



UNIVERSITÀ DEGLI STUDI DI MILANO  
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E SCIENZE ANIMALI



# LEFT AND RIGHT-SIDE ECHOCARDIOGRAPHIC MEASUREMENT OF PULMONARY ARTERY STIFFNESS IN HORSES

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# Pulmonary Artery Stiffness (PAS)

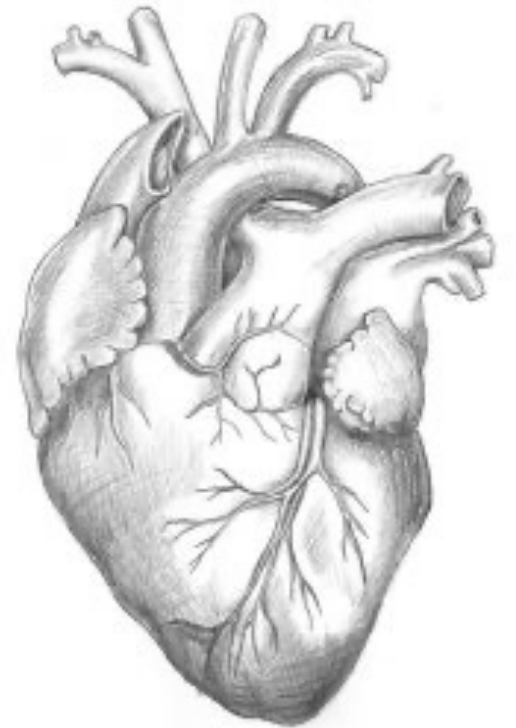
**Non-invasive echocardiographic index** of pulmonary artery elasticity



Assessment of **structural features and function** of the  
pulmonary vascular bed

Humane medicine → **early predictor of pulmonary hypertension**

Equine → can be affected by **chronic pulmonary disease**



# PAS in equine medicine

A study on PAS in healthy horses<sup>1</sup>

- ▶ **Repeatability** and **reproducibility** of PAS measurements
- ▶ **Easy** to measure
  - pulsed-wave Doppler echocardiography: right parasternal short axis view at the level of the pulmonary artery
- ▶ **Well tolerated**



<sup>1</sup> Alberti et al. Feasibility of echocardiographic estimation of pulmonary artery stiffness in horses, Journal of Equine Veterinary Science, 112, 2022.

# PAS in equine medicine

A study on PAS in asthmatic horses<sup>1</sup>

- ▶ **PAS values higher in SEA affected horses**
- ▶ **Correlation between PAS and PAD/AOD**
  - indirect index of pulmonary hypertension



<sup>1</sup> Alberti E. Evaluation of Pulmonary Artery Stiffness in Asthma Affected Horses. Tutor: Zucca E.; Coordinator: Ceciliani F.; DIVAS of University of Milan; 2022 March 31 (34° cycle PhD in VAS; academic year 2020/2021); <http://hdl.handle.net/2434/916663>.



# AIM OF THE STUDY

Institutional Animal Care and  
Use Committee **of the**  
**University of Milan**  
(OPBA\_14\_2023)

To evaluate if there was a  
**difference in PAS measurement**  
between the left and the right  
side of the thorax

# MATERIALS AND METHODS

## HEALTHY HORSES

→ Based on:

- ▶ History
- ▶ Clinical examination
- ▶ Hematology and biochemistry
- ▶ Echocardiografic examination

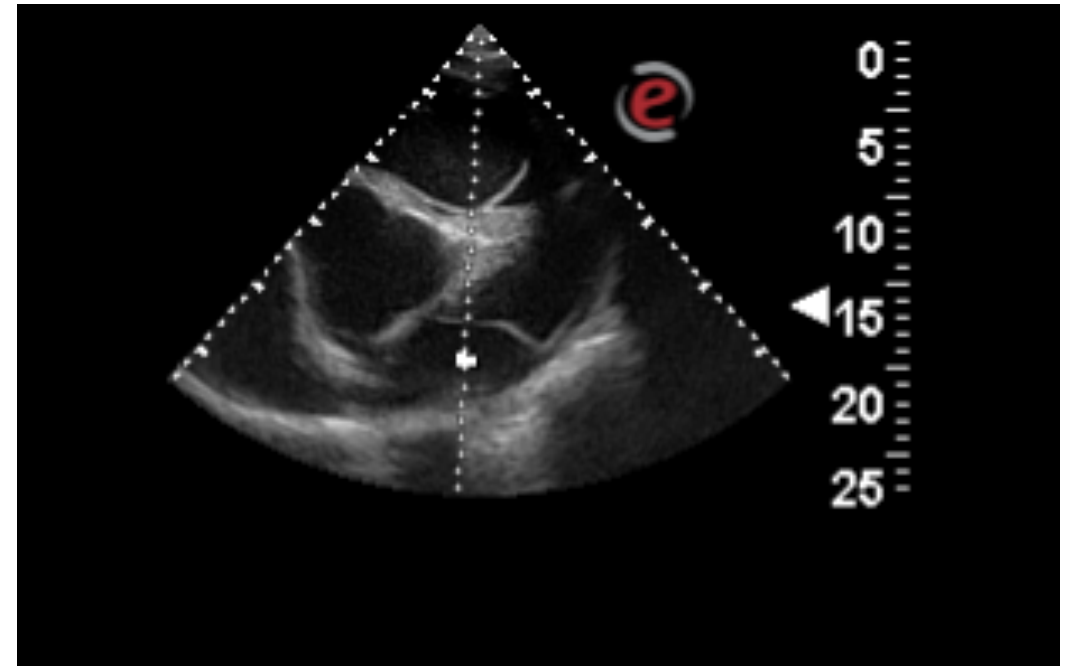
PAS measurement  
from left and right  
side



# MATERIALS AND METHODS

## RIGHT SIDE

- ▶ 2.5 MHz phased array transducer
- ▶ Pulsed wave Doppler of the pulmonary artery
- ▶ **Right parasternal short axis view at the level of the pulmonary artery**

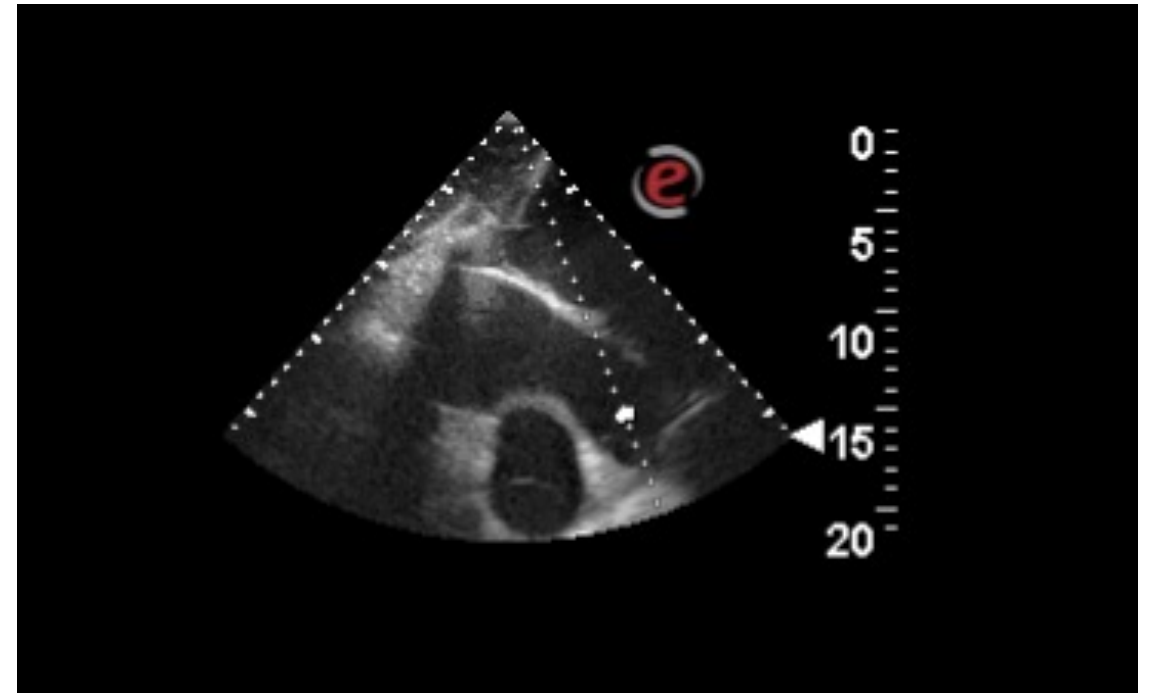




# MATERIALS AND METHODS

## LEFT SIDE

- ▶ 2.5 MHz phased array transducer
- ▶ Pulsed wave Doppler of the pulmonary artery
- ▶ **Left parasternal angled view of the right ventricular inflow/outflow**

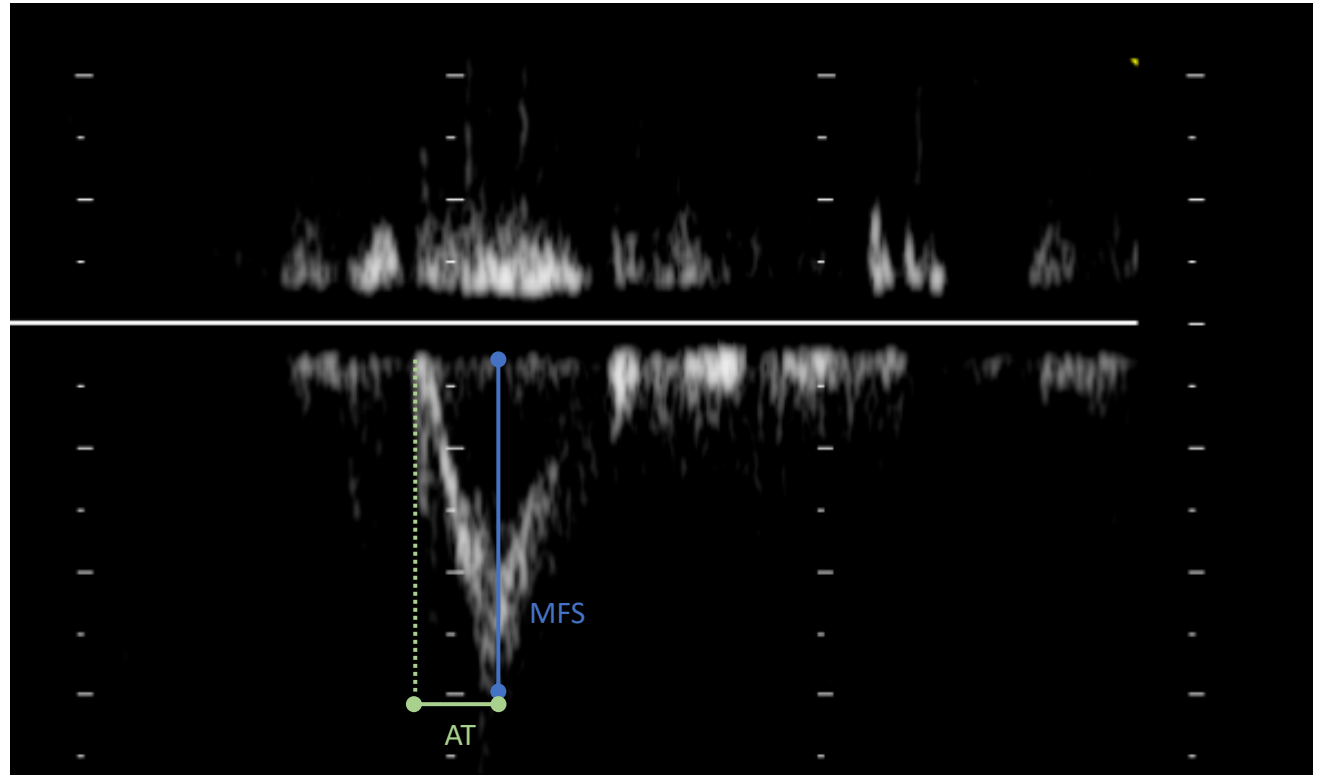




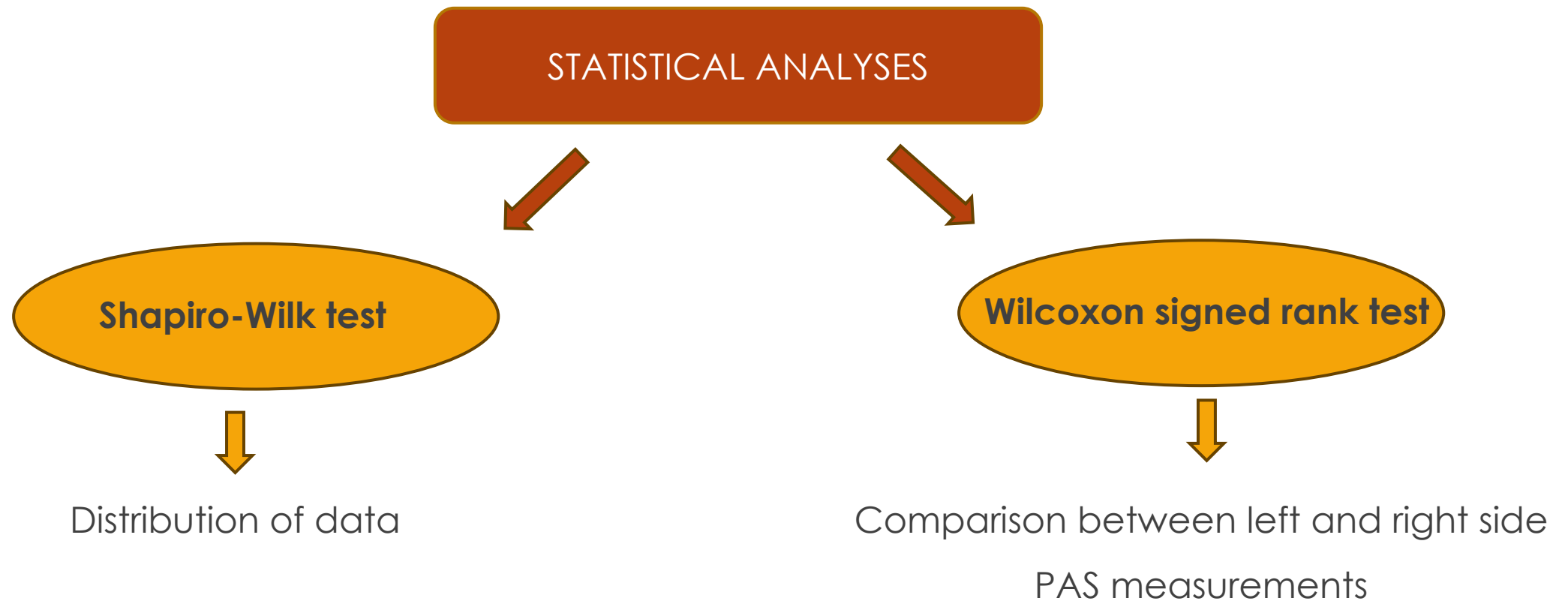
# MATERIALS AND METHODS

## ECHOCARDIOGRAPHIC PAS MEASUREMENT

- ▶ 
$$\text{PAS} = \frac{\text{maximal frequency shift (MFS)}}{\text{acceleration time (AT)}}$$



# MATERIALS AND METHODS



# RESULTS

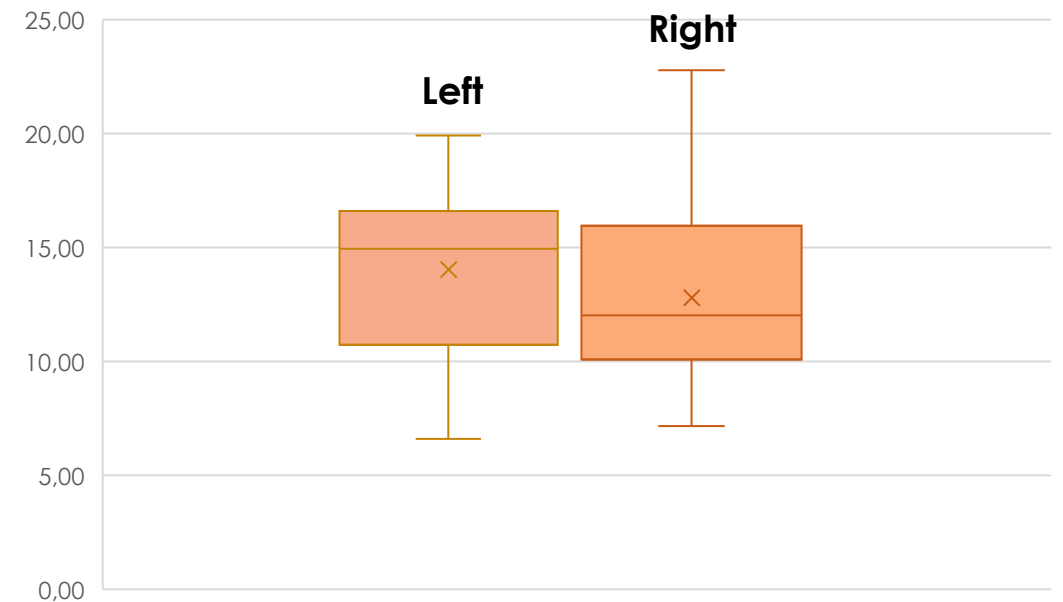
## 15 Healthy Horses

- ▶ **Age:** range 5 – 24 years old
- ▶ **Breed:** 1 Standardbred, 4 Thoroughbreds and 10 Warmbloods
- ▶ **Sex:** 7 females and 8 geldings
- ▶ **Weight:** range 415-690 kg
- ▶ **BCS:** range 3-6 (out of 9)
- ▶ Different type of training



# RESULTS

PAS left (kHz/s)			PAS right (kHz/s)		
Median	IQR 25	IQR 75	Median	IQR 25	IQR 75
<b>14.93</b>	11.17	16.42	<b>12.03</b>	10.43	14.81



- ▶ **NO statistically significant difference** in PAS measurements between the left and the right side



# DISCUSSION

NO difference in PAS measurement between left and right side



Possibility to choose the side



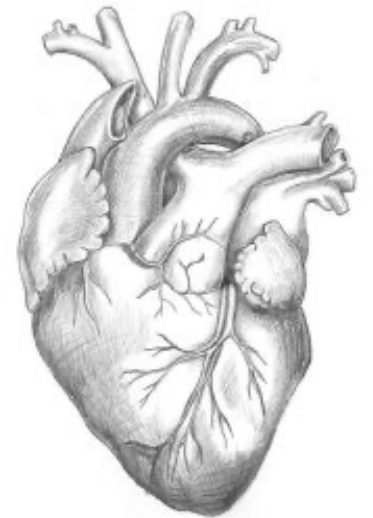
Compliance of the horse



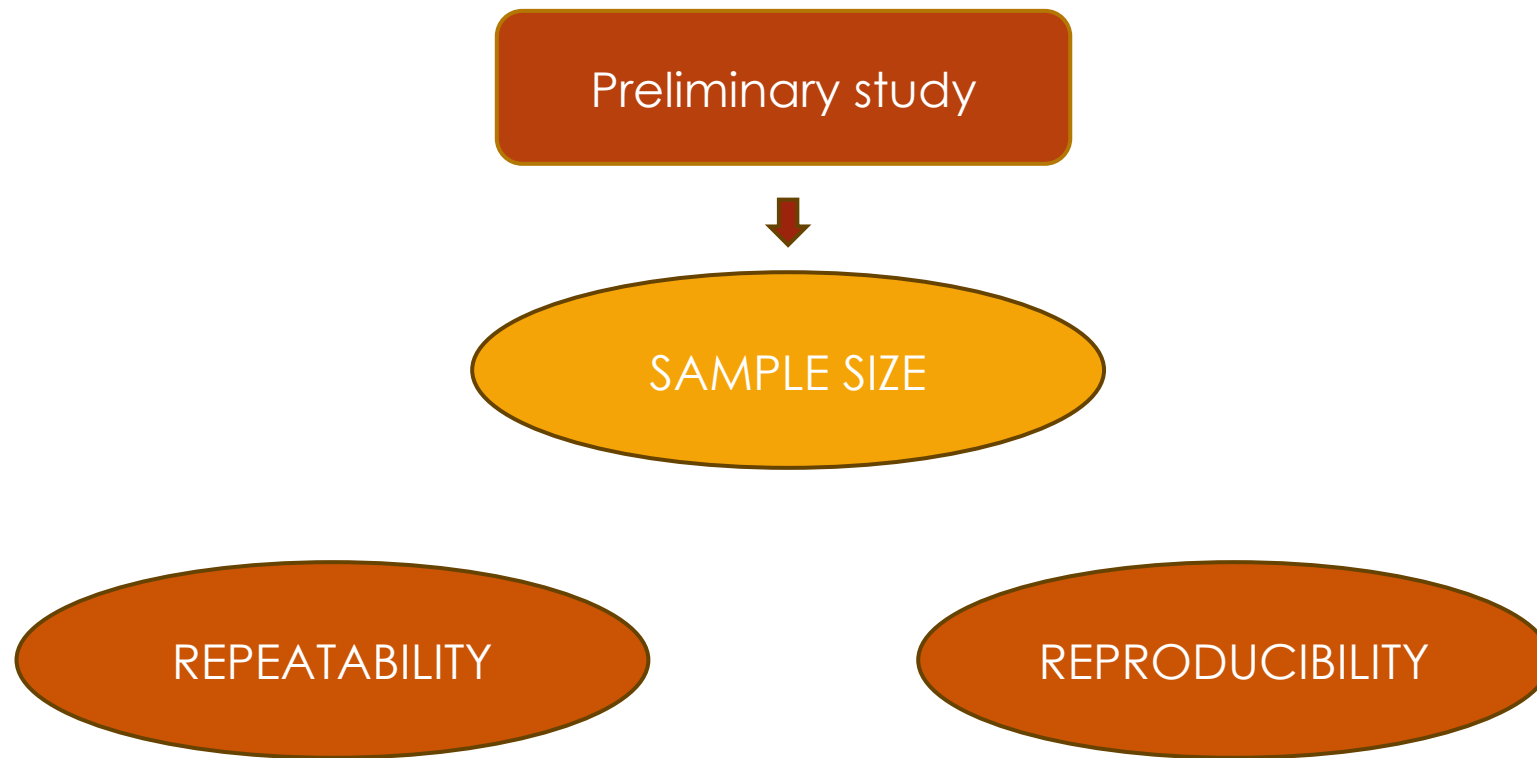
Horse structure



Operator experience



# CONCLUSION





THANK YOU FOR  
THE ATTENTION