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Testing minimally invasive blood collection techniques in pigs used for research

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Is there a future for experimental animal research in Europe and, if so, what is it?

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The PIGWEB project has received funding from European Union's Horizon 2020 research and innovation program under Grant Agreement No 101004770.

Collecting blood from pigs

- Well-practiced experimental procedure
 - ✓ Understanding of metabolism and health
 - ✗ Appear to be stressful and painful
 - ✗ Not very easy experimental task to do (that requires training)

Venipuncture

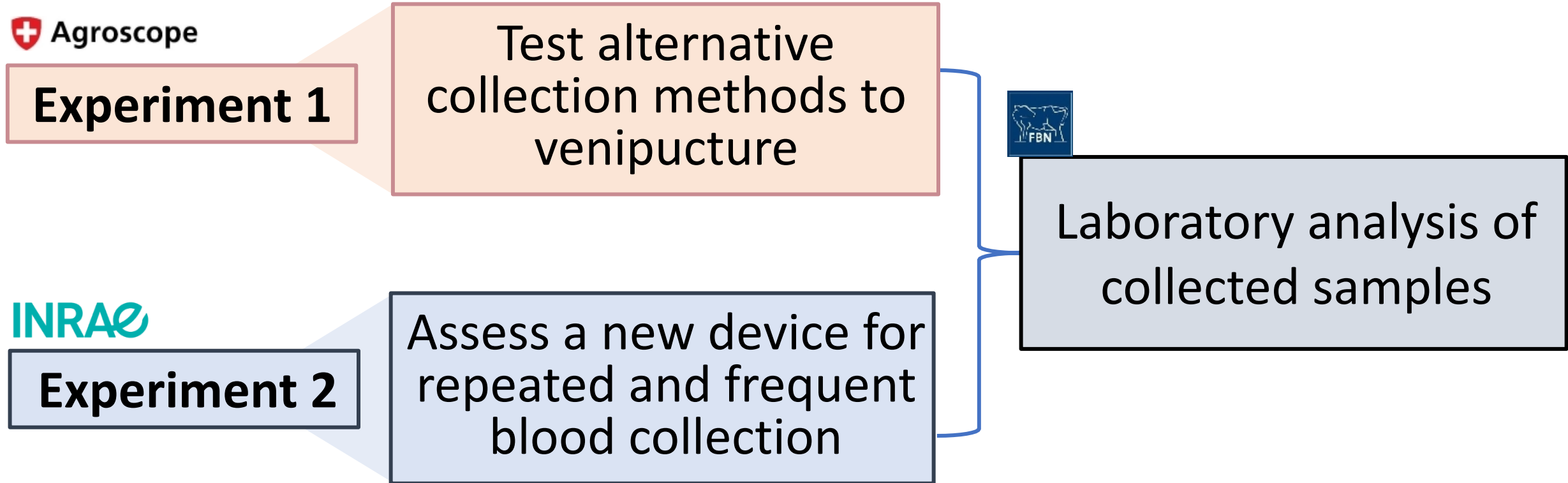


Catheterisation



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Experiments, objectives, and scope



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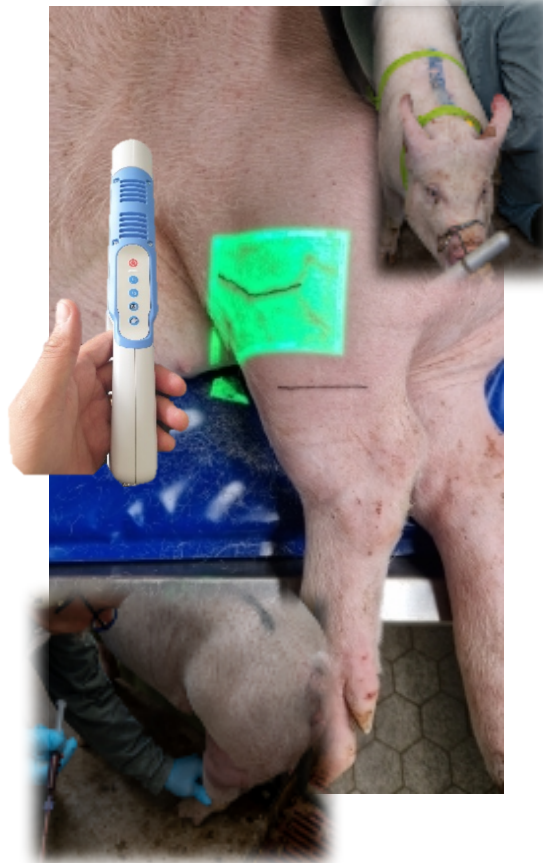
Experiment 1 – alternative to venipuncture



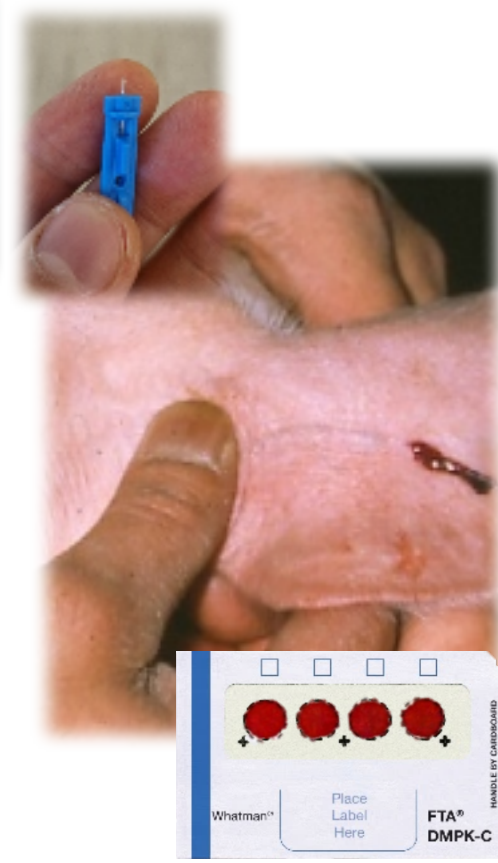
n = 8
58.5 ± 3.58 kg



Catheter



VeinViewer



FingerPrick

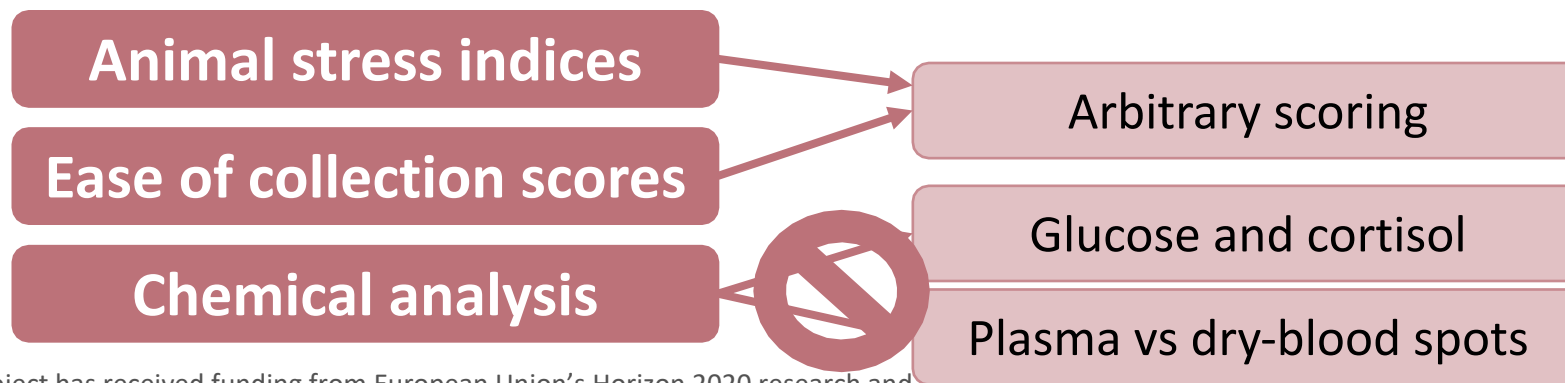
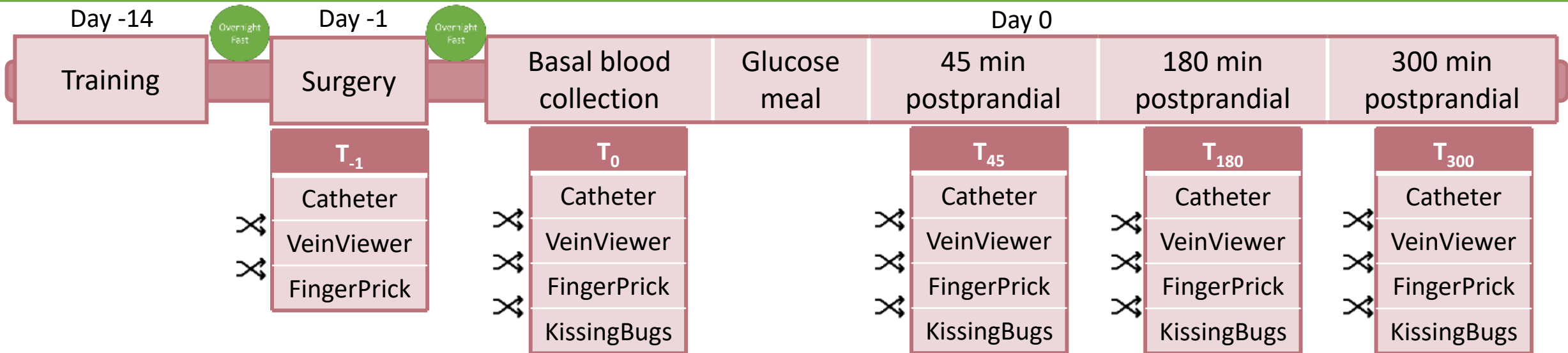


Kissing bugs



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Experiment 1

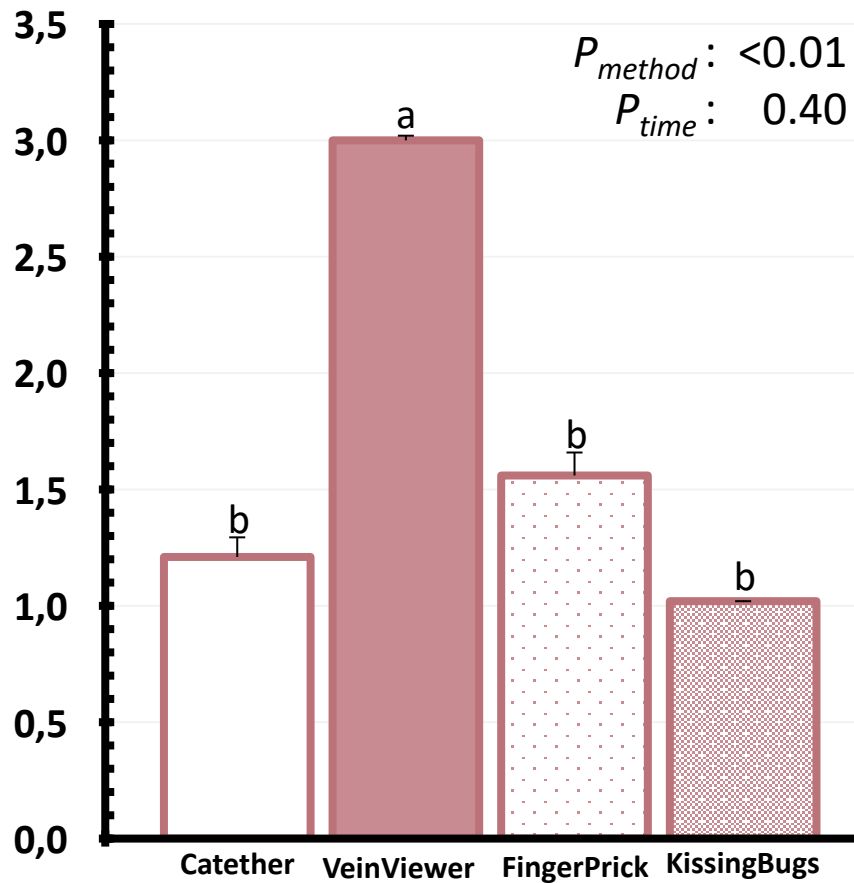


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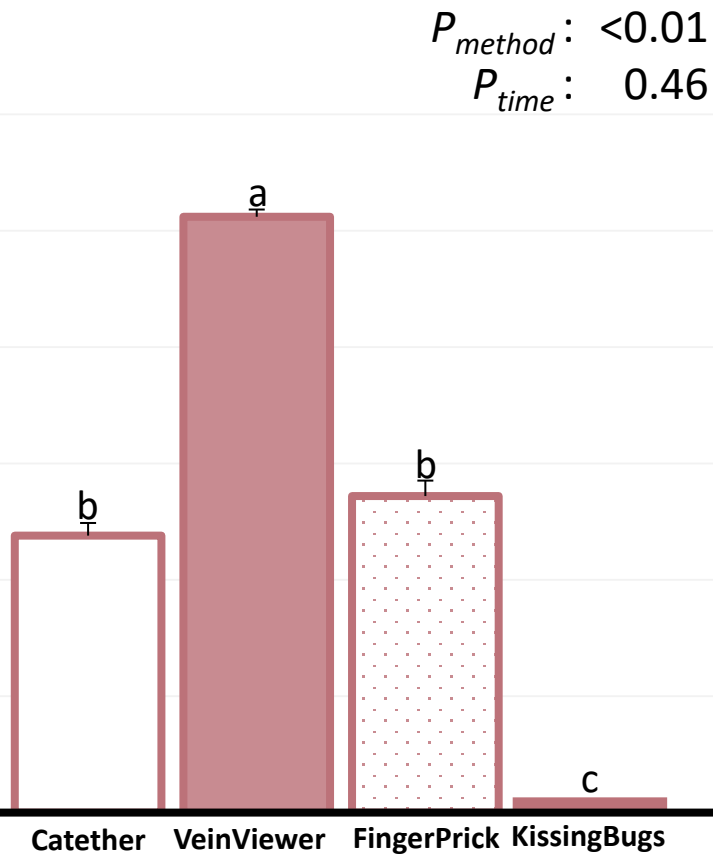
How stressed were the pigs?

1	Relaxed animal
2	Moderately stressed
3	Very visible stress and pain

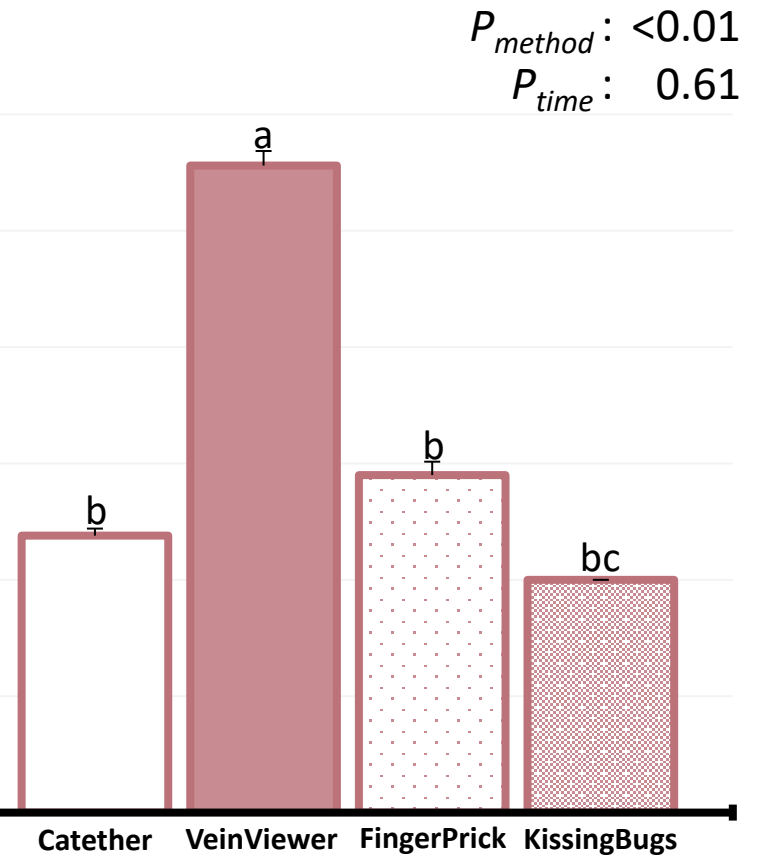
Actual time score



Video score



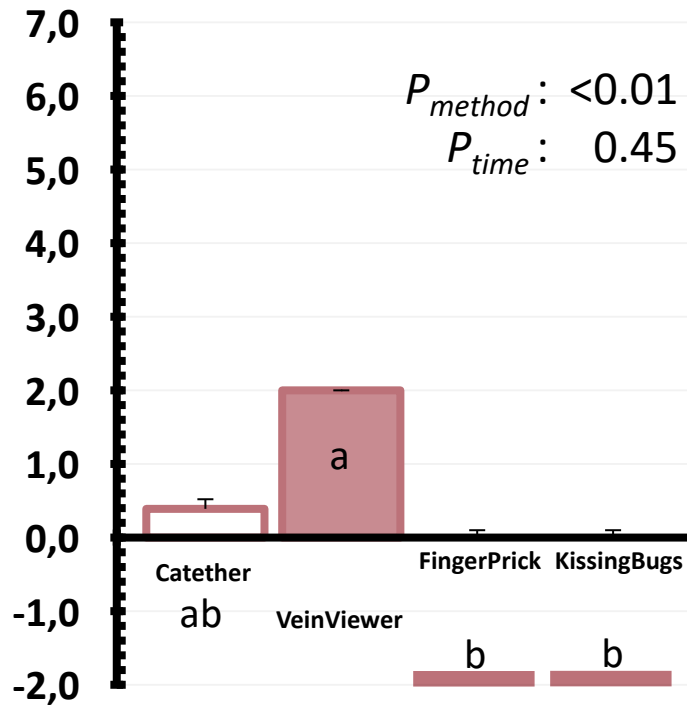
Average score



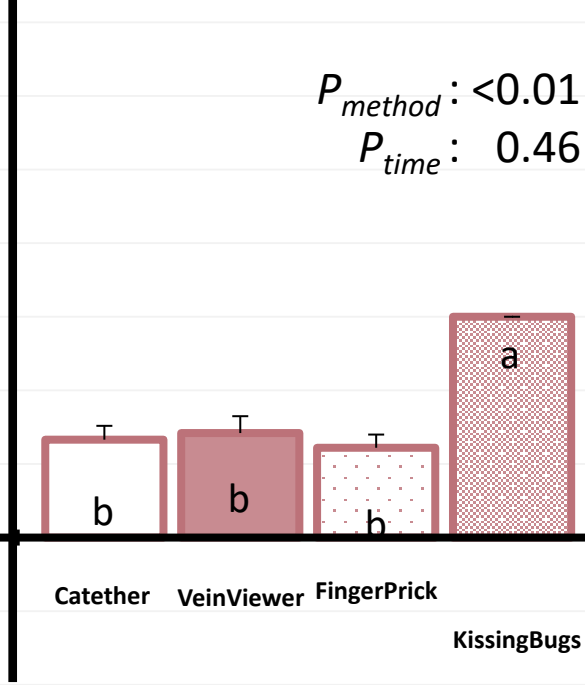
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How easy was the collection?

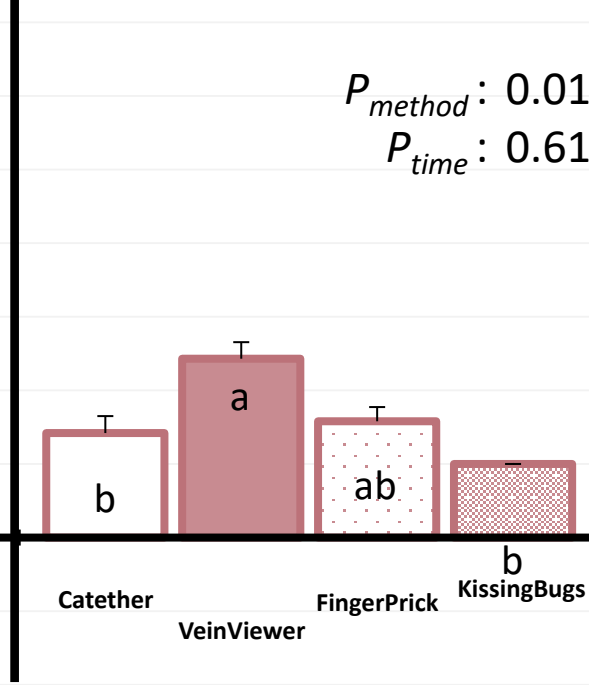
Restriction score



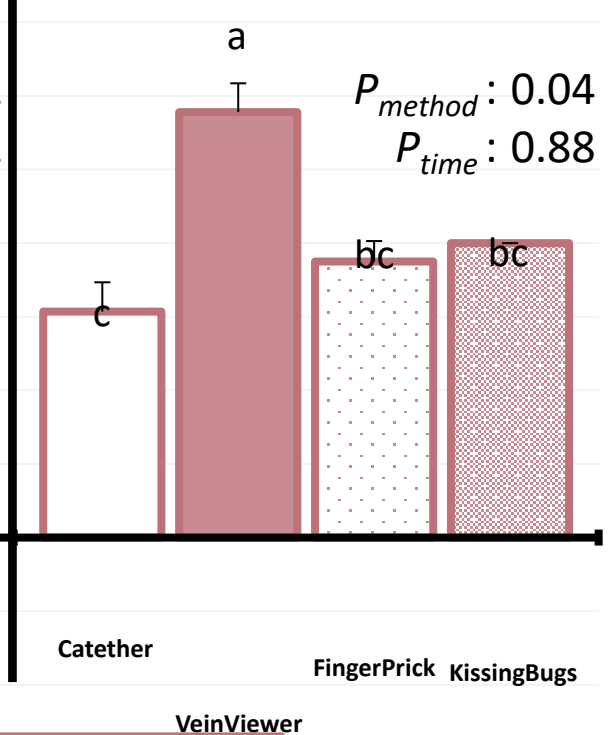
Duration score



Relative ease



Total score



0	No restriction
1	Moved to weighing scale
2	Restrict using snout rope

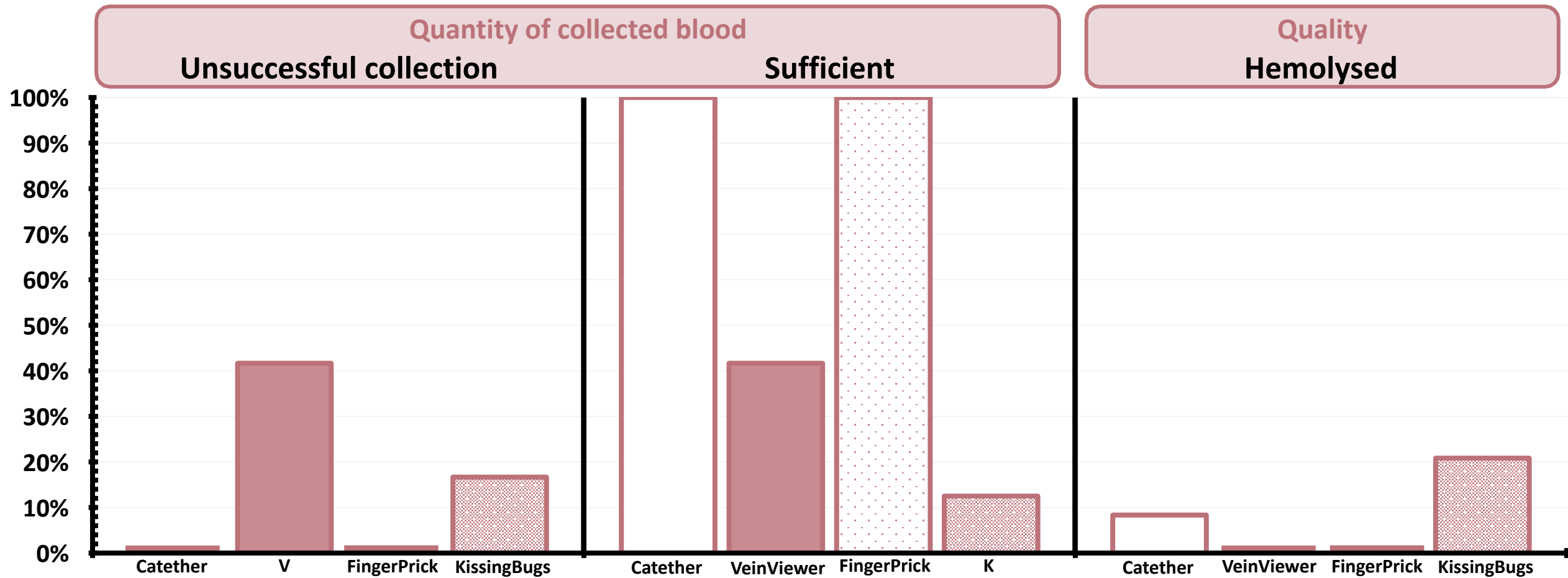
1	< 3 minutes restriction
2	Between 5 to 3 minutes
3	> 5 minutes

1	Easy and fast collection
2	Moderately difficult collection
3	Difficult and complicated collection



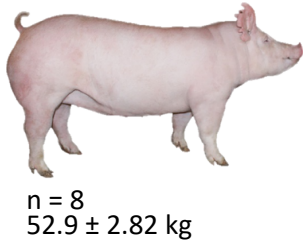
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Quantity and quality of collected blood

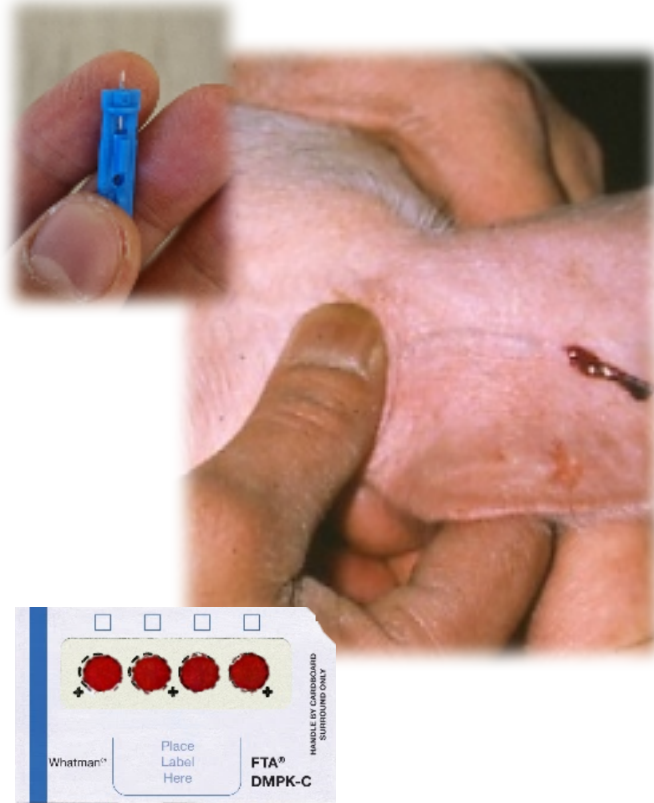


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Experiment 2 – repeated blood collection



Catheter



FingerPrick

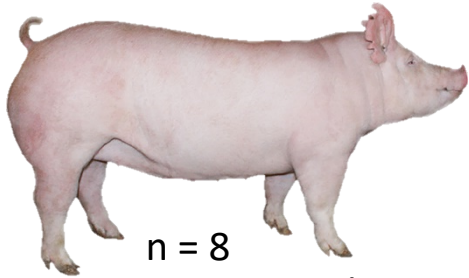


Glucose sensor



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Experiment 2



n = 8
52.9 ± 2.82 kg

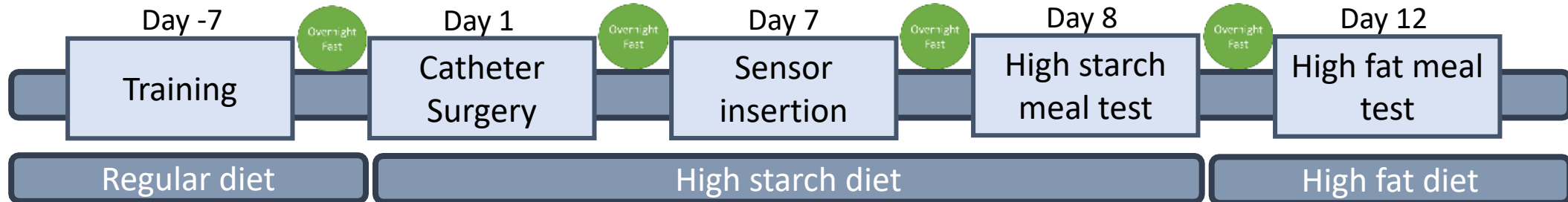
Dietary treatments

High Starch

High starch diet

High Fat

High fat diet (12 to 13 %)



Meal test

Small meal followed by serial blood collection at regular intervals (15 timepoints per pig)

Finger prick collection

Followed experiment 1 (4 timepoints)

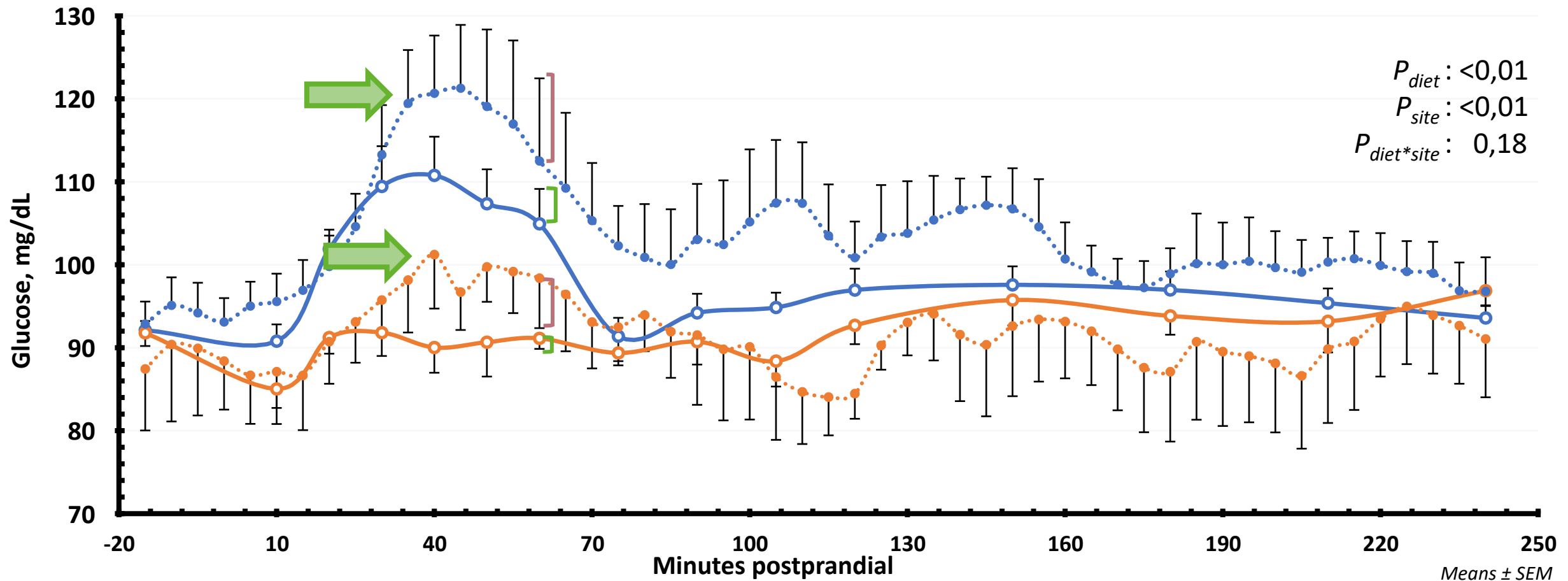
Glucose sensor

Every 5 mins real-time analysis



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Did the sensor collect same data as the catheter?



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Take home messages

Alternatives to venipuncture:

- No real advantage of using the Vein Viewer
- Kissing bug and finger prick collection induced the same level of stress
 - For kissing bugs, biosafety remains an issue (not endemic in Europe)
 - Finger prick seems to be the most promising alternative, but still needs refinement
- **Need to wait for lab analysis to further validate results**

Alternatives to catheterisation:

- Glucose sensors can be a good alternative for frequent blood collection
- But can only be used to follow glucose (for now)
- Interest and need to develop multianalysis sensors and multiplexed data transmission



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Questions? Comments?

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To learn more about PIGWEB:

www.pigweb.eu



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