. The more an equine exercises and the harder it exerts itself, the more heat it produces.

When the WGBT Index is above 33, exercise can only be maintained for a short time without the equine's body temperature rising to dangerous levels because very little cooling takes place, even if the equine is sweating profusely. When the equine's body temperature reached 40.5°C (105°F), the blood supply to the muscles begins to shut down. After this occurs, the blood supply to the intestines and kidneys can shut down. The blood supply to the brain and heart are spared until last, but severe and permanent damage may have already taken place by the time this occurs.

Signs of heat stress/stroke may include the following:

1. Temperature as high as 41-43°C (105-107°F).
2. Rapid breathing, rapid pulse.
3. Stumbling, weakness, depression.
4. Refusal to eat or work.
5. Dry skin and dehydration.
6. In severe cases, an equine may collapse or go into convulsions or a coma.

Treatment

The three most important therapies for heat stress/stroke are:

- Running cold water over the entire body; during more extreme conditions, use of ice water is necessary.
- Place the equine in shade, preferable in a grassy area and not on pavement or dark-coloured ground.
- If there is no breeze, use a fan if possible; a misting fan is even better.
- Allow the equine to drink water to offset dehydration.
- Electrolytes may also be given orally.
- In severe cases, intravenous fluid therapy is necessary to treat dehydration, electrolyte loss and shock.



Remember that signs of heat stroke may range from mild to severe and life-threatening. Equines with heavy muscling and equines that are excessively fat or in poor condition are at a higher risk of having problems. However, keep in mind that strenuous exercise on a hot, humid day can lead to problems in a short period of time for even the best-conditioned equine.

Examples of PA Announcements for Hot Weather Conditions

- Encourage competitors to “house” resting equines in shaded areas and/or on grass surfaces prior to entering the field of play.
- Encourage competitors to pre-cool their equines by hosing them to place lower demands on the equines’ cooling systems while they work.
- Encourage abbreviated warm-ups to lighten the load on equines’ cooling systems.
- Explain the Six Minute Threshold in any demanding exercise (not just cross-country) as being pivotal for heat overload.
- After exercise, encourage the use of cooling procedures as necessary: cold water, ice water, shaded area, area in a breeze, fans, misting fans.
- If conditions justify, explain the need for aggressive cooling until the equine’s temperature is below 39°C.
- Encourage hydration of every equine with cool, clean water, salt and electrolytes.

References

- [Optimising Performance in a Challenging Climate: Preparation for and Management of Horses and Athletes During Equestrian Events Held in Thermally Challenging Environments](#) – FEI
- [Optimising Performance in a Challenging Climate: Management of Horses in Hot Weather](#) – FEI
- [Hot Weather Policy](#) – Equestrian Australia
- [Equestrian Australia’s Hot Weather Policy – Information for Organising Committees](#) – Equestrian Australia



EXTREMELY COLD WEATHER

Equines are capable of withstanding extremely cold temperatures (-40°C or lower) at rest, walking and even trotting, to some extent. However, there is very little scientific information on how exercise and the strenuous exertion of equines in extremely cold weather can affect their health and welfare. There are two main considerations: frostbite of extremities and damage to the respiratory tract from breathing cold, dry air.

Anecdotally, it has been observed that frostbite during exercise at temperatures to -15°C does not occur. One study demonstrated that at temperatures down to -5°C, there is some inflammation of the airways with strenuous exertion but there was no significant damage without repeated exposure. At temperatures of -15°C or lower, the effect on the airways is more pronounced. Like the factors that come into play with hot weather, additional factors –duration of exposure, intensity of exertion, humidity, sun ray and the wind speed, in addition to the actual temperature – need to be considered. The “feels like” temperature calculated by Environment and Climate Change Canada considers the wind chill factor and can be interpreted and considered as equivalent to an actual temperature. Also, a wind chill factor may be created or intensified by the speed of the equine.

Cold outside air can have a high relative humidity but once inhaled and warmed, become relatively very dry, leading to a marked drying effect on the lining of the airways and lungs. The combination of this dehydration with extreme cold can cause inflammation of the airways, although most often not severe enough to cause signs of respiratory distress in an equine with normal, healthy lungs. If any signs of distress do occur, they are most commonly exhibited around 48 hours after an extreme exposure. The bigger concern with extreme cold is often low-level, chronic damage to the lungs due to repeated exertion in cold weather. Equines with pre-existing respiratory conditions such as equine asthma (chronic obstructive pulmonary disease – COPD) and heaves (recurrent airway obstruction – RAO) are more likely to be severely affected by cold air and therefore need to be more closely monitored.

Extreme cold is defined by most racing authorities as temperature between -15°C and -25°C. At these temperatures, additional precautions are put in place and overall weather conditions monitored. Racing is generally not recommended at temperatures in the range of -25°C or colder.

Signs of Respiratory Distress Due to Cold

- Labored breathing.
- Cough.
- Nasal discharge.
- Nose bleeds (exercise-induced pulmonary hemorrhage).
- Reduced exercise tolerance.

Recommendations for Competitions and Training

With exception of racing, the limiting factor for exercising and competition usually becomes the comfort of the human athlete and what conditions they can endure. As mentioned above, besides the actual



environmental temperature, other factors such as humidity, wind speed, sunshine and intensity of exercise come into play.

Competitions are rarely held at temperatures below -5°C. If cold weather training or competitions are held, additional precautions such as longer and slower warm-up exercises, longer cool-down periods and the use of blankets need to be considered. Physical activity should be stopped if any signs of respiratory distress is evident. Offering warm water after a cold weather workout is a good practice.

Temperature (°C)	Recommendations
5	Extend warm-up and cool-down periods.
0	Extend warm-up and cool-down periods, monitor equine for discomfort, cool-down sheet recommended.
-5	Extend warm-up and cool-down periods, monitor equine for distress, use of quarter sheets and cool-down sheets advised.
-10	Extend warm-up and cool-down periods, monitor equine for distress.
-15	Extend warm-up and cool-down periods, monitor for distress, use quarter sheets and cool down sheets. Indoor riding advised.
-20	Extend warm-up and cool-down periods, monitor equine for distress.
-25	No strenuous exercise is advised.

References

- [The application of exhaled breath analysis in racing Thoroughbreds and the influence of high intensity exercise and ambient temperature on the concentration of carbon monoxide and pH in exhaled breath](#) – The Veterinary Journal
- [Airway cooling and mucosal injury during cold weather exercise](#) – Journal of Equine Veterinary Science
- [Cold air-induced late-phase bronchoconstriction in horses](#) – Journal of Equine Veterinary Science
- [Cold weather exercise and airway cytokine expression](#) – Journal of Applied Physiology
- [Influx of neutrophils and persistence of cytokine expression in airways of horses after performing exercise while breathing cold air](#) – American Journal of Veterinary Research
- [International Olympic Committee consensus statement on thermoregulatory and altitude challenges for high-level athletes](#) – British Journal of Sports Medicine



POOR AIR QUALITY

There is a lack of equine-specific recommendations in assessing air quality and its impact on equine health and welfare. As a result, EC's current recommendation to competitions organizers, officials, veterinarians and competitors is to follow Air Quality Health Index (AQHI) guidelines provided by [Environment and Climate Change Canada's Air Quality Index](#) for human activity.

Environment and Climate Change Canada publishes the AQHI daily and it is used to determine the level of exercise and competition safe for humans. When determining whether to modify or cancel a competition in existing adverse or potentially adverse conditions, the maximum forecasted AQHI for the day or current index on an hourly basis should be consulted.

Air Quality Health Messages

Resources are available through Environment and Climate Change Canada to assist with the [use](#) and understanding of [Air Quality Health Messages](#).

The chart below is the guide used by Environment and Climate Change Canada to issue health messages in regards to human outdoor activities. There are scientific findings that suggest equine respiratory systems can be more sensitive than those of humans; therefore, competition organizing committees should consider using the messages outlined for at risk populations for all equines and equine competitions.

Understanding Air Quality Health Index messages

The **AQHI** uses a scale to show the health risk associated with the air pollution we breathe.

The following table provides the health messages for 'at risk' individuals and the general public for each of the **AQHI** Health Risk Categories.

Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population*	General Population
Low	1 - 3	Enjoy your usual outdoor activities.	Ideal air quality for outdoor activities.
Moderate	4 - 6	Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.	No need to modify your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High	7 - 10	Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High	Above 10	Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

* People with heart or breathing problems are at greater risk. Follow your doctor's usual advice about exercising and managing your condition.



Recommendations for Competition

Competitions are required to cancel or reschedule when the AQHI is at Very High (>10). EC sanctioning will be revoked for events that run during conditions of Very High AQHI. See EC's [Competition Administration Policy for National Safety Standards](#).

The following chart is a modified version of the Environment and Climate Change Canada chart with recommendations for equine exercise and competition.

Risk	AQHI	Recommendations for Competition
Low	1-3	No need to change the competition format or timing.
Moderate	4-6	Competitors with high-risk equines* should monitor their equines closely and retire from competition if symptoms of respiratory distress occur.
High	7-10	Reduce exertional effort or reschedule strenuous activities when the AQHI is lower.
Very High	>10	Organizers are required to cancel or reschedule when the AQHI is at Very High (>10)

**High-risk equines include older and younger equines and equines with pre-existing respiratory conditions.*

Environmental temperature and high humidity should also be considered, as these factors will have an added negative effect on the respiratory system.

All competitors should be aware of the signs of respiratory distress and associated risks, especially those with high-risk equines. It is recommended that if competitions proceed when the AQHI is in the range of 4-9, additional announcements and warnings are made and posted. Competitors with equines in the high-risk equine population should continually monitor their equines for any signs of respiratory distress.

Common Signs of Respiratory Distress

- Respiratory rate remaining over 30 breaths per minute at rest (normal rate is 12-20 per minute).
- Shortness of breath with possible wheezing sounds.
- Nostrils obviously flaring and anxious expression.
- Very labored breathing with exaggerated movement of chest wall and flanks.
- Possible repetitive, deep cough.
- Possible nasal discharge.

References

- [Guidelines for Horses Exposed to Wildfire Smoke](#) – UC Davis Veterinary Medicine
- [Reference Guide: What Horse Owners Can Do To Monitor Horses Evacuated from Fire Areas](#) – UC Davis Veterinary Medicine



- [How wildfire smoke affects pets and other animals](#) – University of Calgary
- [The Effect of Wildfires on Equine Lungs: What We Know](#) – Paulick Report
- [Canadian Researchers Embark on Study of Air Pollution And EIPH](#) – Paulick Report



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