

# Observing HR when using the PROTEC Mouthguard

- Bringing human level sport science to equine athletes

# Summary: Results

## PROTEC Mouthguard

- ✓ Horses did not show any sign of distress when attaching the mouthguard.
- ✓ Positive feedback from rider on rideability, and acceptance.
- ✓ Positive feedback from veterinarian on subjective impression, acceptance, and HR observations.
- ✓ All three horses showed physiological benefit from using the PROTEC mouthguard, primarily in post-exercise recovery heart rates.



# Our Take on Horse Training

## TRAINING 2.0

Sustainable mental and physical development of horse and rider is key to success.

## TRANSPARENCY

Data-driven insights eliminate guesswork and reliance on subjective opinions.

## TRUST

Objective insights empowers riders, trainers, and analysts to collaborate effectively, enhancing horse welfare and informed decision making in equestrian sports.



# PROTEC asked us to observe the heart rate

Results



# Heartrate Observations

- Background
- Method
- Summary
- Results on single horses
- Feedback from Rider



# Background

## Introduction: Heart Rate and Recovery Heart Rate in the Context of PROTEC Evaluation

**Heart rate (HR)** is a critical indicator of a horse's physiological response to exercise. It reflects cardiovascular effort and overall fitness during training and competition. Equally important is recovery heart rate, which measures how quickly a horse's heart returns to resting levels after exertion. Faster recovery times are widely regarded as a sign of superior cardiovascular efficiency, conditioning, and readiness to perform.

In this investigation, we analyzed the impact of the PROTEC mouthguard on three horses by comparing heart rate metrics during and after training sessions—with and without the device. By focusing on maximum heart rates, average heart rates during exercise, and recovery heart rates at 1 and 2 minutes post-exercise, we aimed to assess whether the PROTEC mouthguard contributes to improved cardiovascular responses.

The underlying hypothesis is that the PROTEC mouthguard may enhance respiratory efficiency or reduce physiological stress, resulting in lower heart rates during exercise and faster recovery after exertion. These improvements would be reflected in reduced heart rate values and quicker return to baseline post-exercise—key indicators of improved performance and welfare.

Heart rate recovery is a well-established method for assessing equine fitness and conditioning. Horses with faster recovery times are generally better conditioned and more capable of sustained athletic performance (Evans, 2007). By monitoring both exercise and recovery heart rates, this study provides insight into the potential performance-enhancing benefits of the PROTEC mouthguard.

*Evans, D. L. (2007). Training and fitness in athletic horses. In Hinchcliff, K.W., Kaneps, A.J., & Geor, R.J. (Eds.), Equine Sports Medicine and Surgery (pp. 804-827). Saunders Elsevier.*



# Method

- n = 3 Horses, 140cm Performance Level
- Standardised Protocol with Arione Equimetre
- Data Capturing: Dr Vet Claudine Anen, 1st of March
- Rider: Corinna, FEI Nr: xx

**Goal: Observing Physiological Parameter**

## **Guiding Parameter**

- Max Heart Rate during training
- Gallop Average Heart Rate
- Heart Rate during initial Trot and Canter
- Heart Rate Recovery (1–5 minutes post-exercise)



# Course Set Up



# Feedback Vet

## Veterinarian Dr vet Claudine Anen

Specialist in equine sports medicine and rehabilitation (CERP by Tennessee University)

- No sign of distress when attaching the mouthguard
- Horses seem to benefit from the mouthguard through moving better through the body
- Observations in HR show that HR as investigation parameter is highly influenced from context. (Airplane, stress from the rider, etc.) *This should be considered for study protocol.*



# Feedback Rider

Claudia Rupp, FEI Nr 10105364

- No remarkable negative or positive effect on 2/3 horses
- All horses appeared to be more subtle in the mouth.
- **Remarkably positive effect on horse 3**, which is described as feisty, very strong, and taking over control



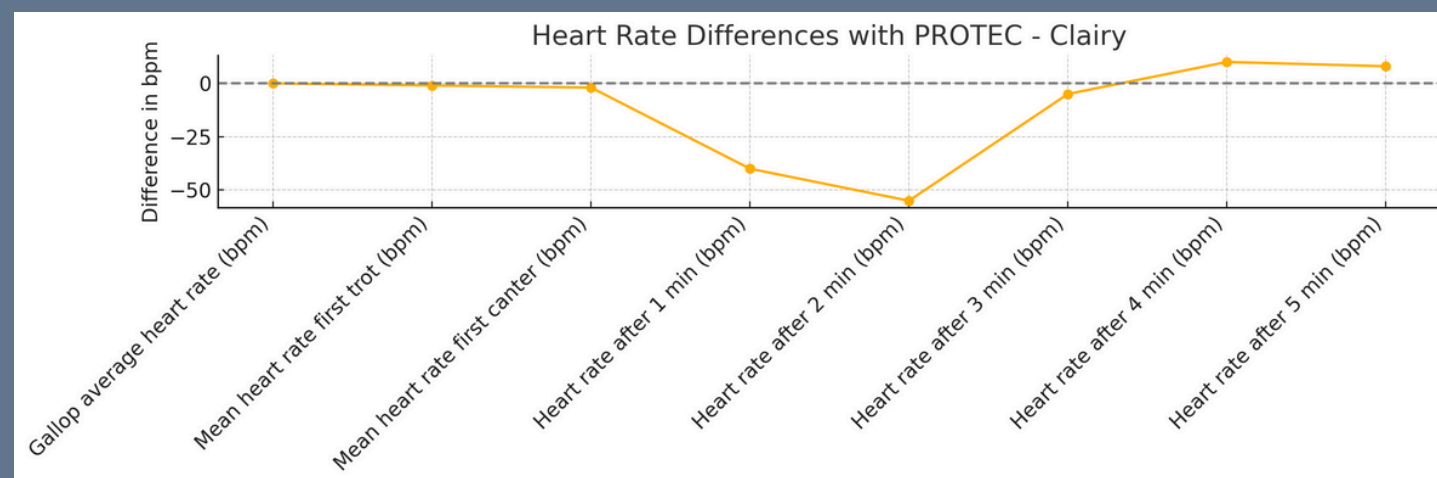
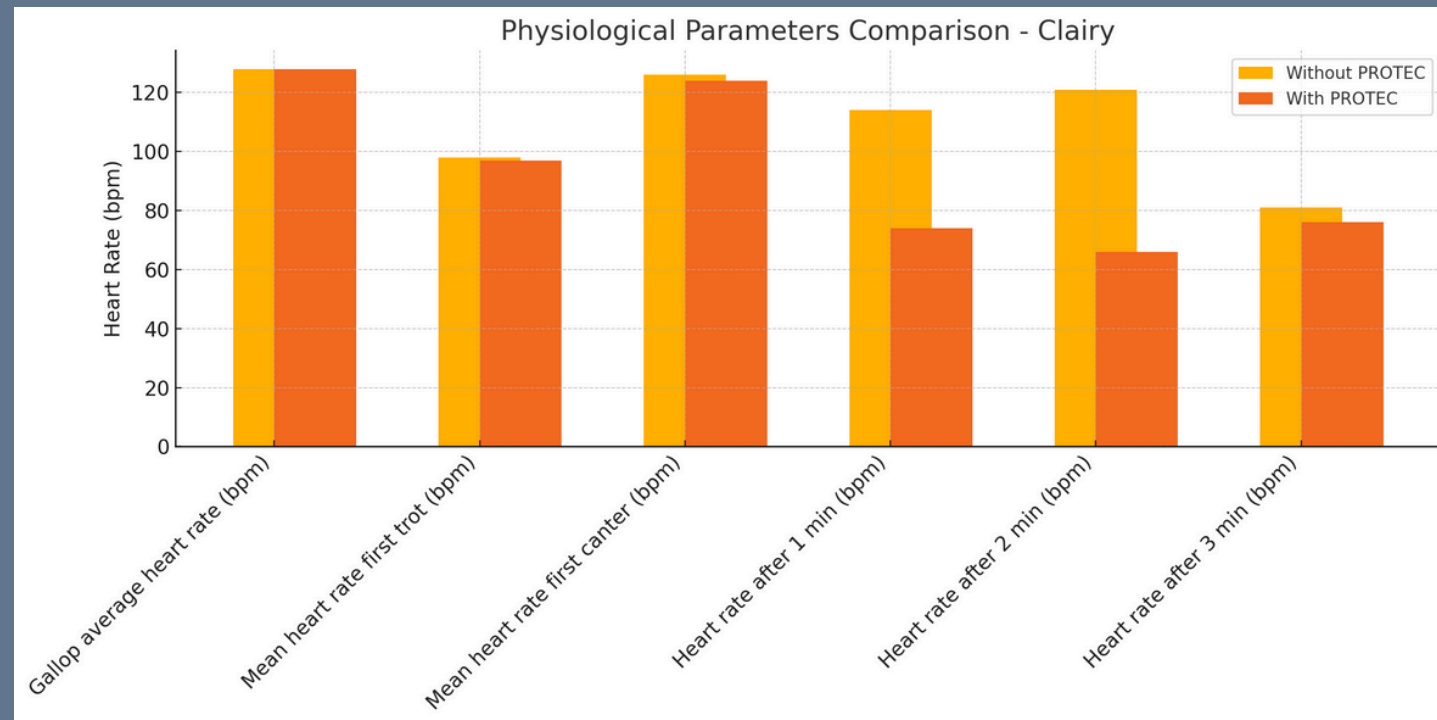
# Results

Horse	level_1	Parameter	Without PROTEC	With PROTEC	Difference (With - Without)	Benefit from PROTEC
Coleona	Max	Heart Rate reached during training (bpm)	191.0	188.0	-3.0	Yes
Coleona		Gallop average heart rate (bpm)	142.0	136.0	-6.0	Yes
Coleona		Mean heart rate first trot (bpm)	114.0	106.0	-8.0	Yes
Coleona		Mean heart rate first canter (bpm)	130.0	129.0	-1.0	Yes
Coleona		Heart rate after 1 min (bpm)	122.0	112.0	-10.0	Yes
Coleona		Heart rate after 2 min (bpm)	101.0	124.0	23.0	No
Coleona		Heart rate after 3 min (bpm)	99.0	100.0	1.0	No
Coleona		Heart rate after 4 min (bpm)	94.0	96.0	2.0	No
Coleona		Heart rate after 5 min (bpm)	90.0	89.0	-1.0	Yes
Nabucco Uno	Max	Heart Rate reached during training (bpm)	187.0	182.0	-5.0	Yes
Nabucco Uno		Gallop average heart rate (bpm)	139.0	134.0	-5.0	Yes
Nabucco Uno		Mean heart rate first trot (bpm)	101.0	96.0	-5.0	Yes
Nabucco Uno		Mean heart rate first canter (bpm)	133.0	122.0	-11.0	Yes
Nabucco Uno		Heart rate after 1 min (bpm)	84.0	134.0	50.0	No
Nabucco Uno		Heart rate after 2 min (bpm)	77.0	99.0	22.0	No
Nabucco Uno		Heart rate after 3 min (bpm)	138.0	91.0	-47.0	Yes
Nabucco Uno		Heart rate after 4 min (bpm)	80.0	88.0	8.0	No
Nabucco Uno		Heart rate after 5 min (bpm)	85.0	73.0	-12.0	Yes
Clairy		Gallop average heart rate (bpm)	128.0	128.0	0.0	No
Clairy		Mean heart rate first trot (bpm)	98.0	97.0	-1.0	Yes
Clairy		Mean heart rate first canter (bpm)	126.0	124.0	-2.0	Yes
Clairy		Heart rate after 1 min (bpm)	114.0	74.0	-40.0	Yes
Clairy		Heart rate after 2 min (bpm)	121.0	66.0	-55.0	Yes
Clairy		Heart rate after 3 min (bpm)	81.0	76.0	-5.0	Yes
Clairy		Heart rate after 4 min (bpm)	73.0	83.0	10.0	No
Clairy		Heart rate after 5 min (bpm)	73.0	81.0	8.0	No

Evaluation of physiological impact of the PROTEC mouthguard, focusing on heart rate data during and after exercise.



# Horse: Claire



## ✓ Horse: Clairry

- Significant benefits observed in recovery heart rates:
  - Heart rate after 1 min dropped by 40 bpm.
  - Heart rate after 2 min dropped by 55 bpm.
- Marginal changes during exercise, but substantial post-exercise recovery improvement.
- Clairry responded the most positively to PROTEC in terms of recovery, which is critical for performance and health.



# Horse 2 +3

## ✓ Coleona

- Benefitted across all measured parameters.
- Reductions ranged from -1 bpm (Mean Canter HR) to -10 bpm (Heart Rate after 1 min recovery).
- Indicates improved cardiovascular efficiency and faster recovery with PROTEC.

## ✓ Nabucco Uno

- Showed some benefits, but less pronounced.
- Mixed results: slight reductions in recovery heart rates, but no significant change in other areas.
- Slight improvement in recovery dynamics with PROTEC.



# Heartrate Observations

✓ All three horses showed some physiological benefit from using the PROTEC mouthguard, primarily in post-exercise recovery heart rates.

- Clairy demonstrated the **most pronounced benefit, particularly in recovery**, suggesting an improved ability to return to baseline heart rates faster.
- Coleona showed **consistent but moderate improvements**, suggesting a reliable, if smaller, cardiovascular benefit.
- Nabucco Uno benefitted the least, but still exhibited some improvements.





# Take Outs

- We are confident that the PROTEC Mouthguard is beneficial for the described use cases of feisty, ambitious jumping horses.
- We believe that the PROTEC Mouthguard is a device for professional rider, who ensure that the application is beneficial for the individual horse.
- Using the PROTEC Mouthguard should not give the impression that it balances an unsteady hand, or lacking rider skill.
- Using a PROTEC Mouthguard should be only used after the clearance of a qualified equine dentist.
- We have not experienced that attaching the PROTEC mouthguard from an experienced rider or rehabilitation specialist creates stress for the horse.





# Study Protocol

- We recommend to set up a jumping parcour with 14 efforts, including doubles and triples as the effect of the PROTEC was often visible in the second part of the parcour, and in demanding set ups.
- We recommend randomised protocols to outrun fatigue effecting the data , but also consider that (in our experience) the effect from the PROTEC lasts.
- We recommend to enhance the analysis with an investigation on cortisol, to evaluate the effect on the internal stress on horses. *(We believe in a positive effect, but cortisol is the only valid guiding parameter to validate the hypothesis of reduced stress on the horse.)*
- We assume that heart rate as guiding parameter might be effected heavily from contextual factors, therefore if chosen, the study protocol, physiologically guiding parameters, and number of participants should be carefully considered.
- We recommend to communicate the must requirement of dentist clearance for the usage of a PROTEC Mouthguard.

