Evaluation of the role of exercise-induced acute phase reaction in the adaptation to training in race and endurance Arabian horses


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GROWTH OF
ENDURANCE DISCIPLINE

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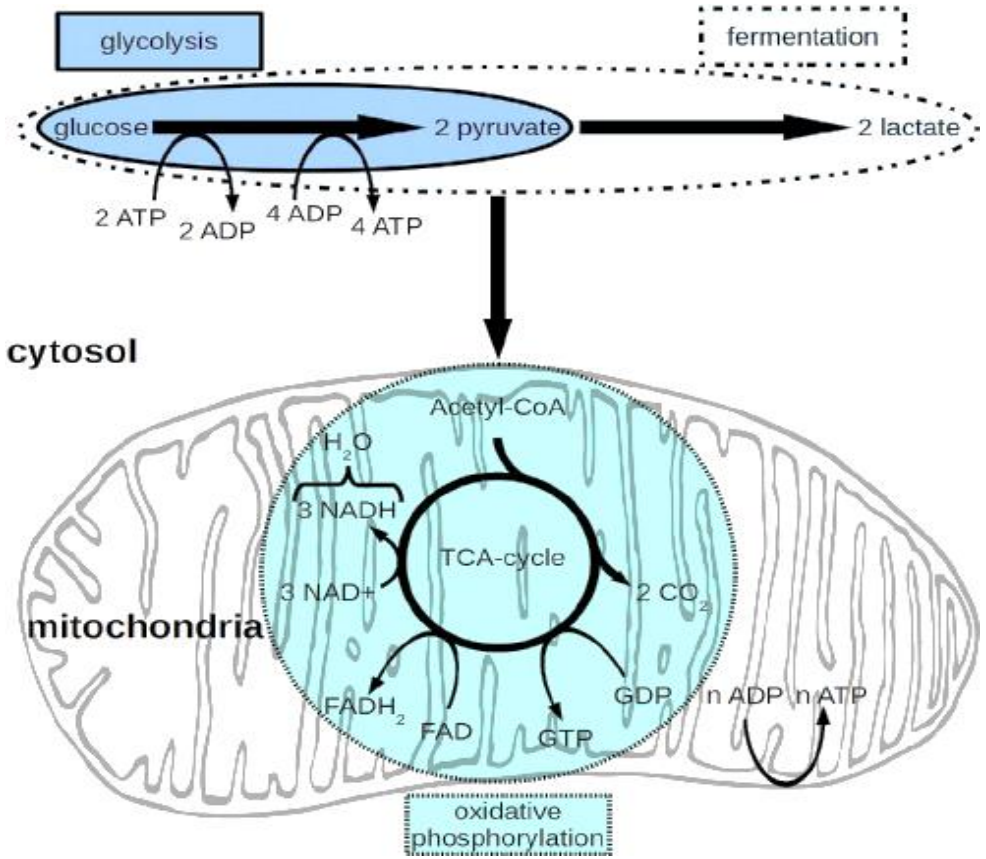
Events since 2007

91% increase in the number of international Endurance events since 2007

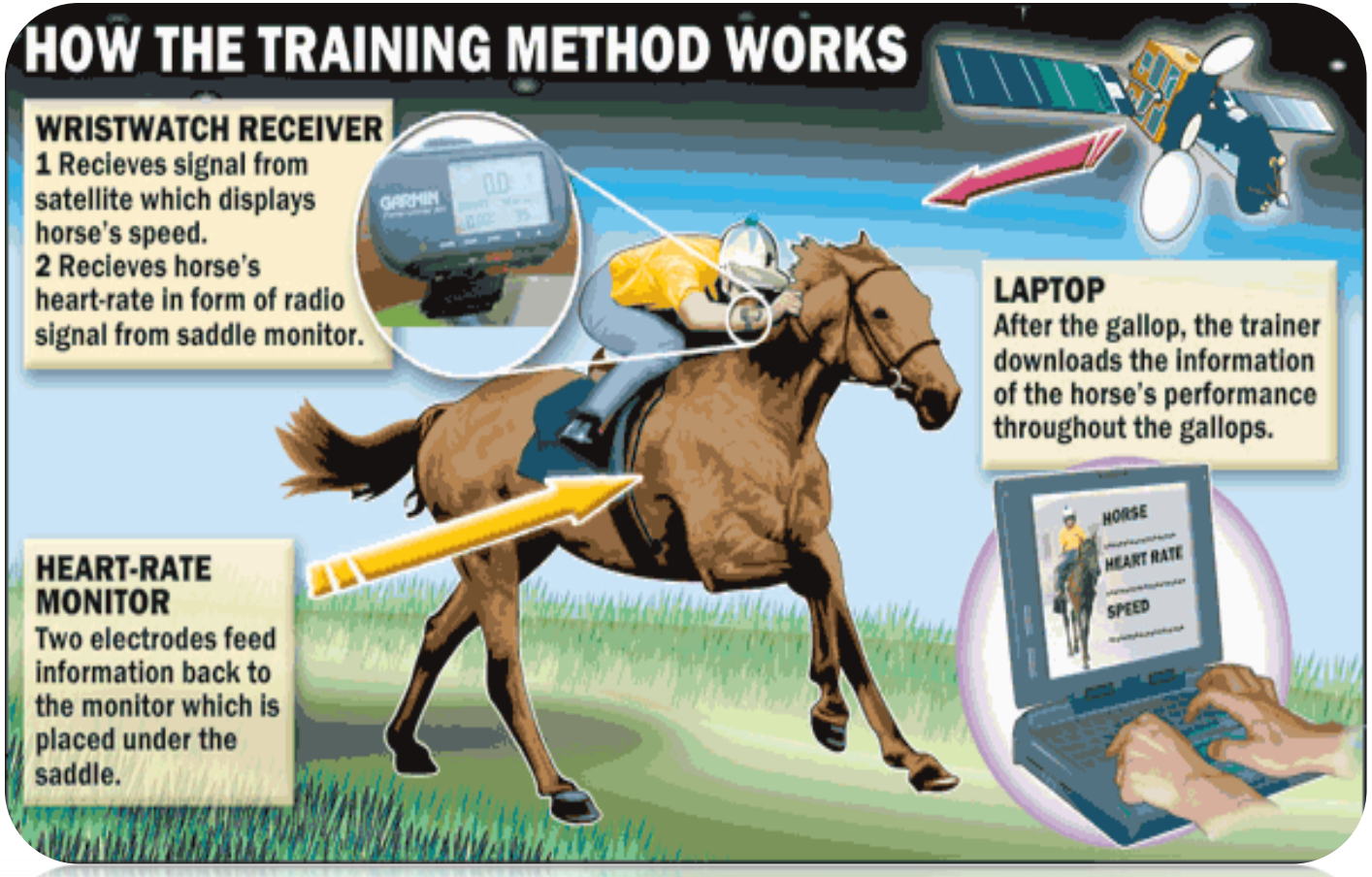
DISCIPLINE	2007	2008	2009	2010	2011	2012	2013	2014	2015	INCREASE IN NUMBER OF EVENTS SINCE 2007	% INCREASE 07/15
Jumping	720	888	947	1088	1237	1305	1314	1443	1475	755	105%
Dressage	245	274	286	323	360	401	453	462	514	269	110%
Eventing	417	437	437	481	555	510	*543*	593	661	244	59%
Endurance	**466**	**549**	**705**	**799**	**811**	**911**	**874**	**893**	**890**	**424**	**91%**
Driving	157	175	173	152	152	135	138	187	272	115	73%
Reining	37	46	72	53	48	34	115	93	48	11	30%
Vaulting	21	21	24	31	31	63	101	99	102	81	386%
Para-Equestrian	9	11	16	18	22	19	19	20	26	17	189%
TOTAL	2072	2401	2660	2945	3216	3378	3557	3790	3988		92%
Increase in number of events from prior year	280	329	259	285	271	162	179	233	198	1916	

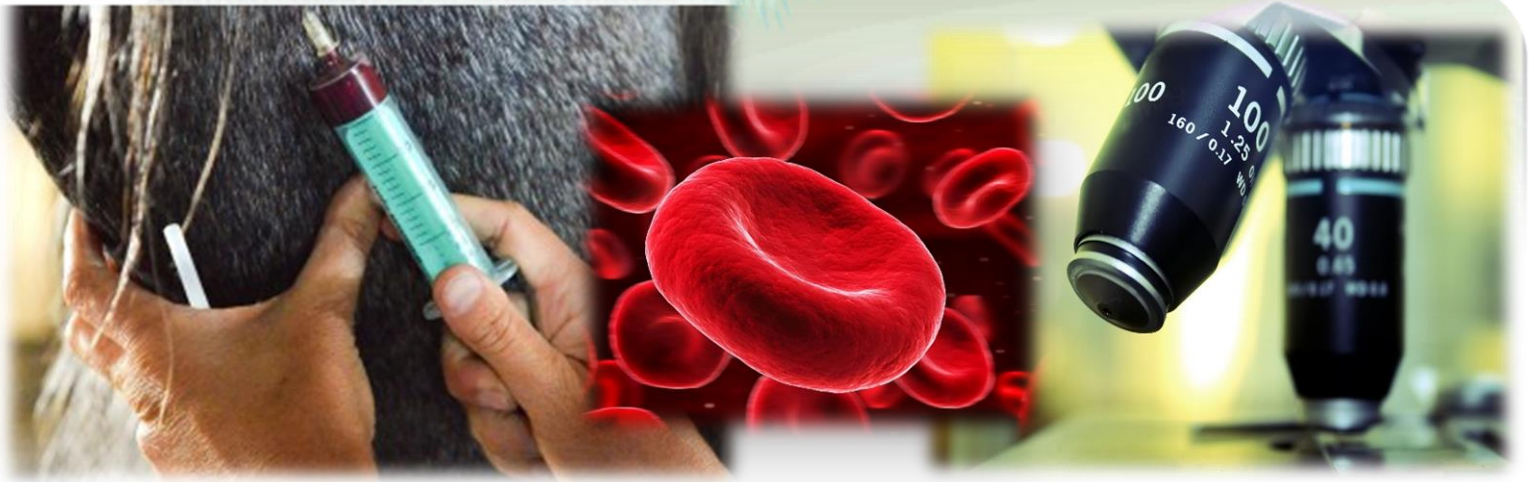
The trainings for racing **(anaerobic effort)** and endurance rides **(effort of oxygen nature)** markedly differ and therefore the differences between endurance horses and race horses are substantial.

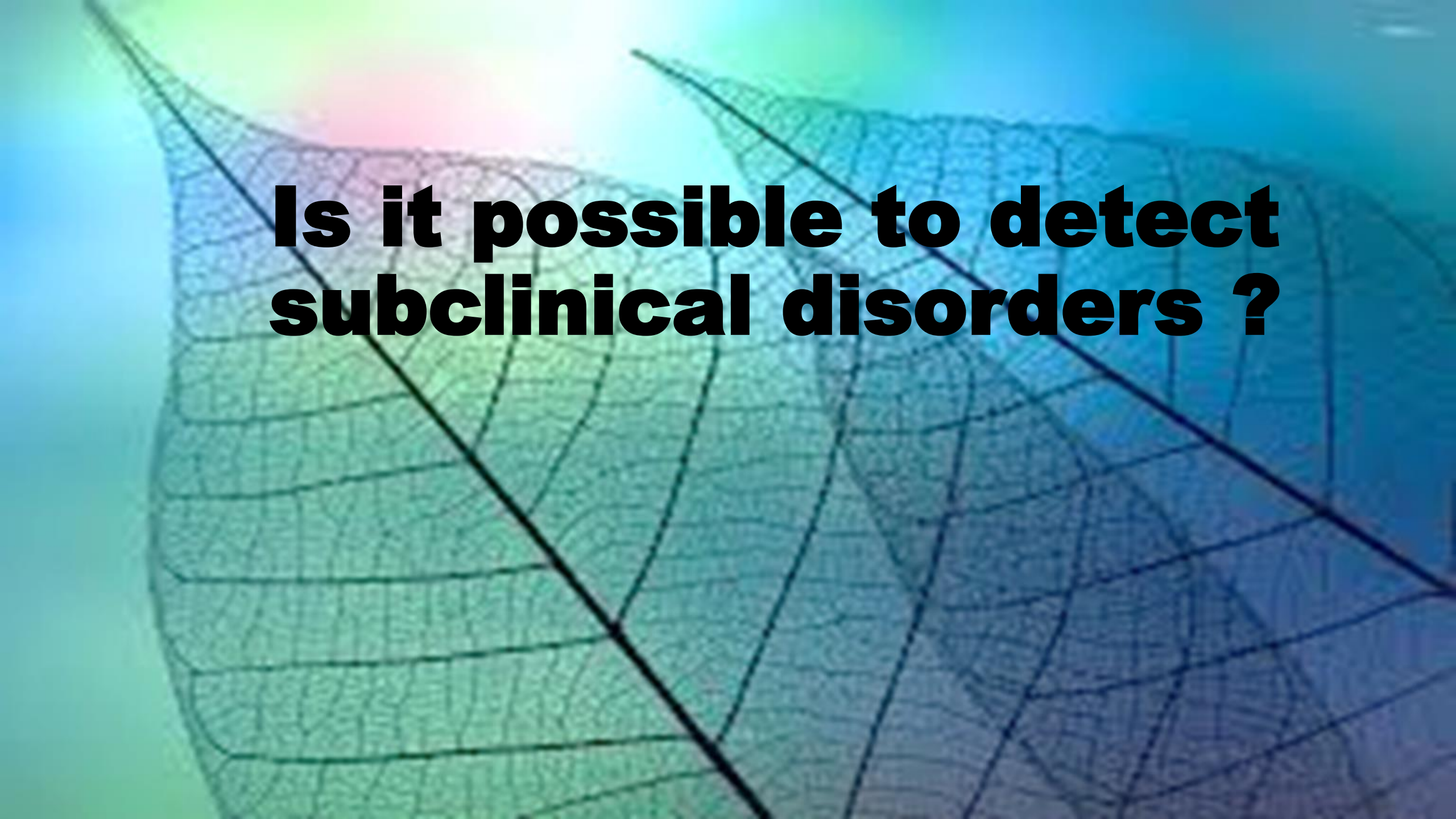


Successful competing in races and endurance rides is determined primarily by good health and proper adaptation to increasing workload during training

Health and performance ability of the horses are usually assessed on the basis of **physical examination** and monitoring of **heart rate** and selected **haematological and biochemical parameters**






Is it possible to detect subclinical disorders ?

APR - Acute Phase Reaction

- **APR** is **the first, rapid and nonspecific response** to any kind of disturbances in homeostasis (infections, traumas, neoplasia or immune disorders)
- In humans, dogs and horses the reaction analogous to APR has been observed also **after prolonged strenuous exercise**

http://www.aladiyat.ae

http://[illegible]network.com/2017/02/race-wild-coast/

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Acute phase protein concentrations after limited distance and long distance endurance rides in horses

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Exercise-induced acute phase response occurred **after long**, but not limited distance ride

Such high values,
although still **within reference ranges**

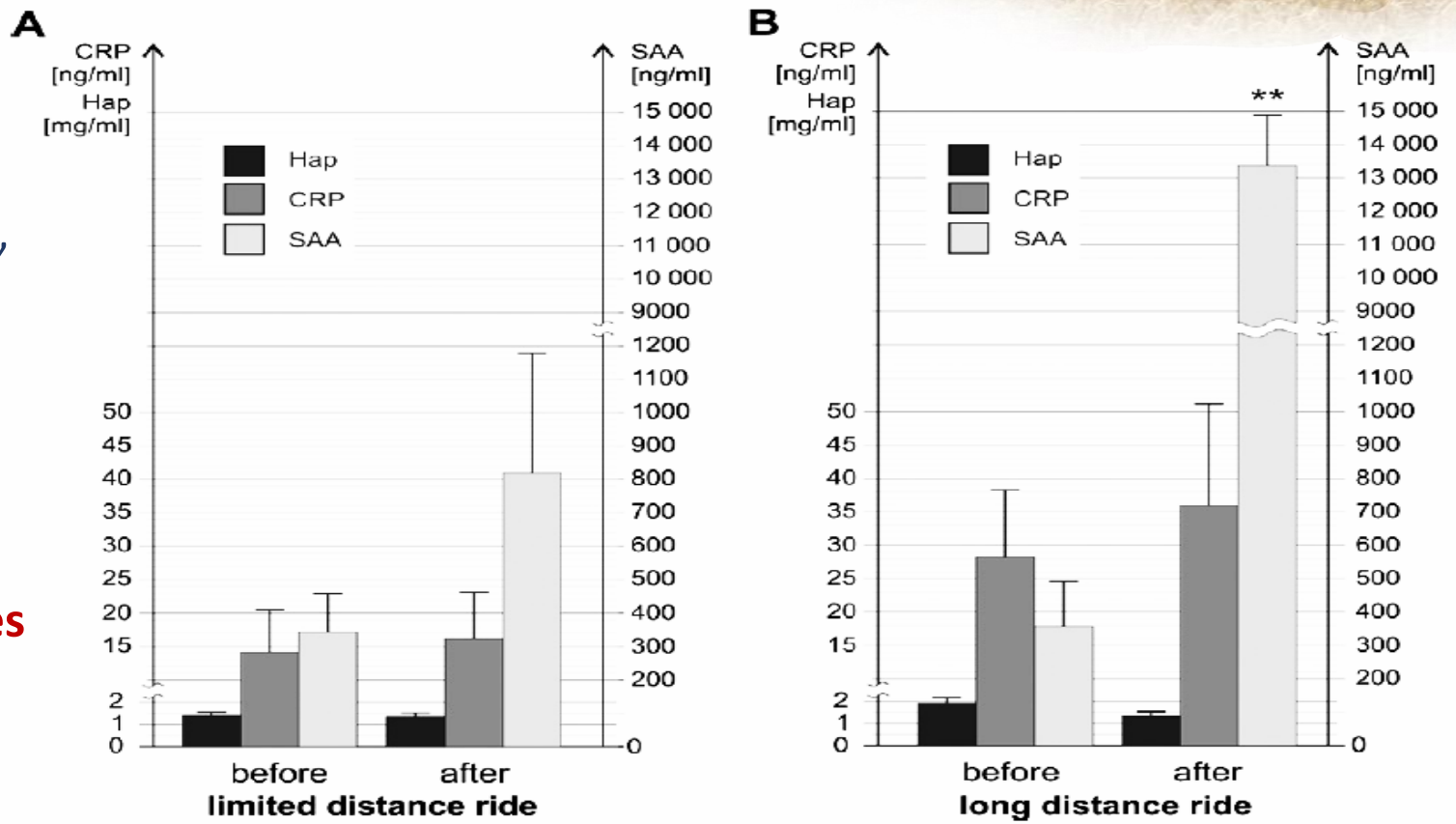
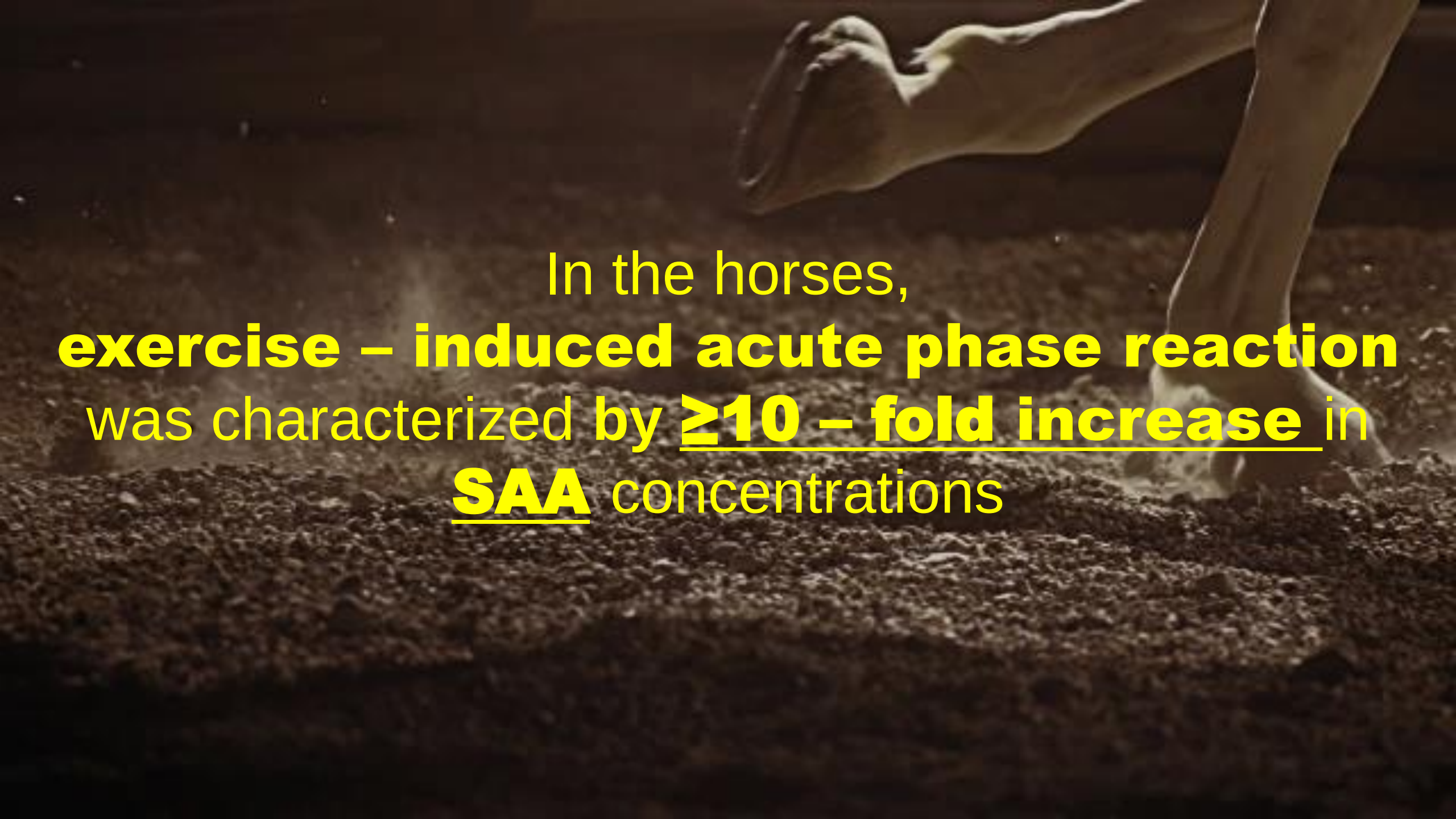


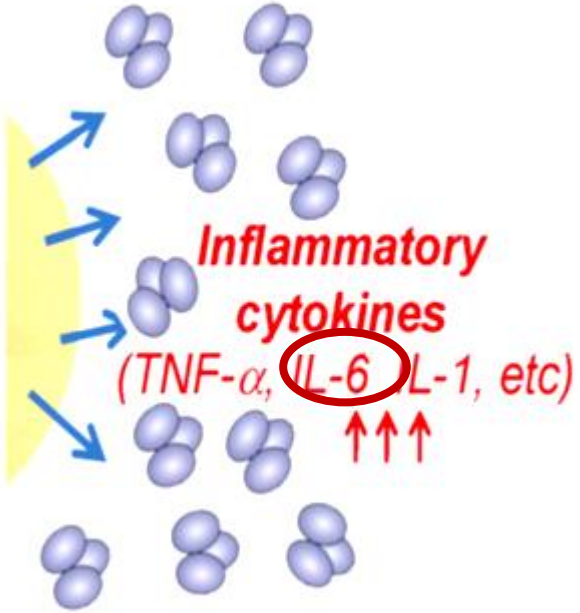
Fig. 1. Acute phase proteins concentrations before and after limited distance and long distance rides. $^{**}p \leqslant 0.017$ (according to Bonferroni correction).

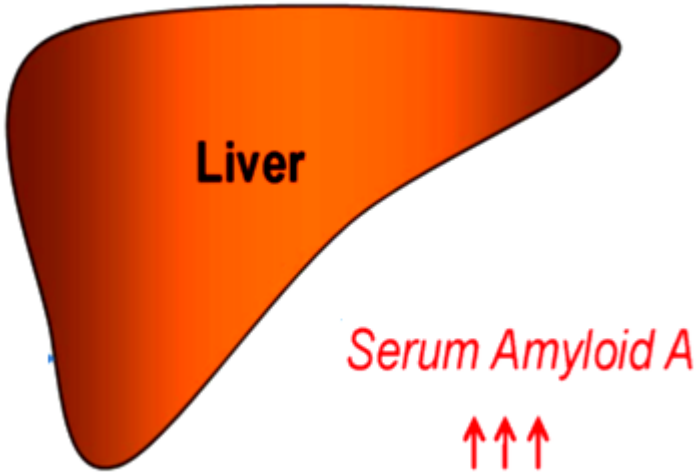

In the horses,
exercise – induced acute phase reaction
was characterized by **≥10 – fold increase** in
SAA concentrations

SERUM AMYLOID A (SAA)

- main **acute phase protein** in horses, released to blood during **acute phase reaction (APR)**

Inflammation





- increases within a **few hours** of infection or tissue injury and reach **peak values** within **one or 2 days**
- concentrations of healthy horses have been reported to range from **<0.5–20 mg/l**

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Serum amyloid A (SAA) concentration after training sessions in Arabian race and endurance horses

Anna Cywinska, Lucjan Witkowski, Ewa Szarska, Antoni Schollenberger, and Anna Winnicka

SAA concentration in **young, unexperienced horses** increased **4-fold:**

- **exercise – induced acute phase reaction ?**
- **unfavorable effects of strenuous exercise ?**
- **physiological adaptation to increased workload during training?**

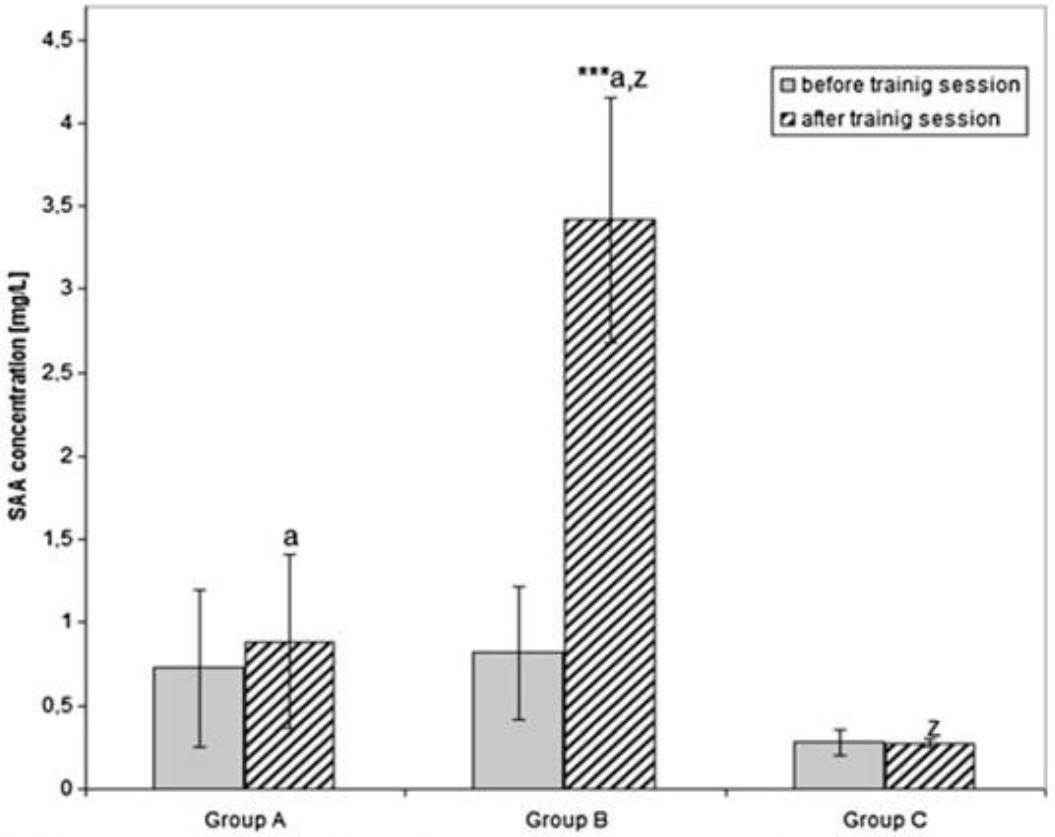

Figure 1 Serum amyloid A (SAA) concentration in the horses before and after training sessions. Group A – race horses, Group B – inexperienced endurance horses, Group C – experienced endurance horses. Significant differences were observed between the following groups: before and after training sessions in each group: $^{*}p \le 0.05$, $^{**}p \le 0.01$, $^{***}p \le 0.001$. groups A and B: $^{a}p \le 0.05$, $^{b}p \le 0.01$, $^{c}p \le 0.001$. groups A and C: $^{d}p \le 0.05$, $^{e}p \le 0.01$, $^{f}p \le 0.001$. groups B and C: $^{x}p \le 0.05$, $^{y}p \le 0.01$, $^{z}p \le 0.001$.

EQUINE VETERINARY JOURNAL

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Serum amyloid A level as a potential indicator of the status of endurance horses

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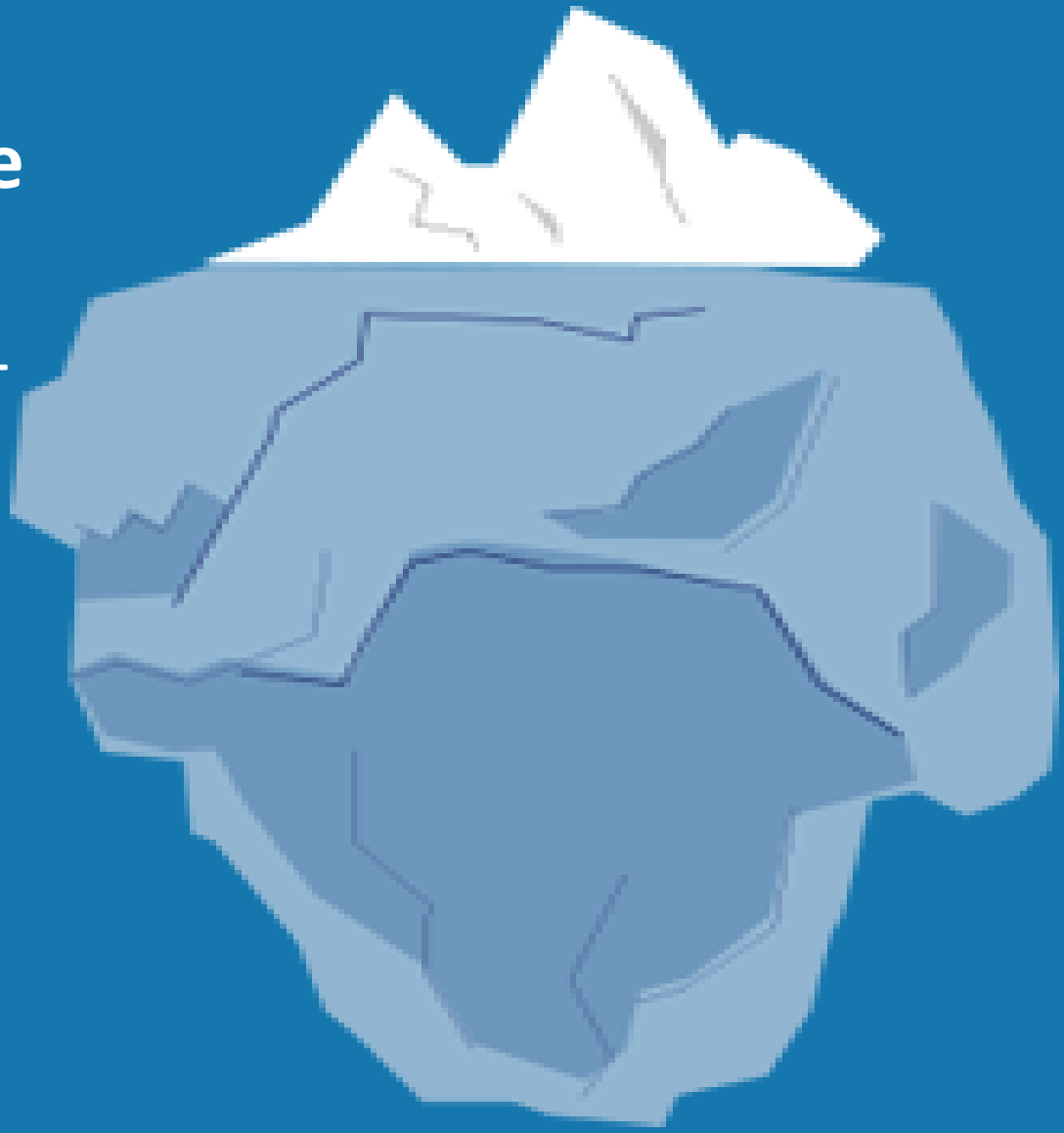
Elevated SAA level may serve as a non-specific indicator of the **poor condition** of endurance horses that results in **elimination** from long distance competition

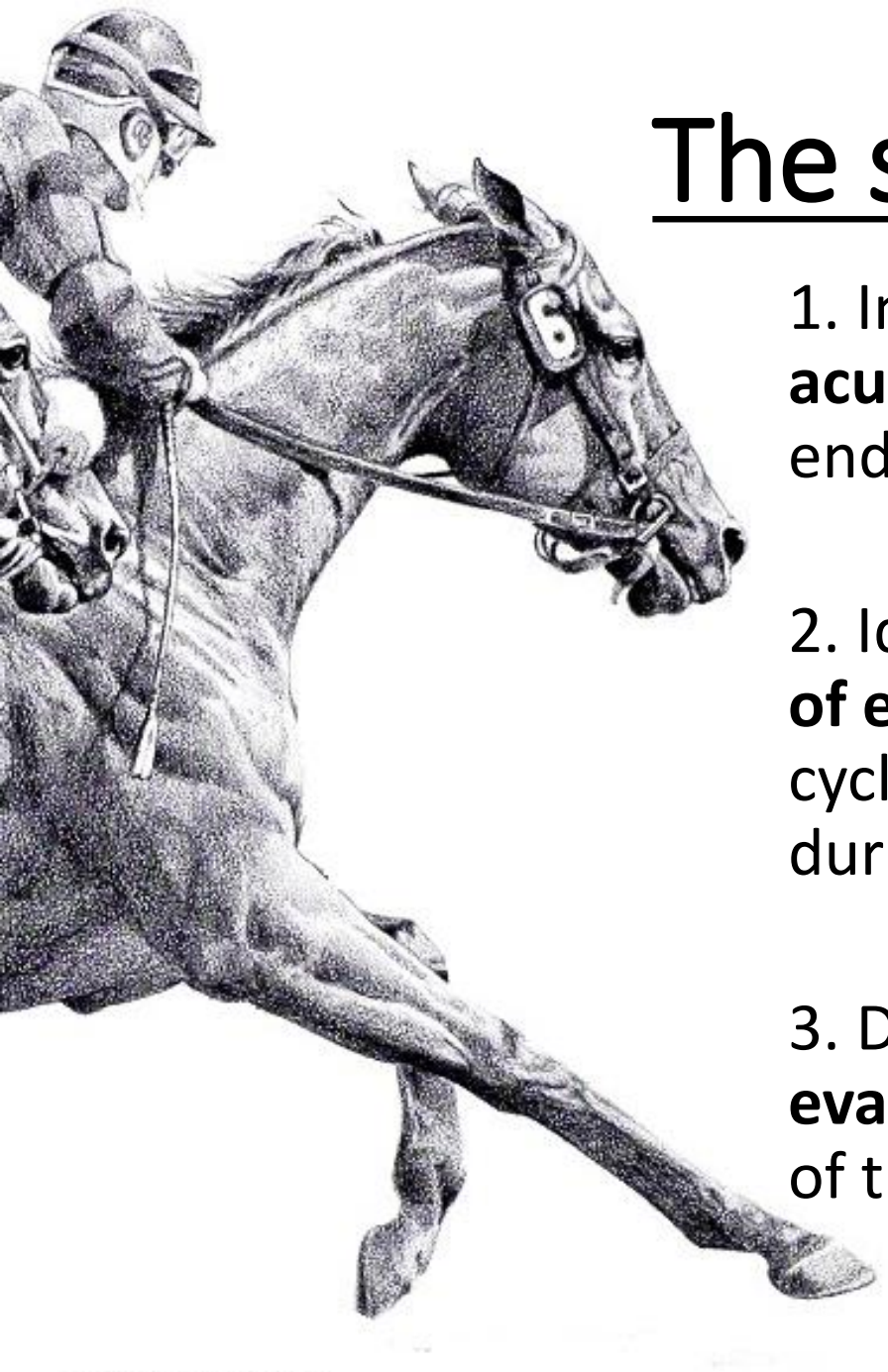
TABLE 1: Horses included in the study

Number	Age, gender	Distance (km)	Result	Precompetition SAA level (ng/ml)	Post competition SAA level (ng/ml)
1	8 m	120	Finish	20.4	13,344.7
2	7 g	120	Finish	31.6	16,157.5
3	10 g	120	Finish	434.3	14,281.3
4	8 g	120	Finish	33.2	14,892.5
5	9 g	160	Finish	940.5	7,719.5
6	14 g	160	Finish	898.8	15,155.2
7	11 g	160	Finish	154.4	19,830.9
8	12 s	160	Finish	780.5	9,288.9
9	9 s	120	Elim. lame (1 vet gate)	4,734.1	10,862.9
10	11 s	120	Elim. lame (2 vet gate)	255.2	10,521.9
11	8 m	120	Elim. lame (3 vet gate)	1,299.5	13,290.6
12	13 g	120	Elim. lame (3 vet gate)	12,144.6	13,412.1
13	10 g	120	Elim. metabol., poor recovery (3 vet gate)	283.5	10,698.1
14	11 g	120	Elim. lame (4 vet gate)	11,655.3	13,048.4
15	11 g	160	Elim. lame (1 vet gate)	10,665.3	13,700.4
16	9 m	160	Elim. lame (1 vet gate)	368.4	6,125.2
17	12 m	160	Elim. lame (1 vet gate)	1,379.8	11,612.0
18	12 g	160	Elim. metabol., poor recovery (3 vet gate)	1,315.2	11,729.7
19	9 m	160	Elim. lame (3 vet gate)	25,372.3	25,722.8
20	10 s	160	Elim. metabol., poor recovery (4 vet gate)	240.5	13,251.6

m, mare; g, gelding; s, stallion.

The current project involves the investigation of changes also in **other parameters** important in **acute phase reaction**, and so that characterization the nature of exercise-induced reaction after training.





The scientific purpose of the project

1. Investigation of the **onset** and **role of exercise-induced acute phase reaction** in the horses that begin race and endurance trainings during their **first two training seasons**,

2. Identification of the **relations** between the **onset of exercise-induced acute phase reaction** during the training cycle and the horses' **adaptation to increasing workload** during training,

3. Development of **multivariable statistical model for evaluation of training performance** of horses and influence of training on their health status.

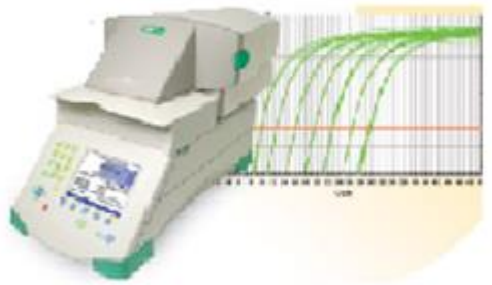
Methodology

Jugular venipuncture

Haematological and biochemical tests

The ELISA tests: SAA and IL-1, IL-6, IL-8, TNF, IL-10

Real Time-PCR



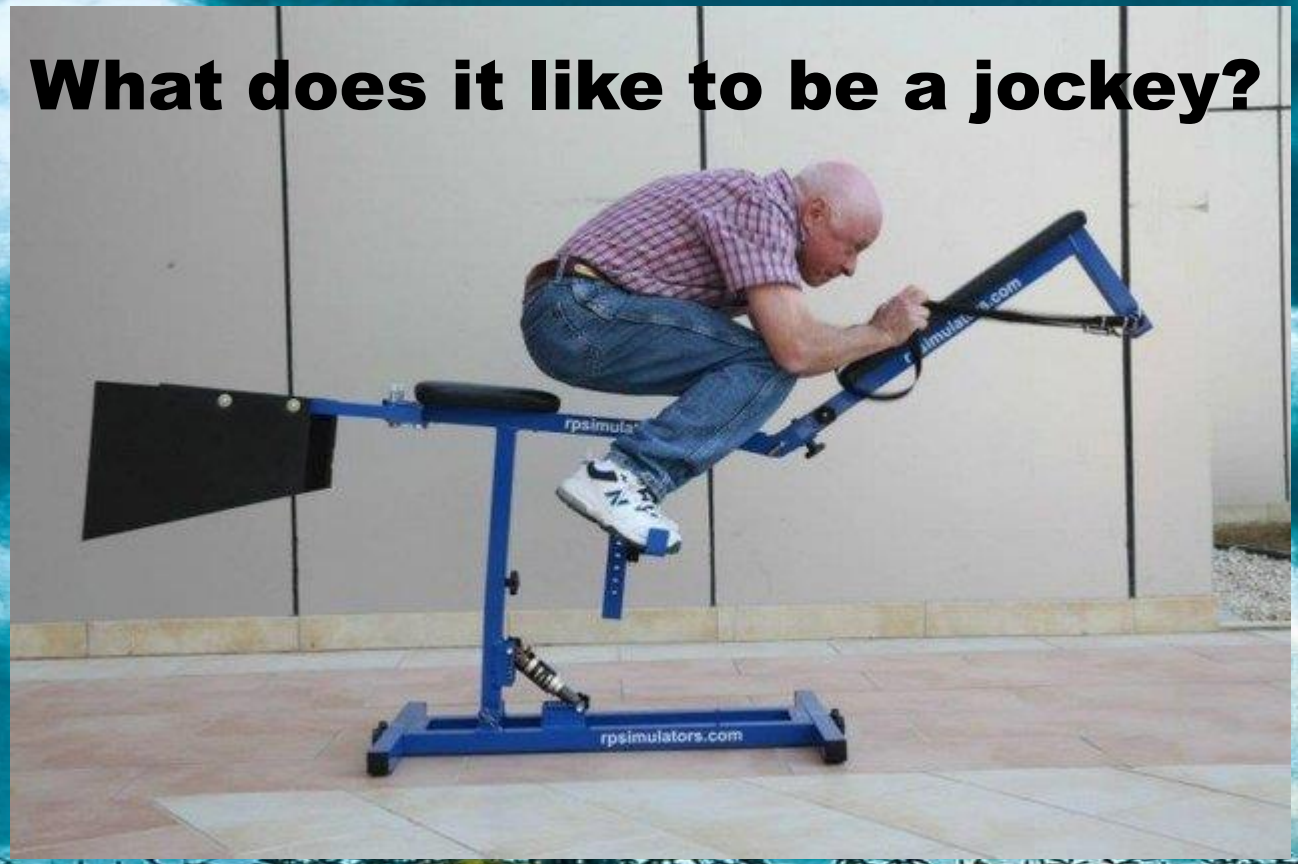
Statistical analysis

Meaning of the project

The **differences** among **typical APR in inflammation**, APR after **heavy exertion** and **exercise-induced APR in training** can be identified. The **role of exercise-induced APR** will be considered in the context of horses' health and performance history,

Analyzing data in the context of horses' performance ability will allow to answer the question if it is **adaptation or unfavorable reaction**,

The determination of **relationships** between activation of **genes** involved in **APR**, the presentation of **exercise-induced APR** features in **peripheral blood, course of training** and selected **orthopedic diseases** development.



I HOPE YOU HAVE A GOOD TIME

THANK FOR YOUR ATTENTION