

EAAP ANNUAL MEETING 01.09.-05.09.2024, FLORENCE

A PROMISING GENETIC BACKGROUND OF PORK HEMORRHAGES OCCURRING AT SLAUGHTER

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TIGER Project

“Testing Inert **G**ases in order to Establish **R**emplacements for high concentration CO₂ stunning for pigs at the time of slaughter”

Stunning with CO₂

- Loss of consciousness **after 20 s** of exposure to CO₂ [1]
- Animals show **signs of discomfort** during this time [2]
 - Gasping, hyperventilation, flight attempts [3]
- Use of **inert gases** leads to **less aversive** behavior [4]
- **Drawback:** higher incidence of hemorrhages [5]
 - Due to longer or stronger excitations

Hemorrhages at slaughter

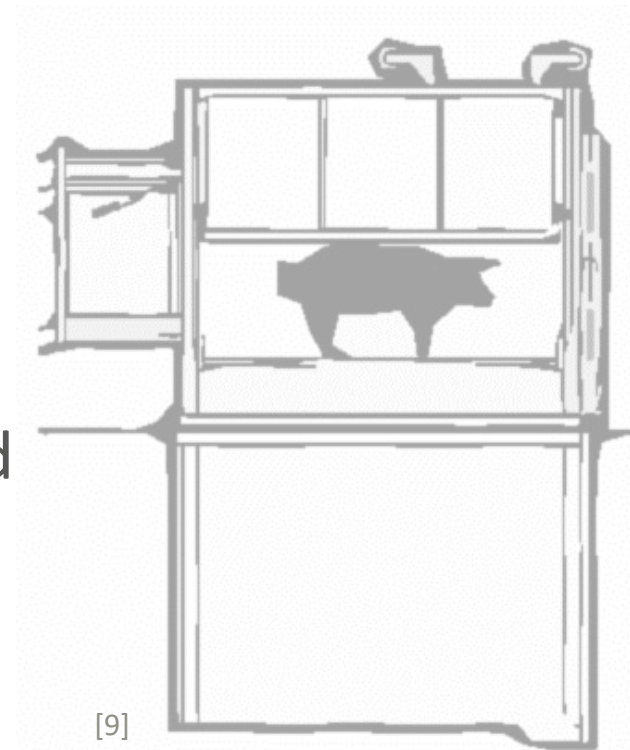
- **Rupture** of blood vessels before bleeding: [6]
 - Muscle **contractions**
 - **Dilation** of arteries
 - Capillary **fragility**
- Occur in **precious** carcass parts [7]
 - Reduction of **quality** and **value**
 - Worst case: **food waste**



[8]

Experimental procedure

- **Existing** dip-lift system was equipped with a **new** and **patented** gassing technology
- **900** pigs, **8** farms, Ø slaughter weight **98.2 ± 8.2 kg**
 - Stunned with **Ar, Ar-N₂ mixture** or **CO₂**
 - Stunning parameters, aversion & meat quality evaluated
 - **378** left ham topsides were examined



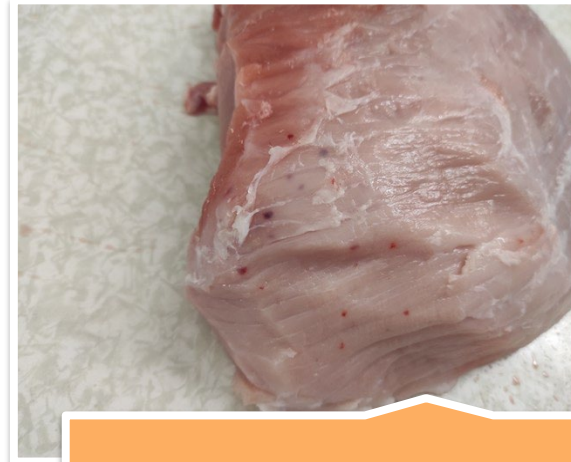
Scoring of the hams



Score 0



Score <5



Score 5-30



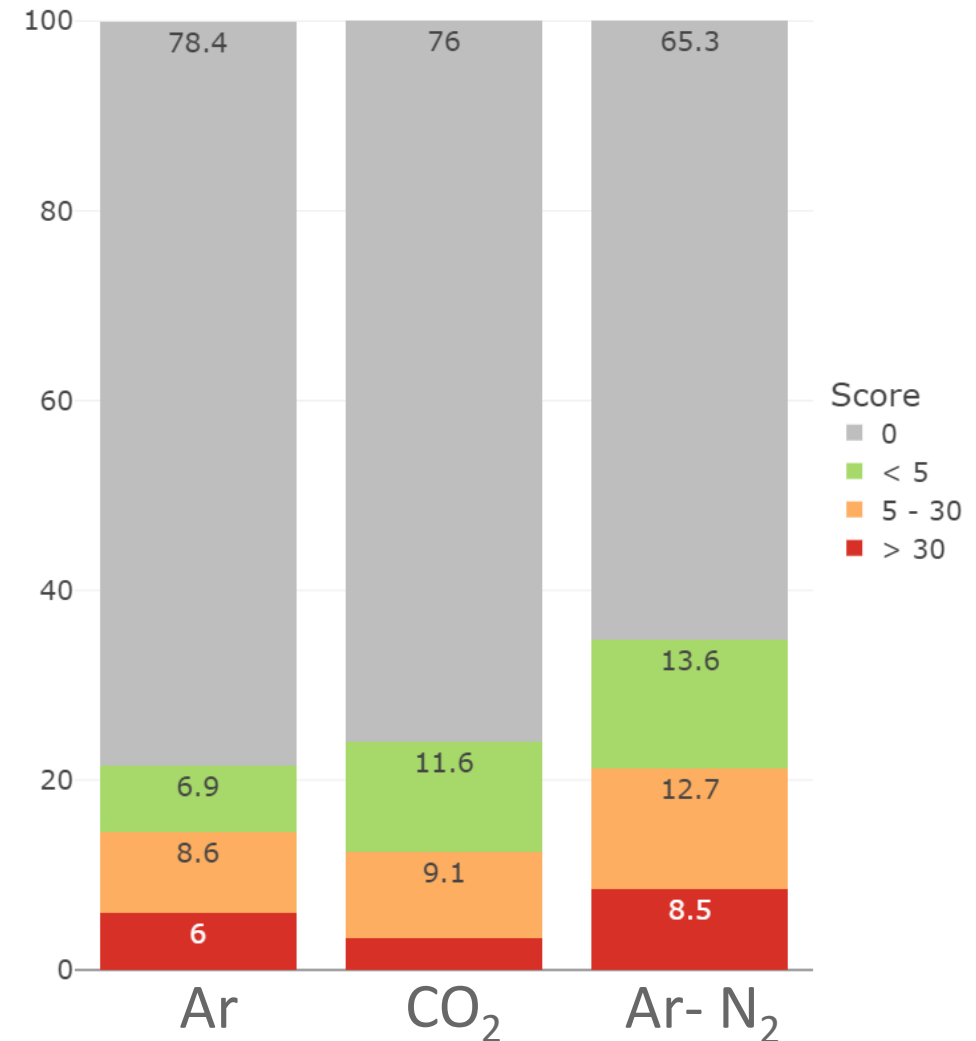
Score > 30

[10-13]

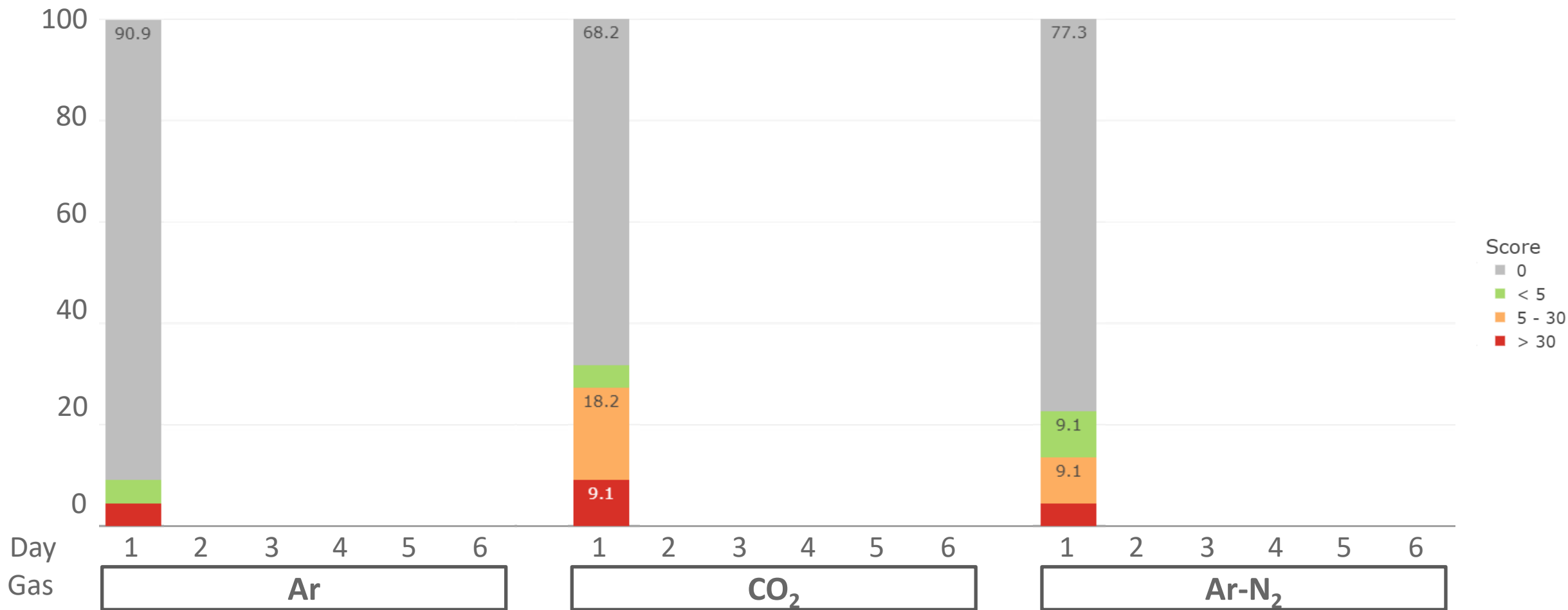
Results – Scoring

- **97** with hemorrhages
 - Score < 5: **36**
 - Score 5-30: **36**
 - Score > 30: **25**
- No sign. incidences (Chi-Square test)

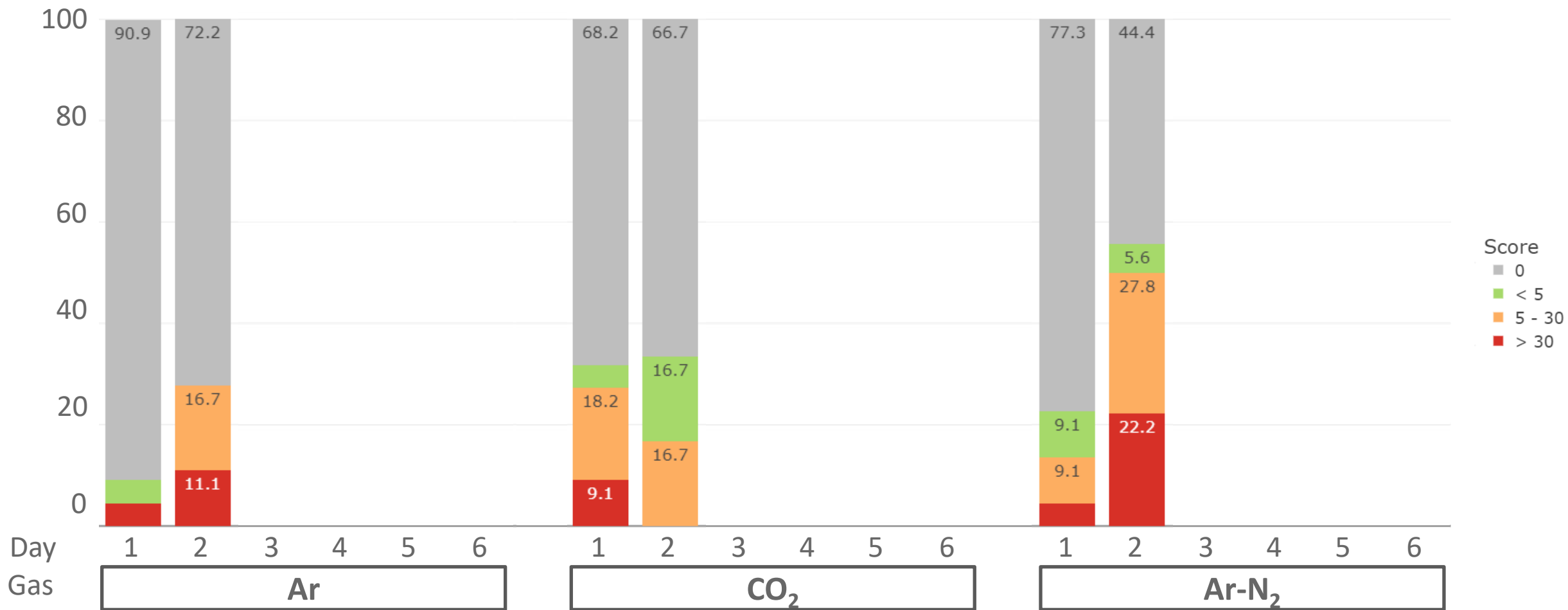
Relative frequency (%) of detected haemorrhages



Relative percentage (%) of detected haemorrhages per gas and day

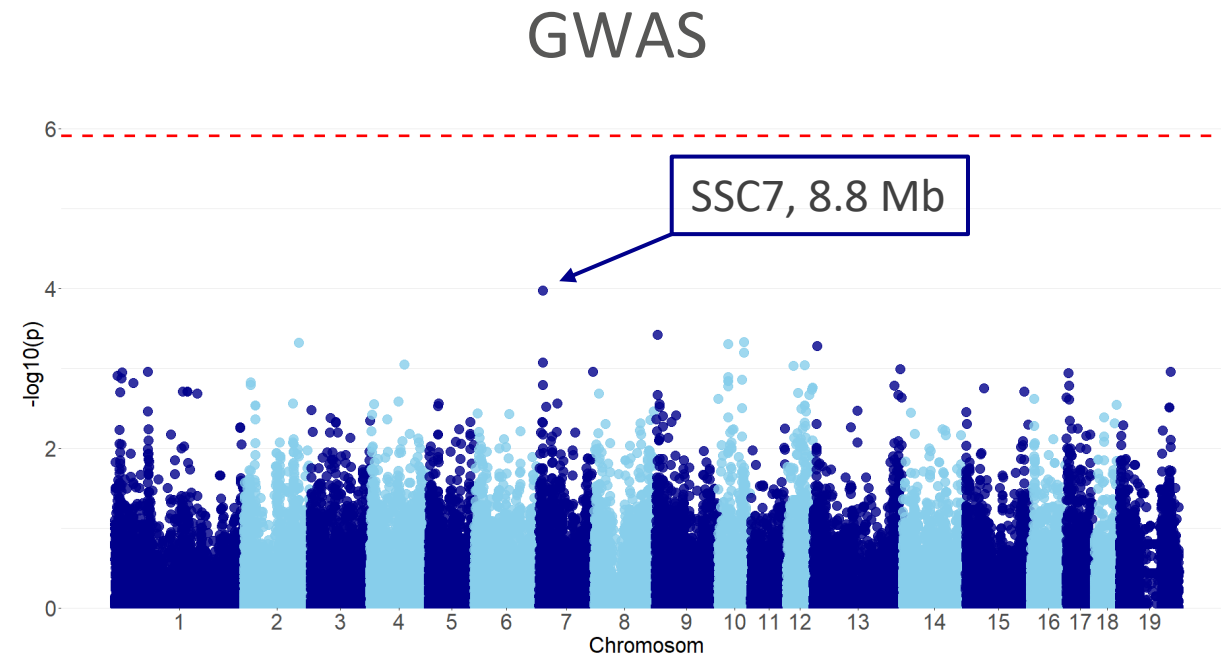


Relative percentage (%) of detected haemorrhages per gas and day



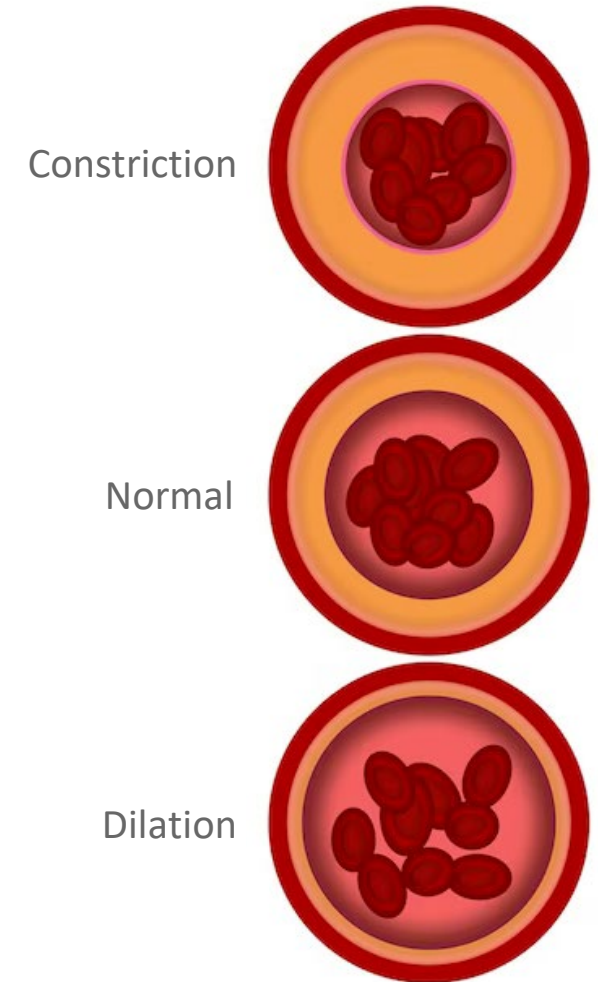
Genetic background?

- DNA from **217** pigs (**54** affected)
- Chip genotyping (50k)
 - 95% genotyping rate
 - MAF > 5%
 - 90% SNP genotyping rate
- GREML: $h^2 \approx \mathbf{0.28} \pm 0.14$, $p < 0.01$



Endothelin 1 (ET-1)

- Potent endothelium-derived **vasoconstrictor** [14]
- Involved in **cardiovascular diseases** [15,16]
 - Hypertension
- Vasoconstriction and **vasodilation** balance [17]
 - Vasodilation as factor for hemorrhages described
 - **Promising gene** in context of hemorrhages



[18]

Conclusion and Outlook

- Incidence of hemorrhages **not necessarily higher** for inert gases
 - **Variations** between measuring days
- No genome-wide significant association
- **Promising** association next to ***EDN1***
- Increase numbers of animals

THANK YOU FOR YOUR ATTENTION!

Funded by:

With support from



by decision of the
German Bundestag

Project manager



References

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Figures

- 8. Private
- 9. <https://d3i71xaburhd42.cloudfront.net/5e7ad0599305e50856ef56edc84da4ab74e0a279/17-Figure10-1.png>
- 10. Private
- 11. Private
- 12. Private
- 13. Private
- 18. https://img.freepik.com/premium-photo/comparison-normal-vasoconstriction-vasodilation-blood-vessels-with-cross-section-arteries_698953-14847.jpg

Numbers of animals per Genetik

Farm	Genetic	Ham scoring (n)	Genotyping (n)
Farm A	[DanL x DanY] x Pi	96	51
Farm B	[DL x DE] x Pi	54	-
Farm C	DL x Pi	16	15
Farm D	[DL x DE] x Pi	8	1
Farm E	[DanL x DanY] x Pi	54	1
Farm F	[DanL x DanY] x Pi	133	132
	[DanL x DanY] x Du	17	17

With: DL = German Landrace, DE = German Edelschwein, Pi = Pietrain, NL = Norwegian Landrace, LW = Large White, DanL = Danish Landrace, DanY = Danish Yorkshire, Du = Duroc, square brackets indicate crossbreed genetics of the SOW.