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# The development of a telemetric overground endoscope

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# Why is this technology needed?



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- Upper airway collapse is a common cause of poor athletic performance and abnormal respiratory noise in racehorses.
  - Many different conditions can occur. These typically only occur during exercise, making diagnosis difficult.
  - Treadmill endoscopy was previously the only way to make an accurate diagnosis but is not widely available and is only performed on a small percentage of horses.
  - Frequently surgery is performed without an accurate diagnosis being established first.
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# Aim of the study

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- Key objective – to develop a reliable system:
    - Safe, lightweight and easy to fit to the horse
    - Maximise chances of collecting diagnostic data
      - Ability to observe the image in real-time
      - Wireless control of the endoscope position
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# Overground endoscopy during galloping exercise



- This horse has been fitted with the endoscopy system.
- The vet is travelling in a car alongside the horse.
- The endoscopic image is transmitted to the handheld box for viewing in real-time and is recorded for reviewing at a later date.





# Results of this study

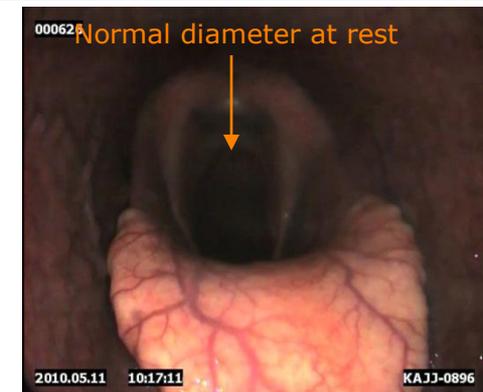
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- The system was tested on 32 horses and was very well tolerated by all horses examined.
  - Excellent diagnostic images of the upper respiratory tract are achievable both on the lunge and during fast ridden exercise on the gallops.
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# Examples of conditions diagnosed with the overground endoscope



- This is a racehorse with **recurrent laryngeal neuropathy**, a common condition in which dysfunction of the nerve that supplies the left side of the larynx (voice box) causes weakness and, when under pressure, the horse is unable to keep the larynx open, so the air supply is interrupted and the horse tires.
- Notice the difference between the resting image where the larynx is open and the exercising image where the left side of the larynx (right as you look at it) is collapsing inwards and blocking the air flow.
- Horsemen describe affected horses as "roarers" and call the noise they make an "inspiratory whistle".
- Surgeries that are sometimes performed on affected horses include a "tie-back" and "Hobday operation".



At rest: larynx open

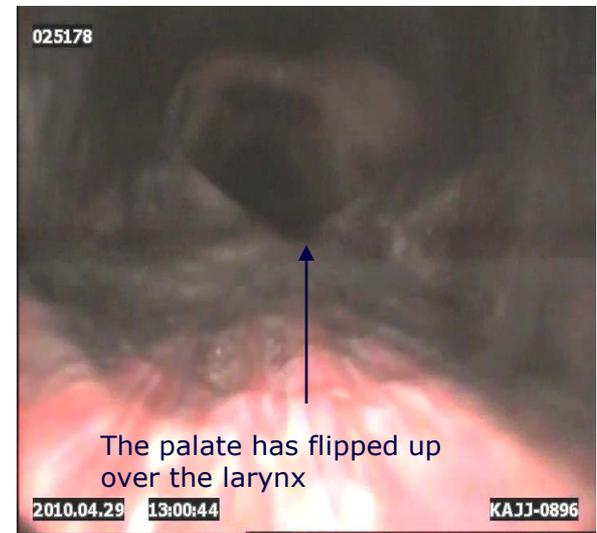


Galloping: larynx collapsed

# Examples of conditions diagnosed with the overground endoscope



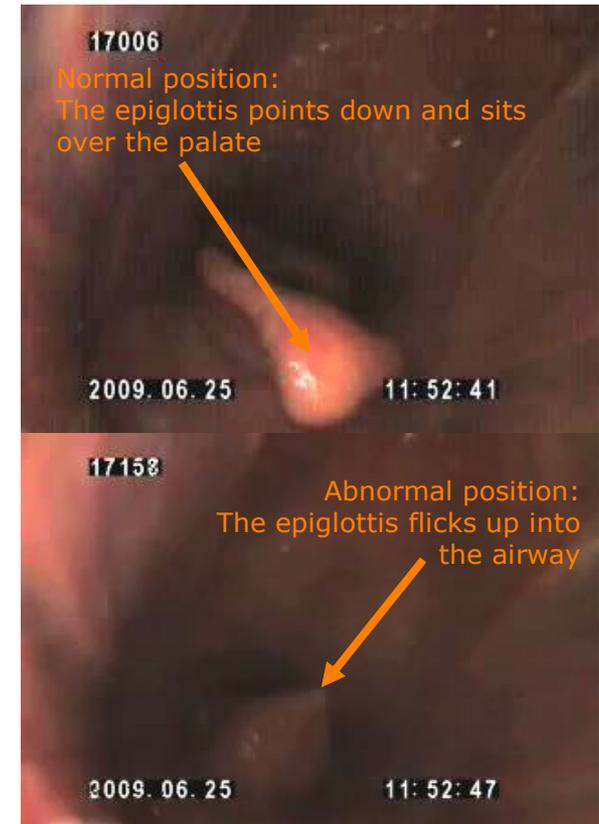
- This is a racehorse with dorsal displacement of the soft palate.
- In this condition, the palate flicks upwards over part of the larynx, the epiglottis. The horse can correct this by swallowing, but has to slow down to do so.
- Horsemen describe the condition as “choking up” and call the noise that the horse makes as “gurgling”.
- The condition is impossible to diagnose at rest, and is an excellent example of a common condition which can now be diagnosed and studied much more easily.
- Some affected horses undergo surgery for this condition, while in others a tongue tie is very helpful - which is why you will occasionally see horses in the paddock with ladies tights around their tongue!



# Examples of conditions diagnosed with the overground endoscope



- This is a racehorse with an unusual form of upper airway obstruction, **epiglottic retroversion**.
- The epiglottis is the triangular structure that should be pointing downwards.
- When the horse swallows, this flap of tissue flicks up to block the windpipe as food travels past, but during exercise, it should sit snugly over the soft palate to allow unimpeded airflow through the nose and larynx and down the windpipe into the lungs.
- In this horse, the epiglottis is pointing upwards during exercise



# Commentary on conclusions

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- This technology is anticipated to have a huge impact on racehorse health and welfare.
  - The use of overground endoscopy has the potential to revolutionise the way in which upper airway obstructions are diagnosed and will enable a much greater number of horses to have a definitive diagnosis established.
  - In addition, the use of such technology will more readily facilitate research into upper respiratory tract disorders and the best ways to treat affected horses.
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## Scientist's summary

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- Disorders of the pharynx and larynx are common causes of poor performance in racehorses. Some conditions are only visible when a horse is being exercised and the airway appears normal when examined at rest by an endoscope (a internal camera inserted through the horse's nose).
  - In the past, such conditions required endoscopy during a high speed treadmill examination. This project has developed a novel, on-board endoscope to examine the upper airways during routine fast ridden exercise.
  - This important development will allow accurate diagnosis of throat problems and lead to improved treatment of upper airway disorders.
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- [http://onlinelibrary.wiley.com/journal/10.1001/%28ISSN%292042-3306/homepage/hblb\\_virtual\\_issue.htm](http://onlinelibrary.wiley.com/journal/10.1001/%28ISSN%292042-3306/homepage/hblb_virtual_issue.htm)