



UNIVERSITAT  
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# Renal alterations after extreme exertion

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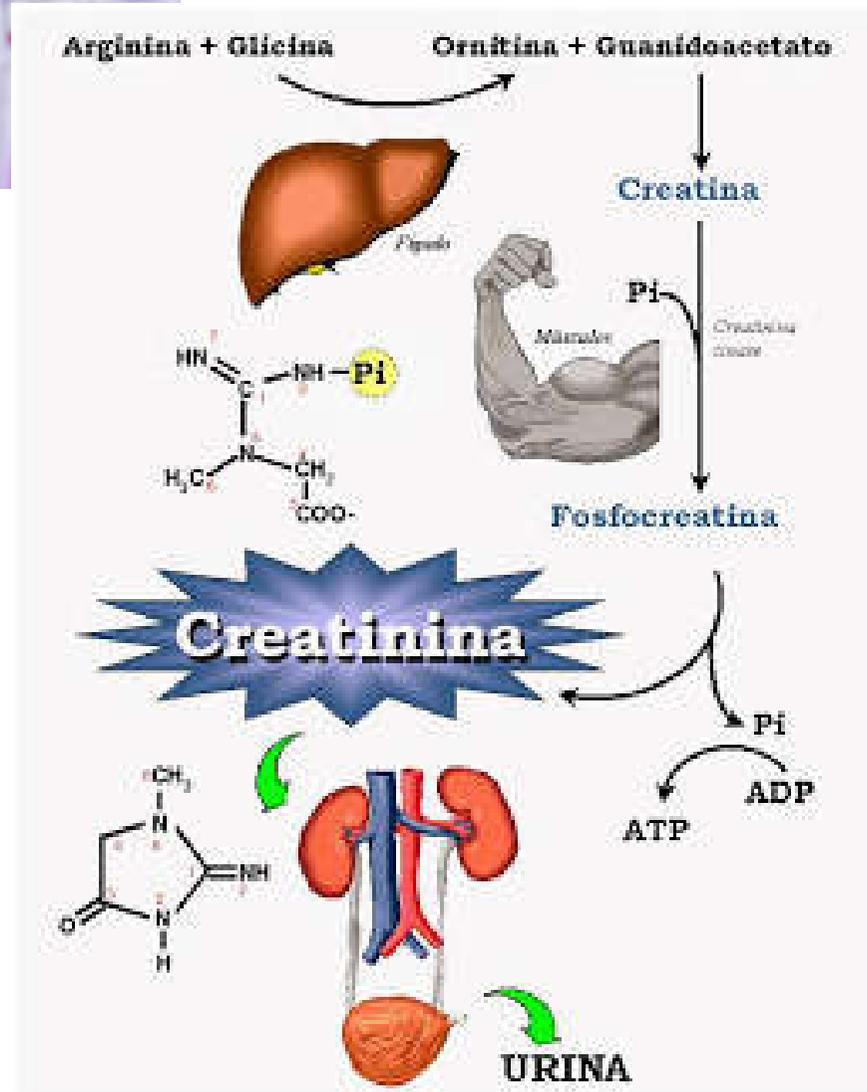
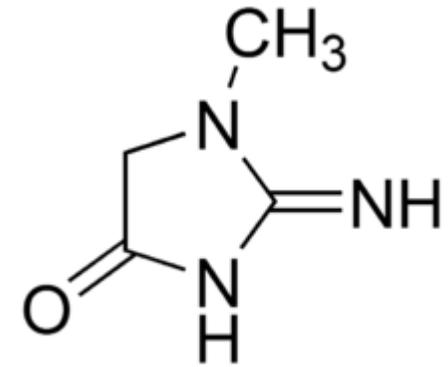
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Universitat Jaume I (Castellón)

Hospital Vithas NISA Rey Don Jaime (Castellón)

# INDEX

- Renal function general explanation.
- Rhabdomyolysis
- Findings in mountain runners. (Our experience).
- Some recommendations
- Conclusions.





$$\frac{(140 - \text{edad}) \times \text{peso (kg)} \times 1,73 (\text{m}^2) \times f}{72 \times \text{Creatinina sérica (mg/dl)}}$$

f=1 (varones); f= 0,85 (mujeres)

### Cockcroft-Gault Calculator (with SI Units)

Plasma creatinine (PCR)

mg/dL  umol/L

Weight (wt)

kilograms  pounds

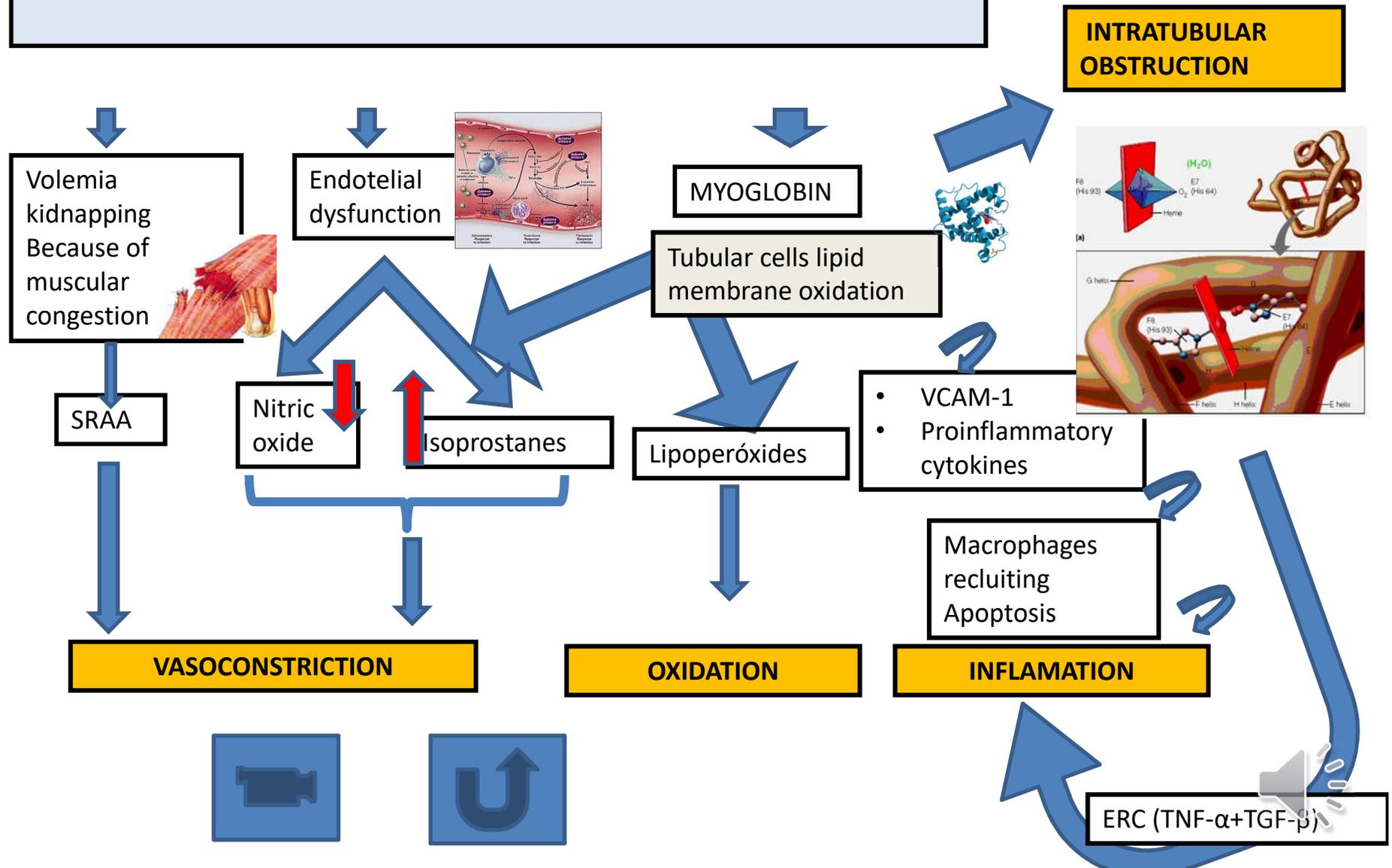
Gender

Male  Female

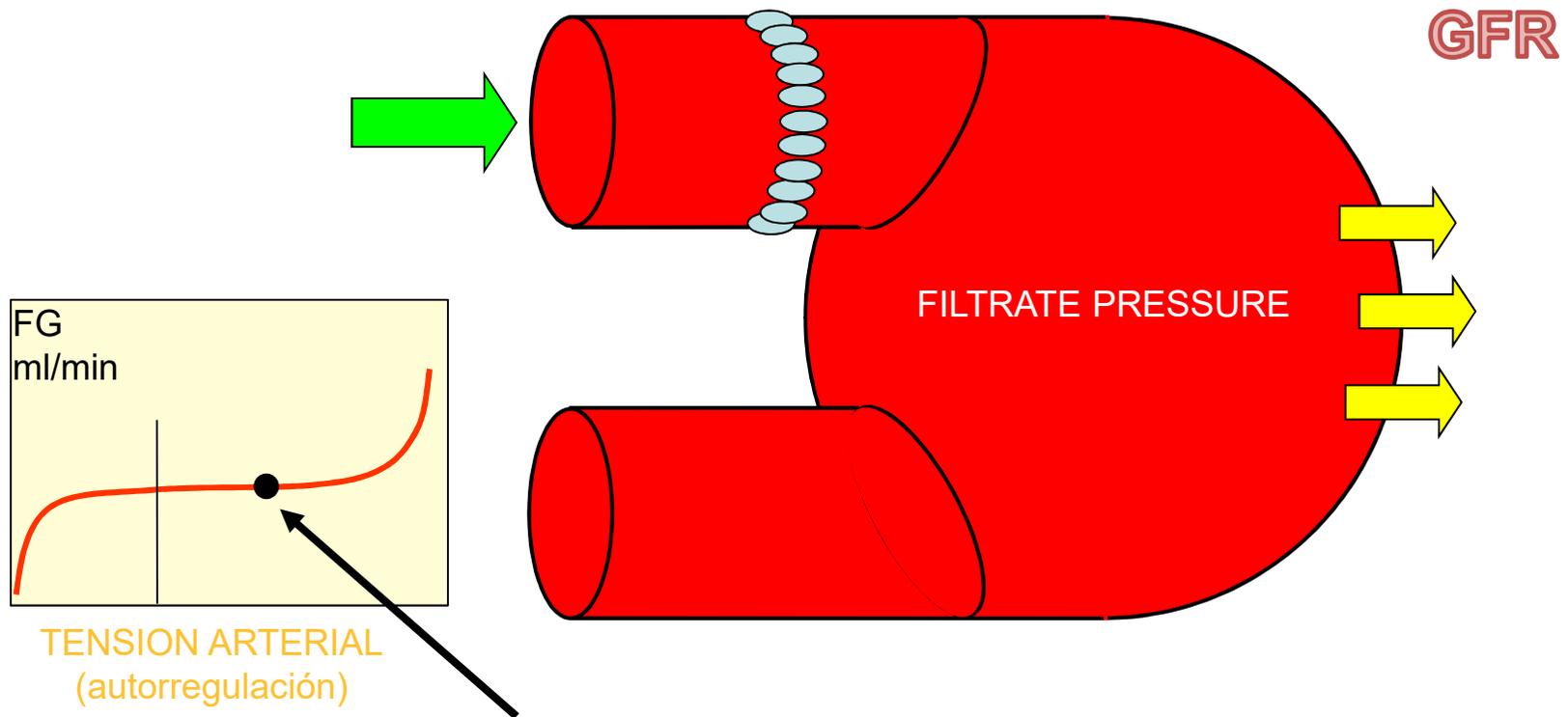
Age

Normal Glomerular filtration rate: > 60 ml/min

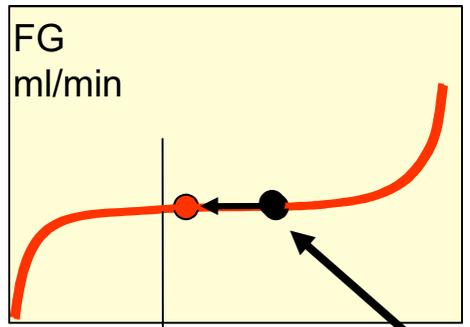
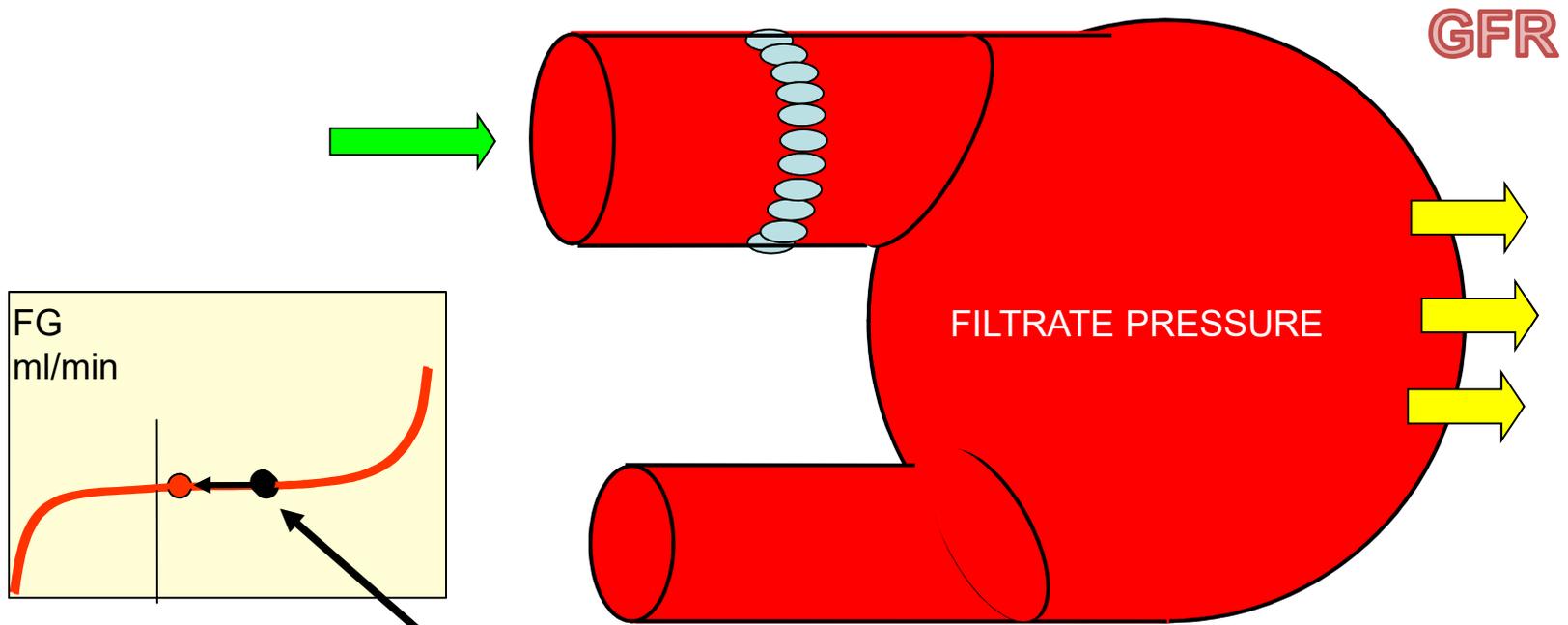
# SKELETAL MUSCLE MASSIVE DESTRUCTION



# ...Normal situation

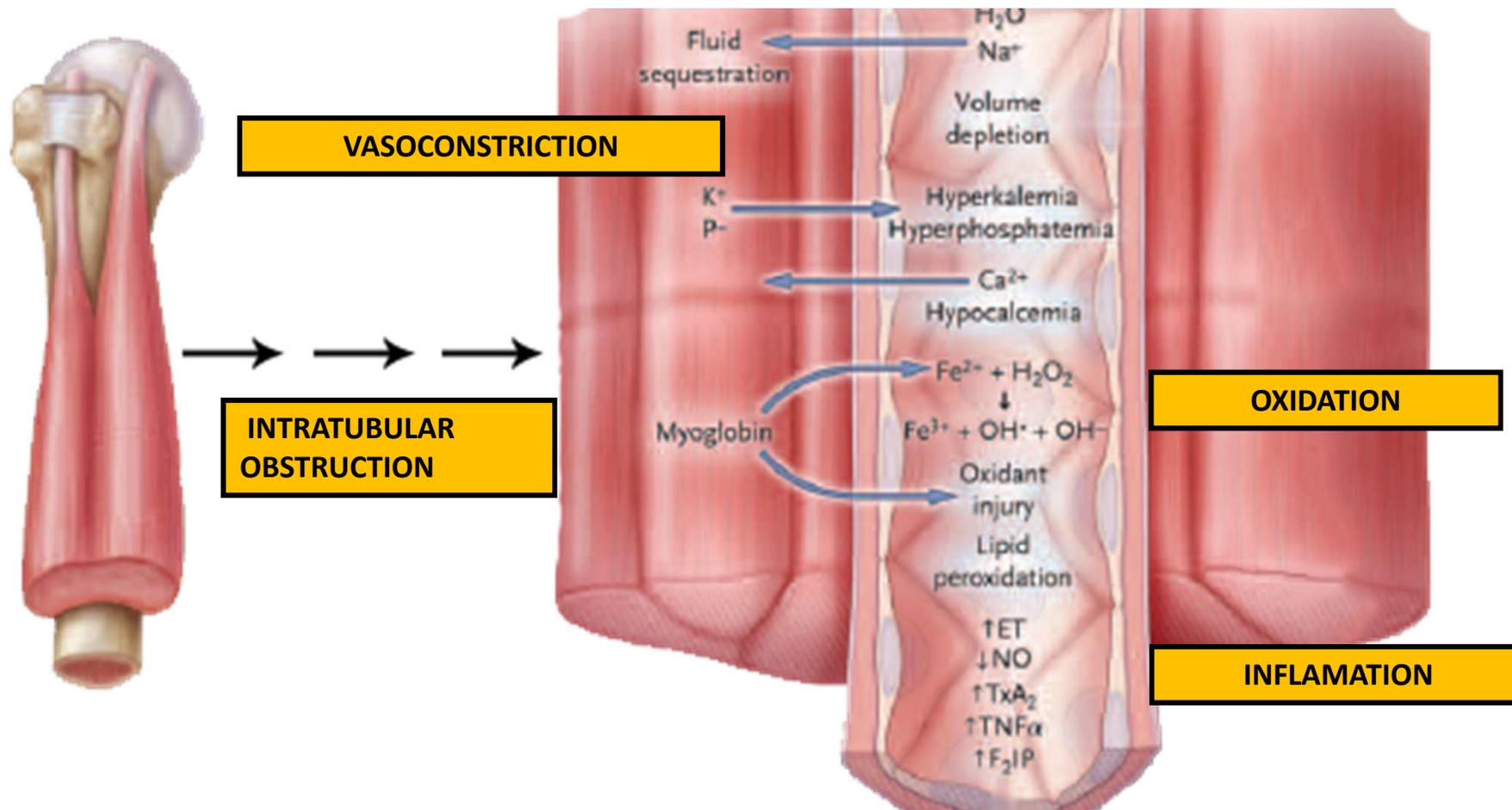


... Low systemic pressure...



**SYSTEMIC  
ARTERIAL  
PRESSURE**

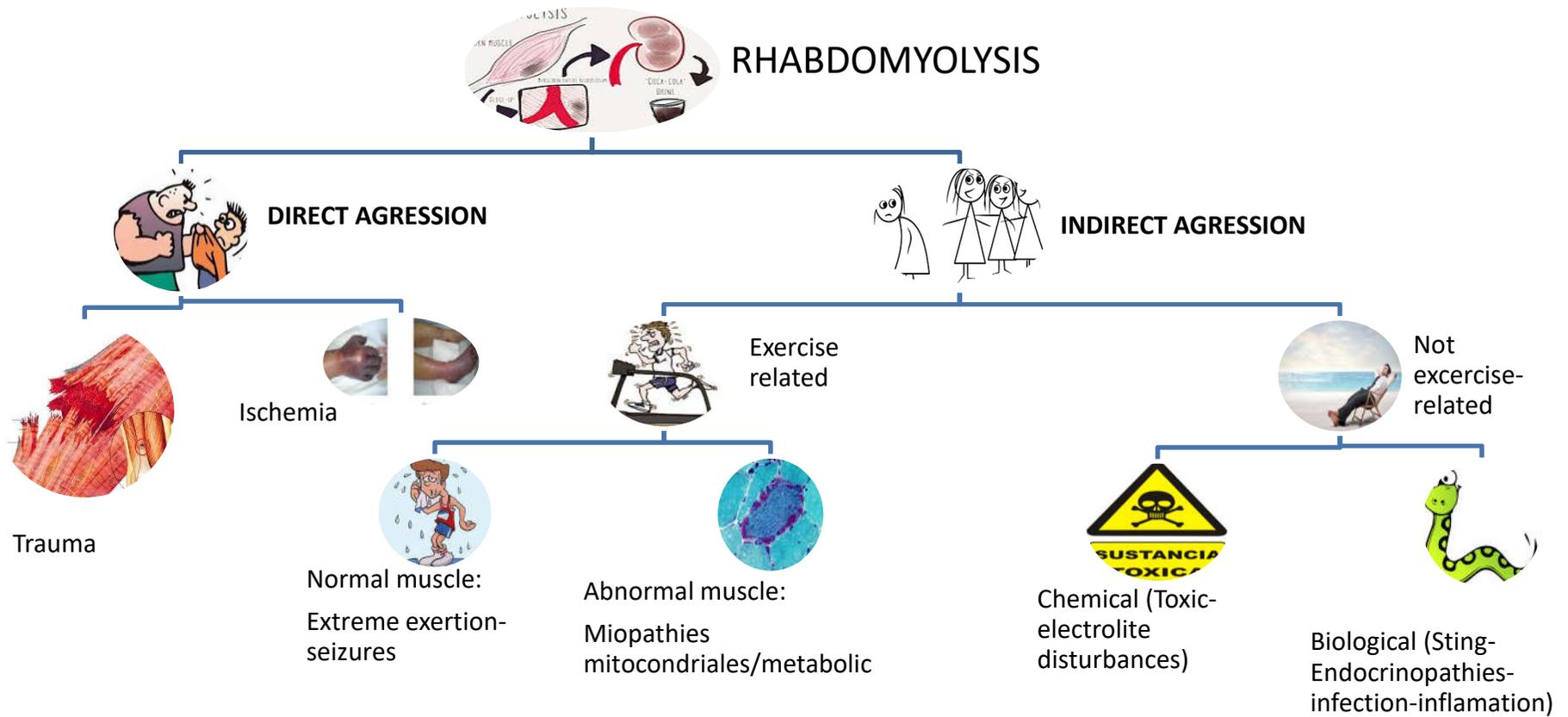




# RHABDOMYOLYSIS SUMMARY

- Glomerular filtration rate reduction
- Concentrated urine with little water and little sodium
- Death of tubular cells
- Alteration of the permeability of the renal glomerulus. Appearance of microalbuminuria
- Systemic inflammation. Elevation of inflammatory markers.

# CAUSES



# PROYECTO PENYAGOLOSA

Trail saludable

n 50



ENCUESTA DE SALUD

CONTROLES PRECARRERA:  
 Constantes vitales  
 Analítica sangre y orina  
 Bioimpedancia

CONTROLES POSTCARRERA:  
 Constantes vitales  
 Analítica sangre y orina  
 Bioimpedancia



## MARATÓ I MITJA CASTELLÓ-PENYAGOLOSA

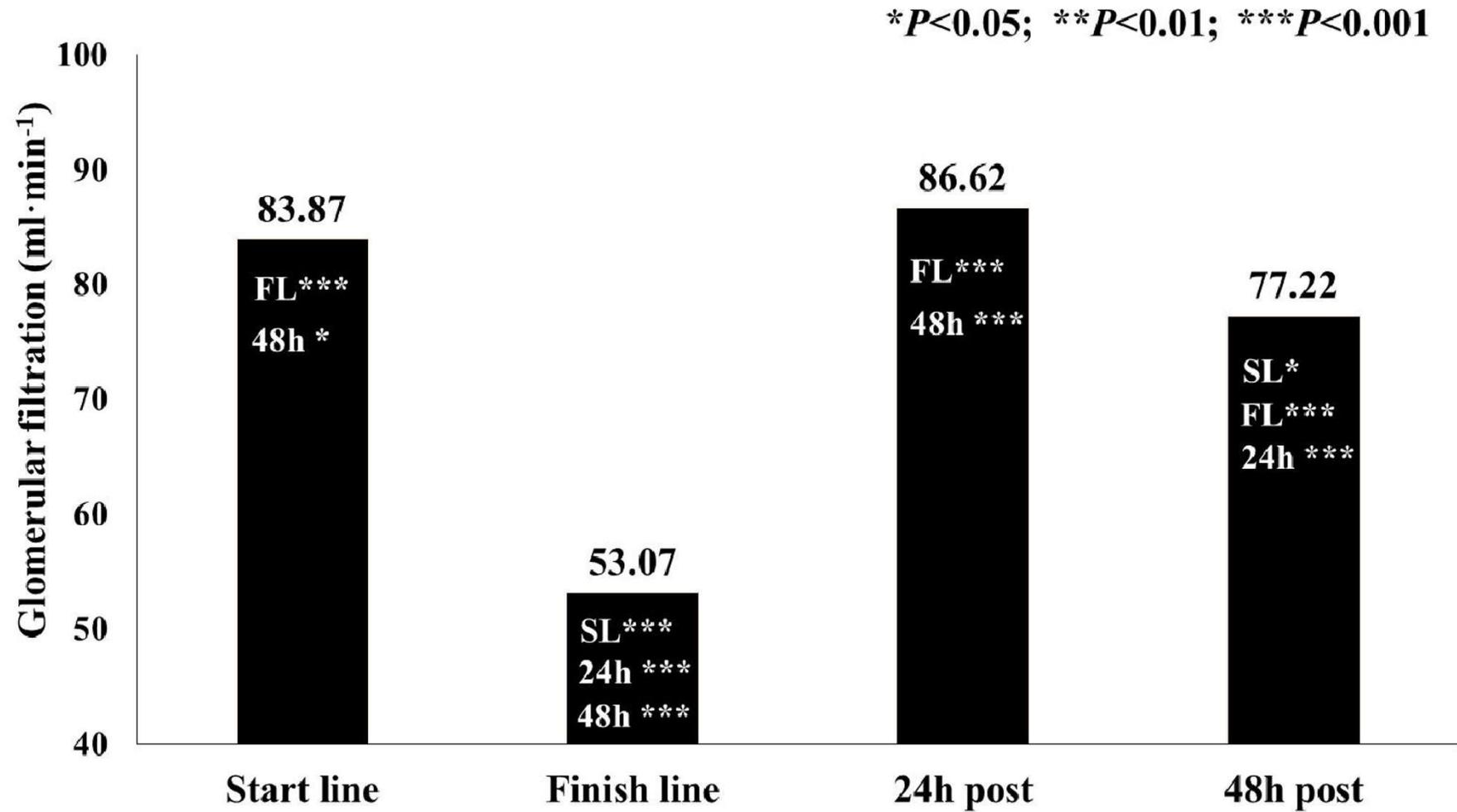
desnivell acumulat en pujada: 2500m.  
 desnivell acumulat en baixada: 1000m.



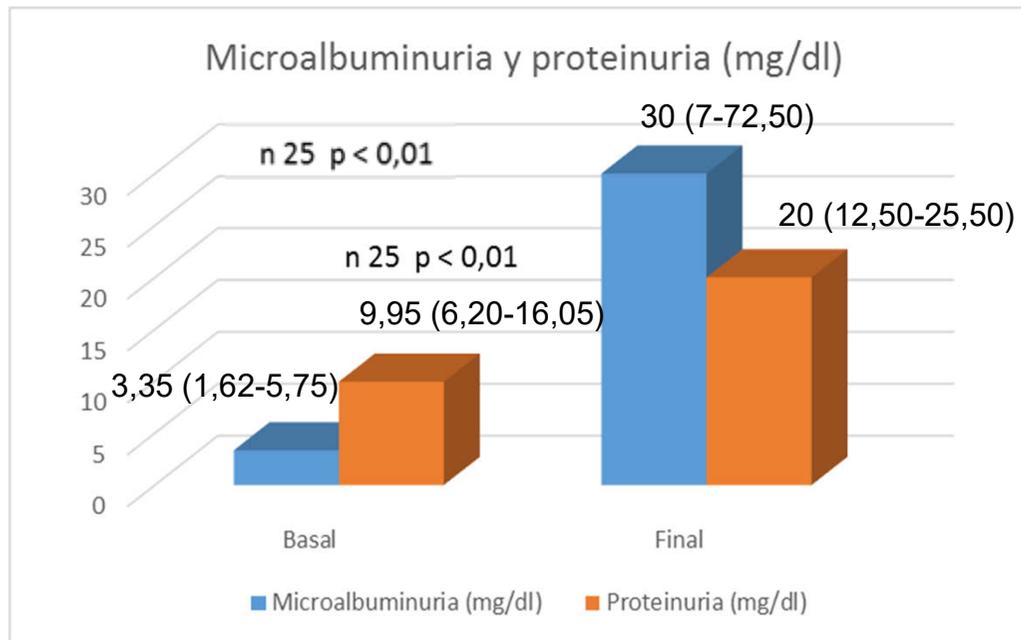
montaña son todas y cada una de estas alteraciones, pero unas nos llaman más la atención que otras.

**Tabla 5 Modificaciones fisiológicas registradas tras la prueba deportiva. T-Student para muestras apareadas. ANOVA para muestras apareadas en los casos con n < 30 ó distribución anormal de la variable. Test de Mac Nemar para las variables cualitativas binomiales.**

<b>Variable</b>	<b>Basal</b>	<b>Final</b>	<b>p</b>
<b>CONSTANTES VITALES (n 37)</b>			
<b>TAS (mm de Hg)</b>	<b>136,62 ± 15,77</b>	<b>115,84 ± 11,76</b>	<b>&lt;0,01</b>
<b>TAD (mm de Hg)</b>	<b>88,54 ± 8,42</b>	<b>77,73 ± 10,26</b>	<b>&lt;0,01</b>
<b>FC (lpm)</b>	<b>74,38 ± 8,61</b>	<b>91,49 ± 13,78</b>	<b>&lt;0,01</b>
<b>Temperatura corporal (°C)</b>	<b>34,70 ± 0,72</b>	<b>35,53 ± 0,81</b>	<b>&lt;0,01</b>
<b>COMPOSICIÓN CORPORAL (n 30-35)</b>			
<b>IMC (kg/m<sup>2</sup>) n 35</b>	<b>24,44 ± 2,3</b>	<b>22,88 ± 4,56</b>	<b>0,06</b>
<b>Masa grasa (kg) n 30</b>	<b>9,86 ± 3,87</b>	<b>9,77 ± 3,63</b>	<b>0,20</b>
<b>Masa magra (kg) n 31</b>	<b>58,64 ± 14,17</b>	<b>57,64 ± 6,60</b>	<b>0,84</b>
<b>Agua corporal total (l) n 30</b>	<b>44,72 ± 5,52</b>	<b>42,10 ± 4,82</b>	<b>&lt;0,01</b>

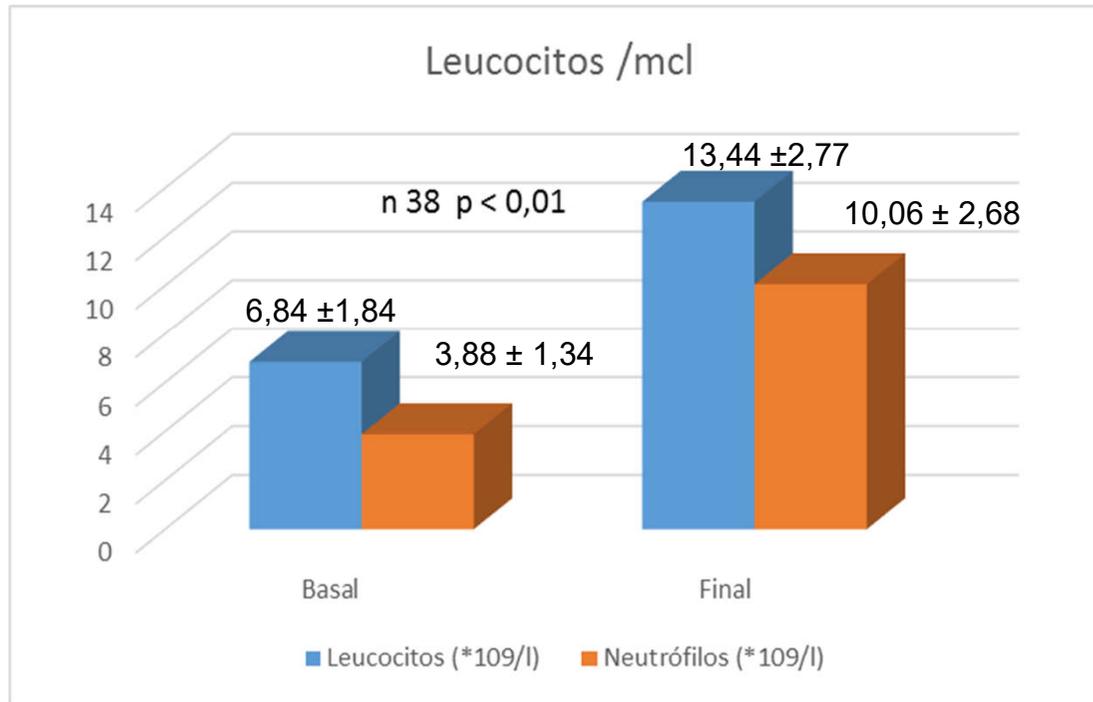


# RESULTS-Physiological changes



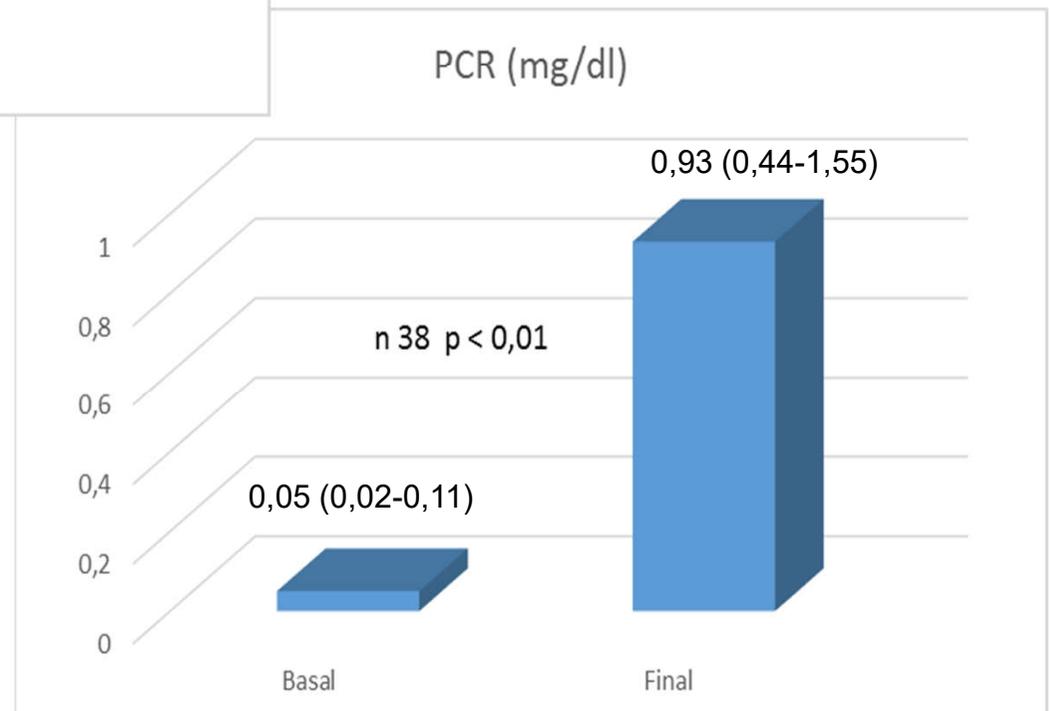
**Paired ANOVA test**

# RESULTS-Physiological changes



**Paired T-Student Test.**

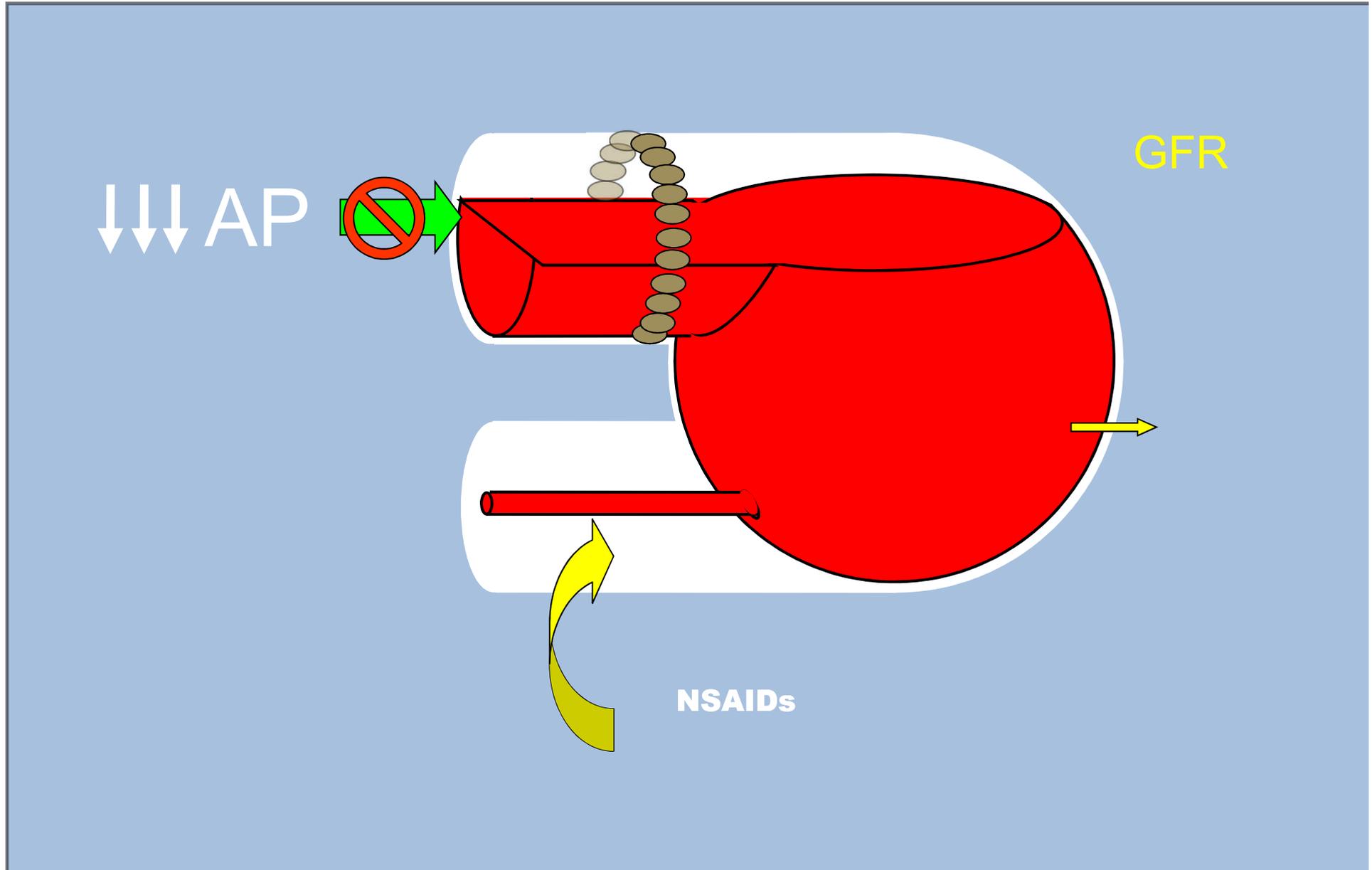
**Paired ANOVA test**



# RECOMENDATIONS

- Isotonic abundant hydration maintained up to 48 hours after the end of the race.
- Basal strength training
- Avoid NSAIDs (Non steroidal antiinflammatory drugs) the days next to the race.

... What happens with NSAIDs  
(Antiinflammatory drugs)?



# CONCLUSIONS

- ▶ Water loss during mountain trial and myoglobin liberation induce kidney transient alterations.
- ▶ In order to minimize renal damage it is important an adequate hydration, muscular strenght training and antiinflammatory drugs avoidance.
- ▶ The extreme physical exercise establishes in the organism an intense systemic inflammatory response with repercussions not well known until now.
- ▶ The analytical study of healthy subjects undergoing extreme physical exercise, can be a model free of confounding factors, to get insight into the pathophysiology of inflammation and its systemic, cardiovascular and renal effects, and to future trials with agents aimed at block these inflammatory mechanisms in order to avoid their harmful effects in this and other clinical contexts.

**THANK YOU !!!**