

Airway Management Devices

including SGAD general training

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Dawn Sheppard
Product Specialist
Docsinnovent Ltd
London

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- **Revision of airway anatomy and related terms**
- **ETT intubation**
- **History of v-gel[®] (SGAD)**
- **How does v-gel[®] work?**

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Anatomy Deadspace Airway Resistance

Anatomy

cat

Hard palate

Pharyngeal arch

Tongue

Epiglottis

Trachea

Soft Palette

Arytenoid cartilage (vocal cords)

Pictures courtesy of Matt McMillan

Deadspace

Where gaseous exchange (oxygen to carbon dioxide) does not take place

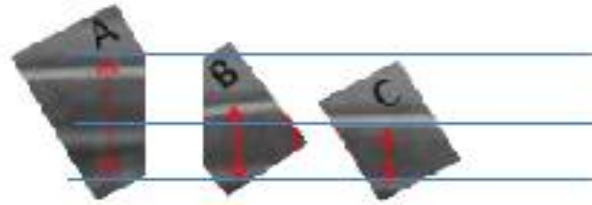
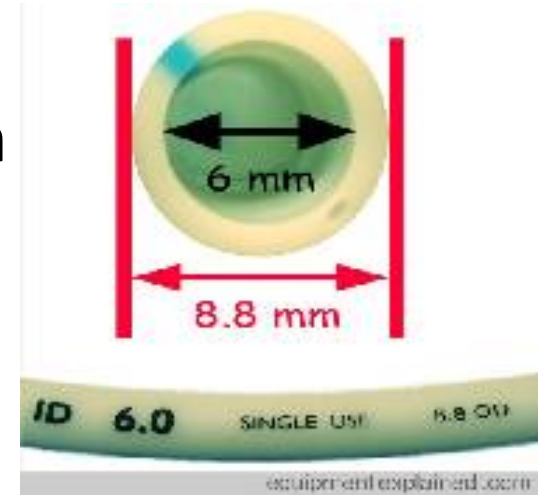
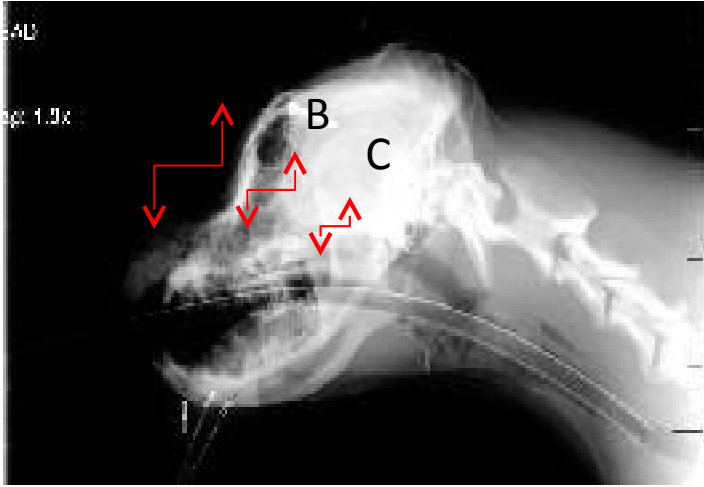
Anatomical

Mechanical

If the deadspace exceeds the lung volume, the patient cannot push the CO₂ out and this will be just re-breathed instead of fresh air

Airway resistance

Increased workload for patient to breath



What is the purpose of airway management?

- To gain and maintain a patent airway
 - Allow delivery of oxygen and inhaled volatile agents
 - Allow manual or mechanical intermittent positive pressure ventilation
- To protect against aspiration
 - Fluid seal
 - regurgitation (up to 67% canine cases reflux gastric fluids)
 - Dental fluids and debris

Airway Management Choices

- Facemasks
- Endotracheal Tubes
- Supraglottic devices

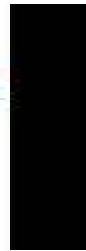
The Endotracheal tube – a history lesson



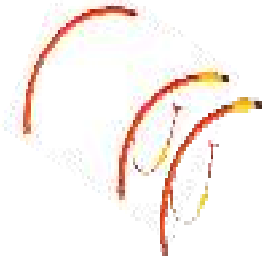
Sir William MacEwen CB,
DSc, DCL, MD, FRS
(1848-1924)

- 1778 a surgeon, Dr Charles Kite, described nasal placement of a catheter in drowning victims
- **1878** the first elective oro-trachea intubation with a metal tube was performed by a Scottish Surgeon, William MacEwan .
- 1889 Annandale designed a tube constructed of rubber.
- 1950's high pressure cuff changed for low pressure cuff
- 1964, the first tube constructed of polyvinylchloride (PVC) with an integrated inflatable cuff was marketed.

Endotracheal tube - human use



Endotracheal tube – veterinary use



- Rubber tubes are manufactured either plain or with an inflatable cuff.
- Manufacturer's instructions indicate autoclaving at low temp for no more than 10 cycles
- The rubber on these tubes breaks down very quickly and causes cracks that are impossible to clean and disinfect so are less used than in the past because of concerns over cross-infection.
- They have high pressure, low volume cuff contacting only a small surface area of the trachea and thus can exert high pressure along a small part of the tracheal mucosa, this carries higher risk that the pressure within the cuff can cause trauma to or necrosis of the tracheal wall.
- The wall is thicker than a PVC tube, so smaller internal measurement gives higher airway resistance.



- Polyvinyl chloride--disposable, intended for single use only. They usually incorporate a radiopaque strip to aid visualization.
- Once the PVC tubes have been in the trachea for a while, the plastic softens and becomes more pliable
- They have the more modern low pressure, high volume so requires a lower inflation pressure to produce a seal.
- However, there is a danger that, if the cuff is over-inflated, rupture of the trachea can occur. It is important that only very low pressures should be used to inflate these cuffs.



- Silicon baffle tubes
- No inflation, but baffles scrape along tracheal walls de-ciliating lining
- Re-usable. (Autoclavable)
- Have to use with stylet to place.
- 4 sizes only
- Potential for high airway resistance.

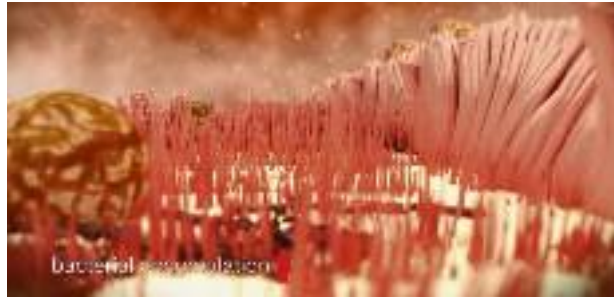
What happens when we intubate?



- Narrow the patients airway, increasing breathing effort
- Trauma to larynx/vocal chords with sharp hard end of ETT
- Trauma to cilia lining compromising the body's immune defence system
- Risk of laryngospasms/bronchospasms



24th Annual Meeting, 2016



Vets/nurses **hardly ever** see the effects on the pet of using endotracheal tube

The pet owner **worries** when their pet is coughing back home

Coughing

Voice change/lack of Meow

Difficulties giving oral medication

Issues with feeding

Reflux and regurgitation

Reflux = movement of gastric contents into the oesophagus.

pH <4 (acid reflux) or > 7.5 (bile reflux)

Can cause post-operative pain and oesophageal stricture formation.

Reported incidence of over **70%** (Raptopoulos, D. 2019)

Regurgitation= Material flowing into the pharynx.

Can occasionally be seen exiting the mouth or nose.

End stage, dangerous and can cause laryngospasm and aspiration pneumonia.

Reported incidence of up to **48%**

(Wilson et al, 2005) , (Wilson et al, 2006), (Rosewell, L.J. and Buckley, L.A., 2018), (Viskier, S. and Sjöström, L. , 2017)

reflux/regurgitation – is an inflated ETT cuff sealed protection?



ETTs show substantial variation in fluid aspiration, relating to cuff material and design.

Variability in performance is due to the random manner in which involutions folds form in the inflated ETT cuff

fluid leakage is observed within 10 min only at 10 cmH₂O

Fluid leakage past tube cuffs occurred in all conventional endotracheal tubes at cuff pressures from 10 to 60 cmH₂O

Credit pictures to UCSF, University of California

Cuff Pressures

The goal: achieve a seal between the cuff and the trachea with a pressure...

- Great enough to prevent gas leakage
- Low enough that tracheal blood flow will not be impeded
 - No tears in tracheal wall



Images used with permission

Cuff Pressures

Numerous studies have shown that over **60%** of cuffs are over inflated with an average of **2-3 times** the recommended guidelines ¹

Tufts University state **70%** of tracheal trauma cases presented are from over inflated cuffs in dental procedures.

1.

Evaluation of the endotracheal tube cuff pressure resulting from four dif
Vet Anaesth Analg. 2012 Sep;39(5):488-94. doi: 10.1111/j.1467-
2995.2012.00719.x. Epub 2012 May 30.

ETTs – Pros and Cons



- Controlled direct airway
- Ability to ventilate
- **Single-use** devices

- Published proof of increased death rates in cats
- Cause tracheal and laryngeal trauma
- Cause Laryngospasms
- Increased airway resistance
- Risk of malposition

Supraglottic Airway Devices (SGADs)



- Devices that keep a patent airway without touching upper airway structures.



- First appeared for humans in 1986 and animals in 2012

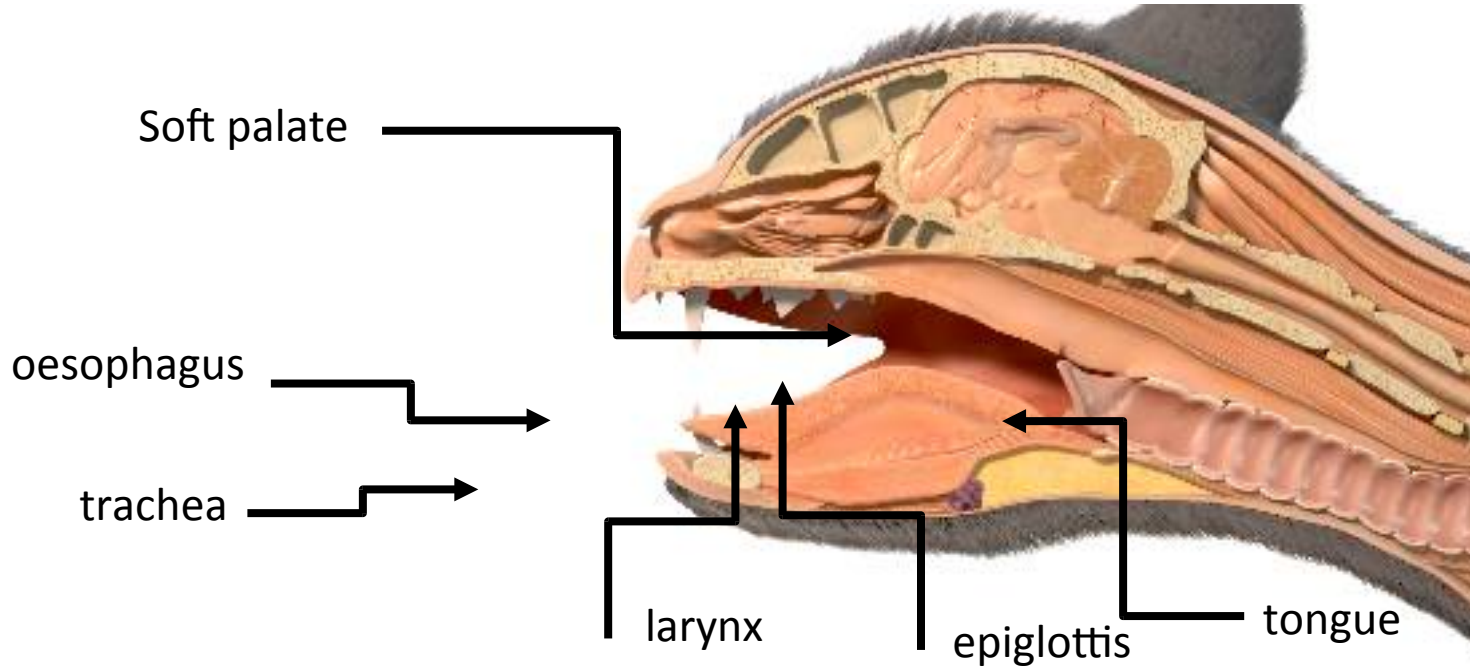


- Species-specific – human, rabbit, cat, Anatomically shaped to sit over the glottis avoiding the larynx and trachea structures

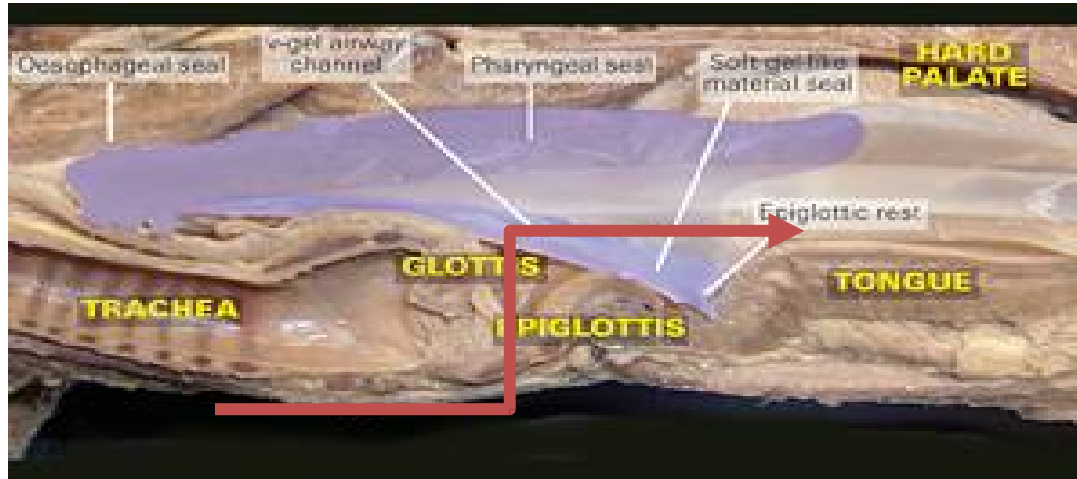
Major Benefits of supraglottic airway devices

- No increase in airway resistance
- No tracheal cilia trauma
- No laryngeal trauma
- No laryngospasms caused
- Comfort for patients post-operatively
 - smooth recovery, no stridor and coughing
- Staff health and safety
 - minimal leakage of anaesthetic gas
- Quick and easy to place so airway can be established quickly
- Excellent for most procedures including dentals

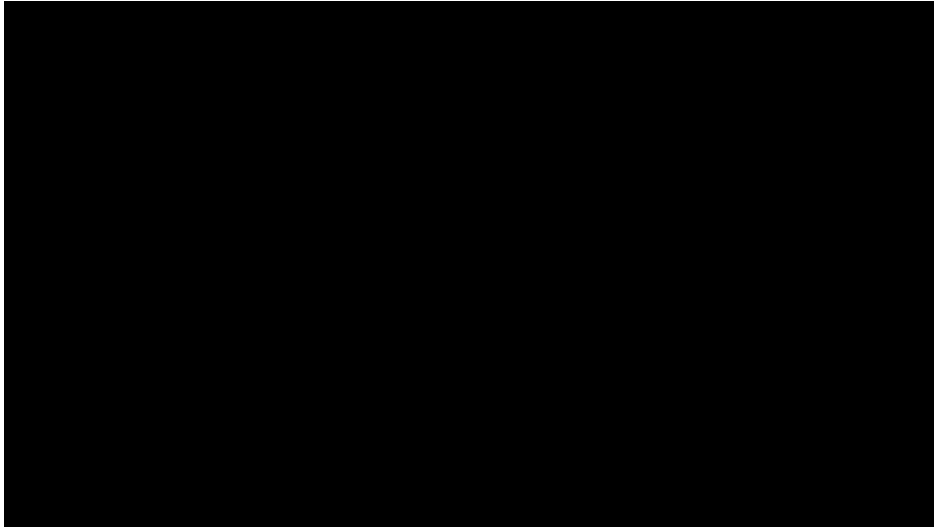
SGADs positioning



SGADs positioning



Placement of Cat v-gel[®] and v-gel[®] advanced



Why change the v-gel ?

Customers loved the original v-gels®

- ✓ Ease of placement
- ✓ Smooth recoveries
- ✓ Ability to ventilate

Docsinnovent continuing to be innovative and develop designs to continually improve veterinary airway management

Constructive customer feedback

- US/Canada market requested bigger range of cat sizes
- Occasional epiglottis fold seen as raspy breathing on insertion seen more in rabbits
- 'Blue', congested tongue occasionally seen in rabbits
- Damage caused by incorrect cleaning process
- Outlay costs restricted the purchase of multiple sizes

v-gel[®] advanced

Rabbit

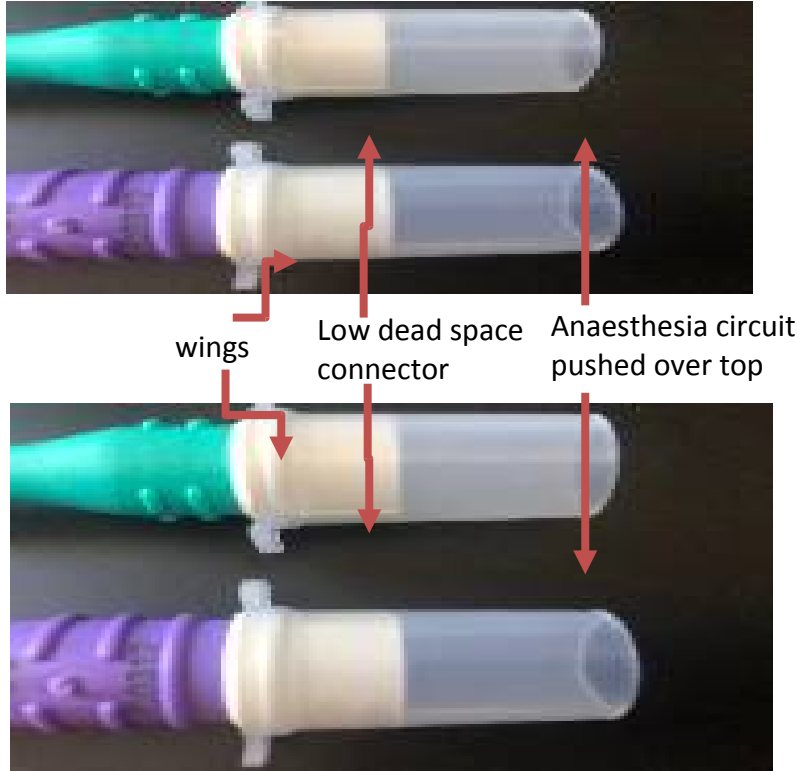


Cat



1. Low dead space connector
2. Ridges- enabling easy tying
3. Shoulders – bulk removed so and now a slim fit in mouth
4. Bowl – thinner walls, fits around glottis, allowing more internal space for epiglottis
5. Oesophageal plug

v-gel advanced[®] Low dead space connector

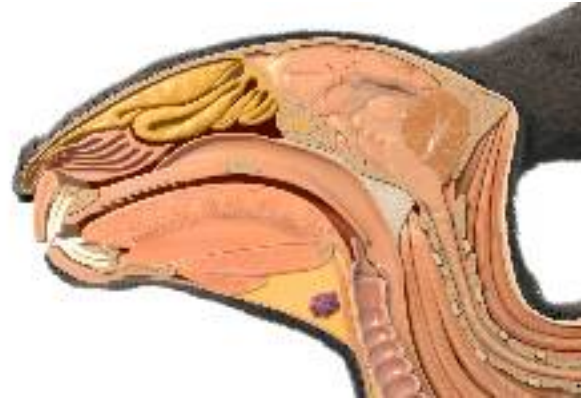


External diameter
Internal diameter
Airway channel

Dead space area
infilled inside
connector

Benefits of rabbit v-gel[®] advanced

- Thin, soft walls on pharyngeal bowl envelopes the whole larynx:
- Epiglottis sits inside bowl without restrictions
 - ✓ “noisy breathing from folded epiglottis” avoided
- ‘Blue’ tongues minimised as soft bowl no longer pushes on base of tongue.
- High seal pressure –
 - Excellent for positive pressure ventilating
- Each size suits greater range of patient sizes – more forgiving if wrong size choice selected.
- More space in the mouth and security for dentals
- Tying rings broken top/bottom to avoid catching on incisors
- Low dead space connector



Benefits of Cat v-gel[®]

advanced

- Thin, soft walls on pharyngeal bowl envelopes the whole larynx
- Epiglottis sits inside bowl without restrictions
- Excellent seal pressure for positive pressure ventilating
- More space in the mouth and security for dentals
- Size range extended; smaller kittens and larger cat breeds covered
- Suitable for brachy, meso and dolio – cephalic breeds
- No dorsal inflation now required
- Low dead space connector

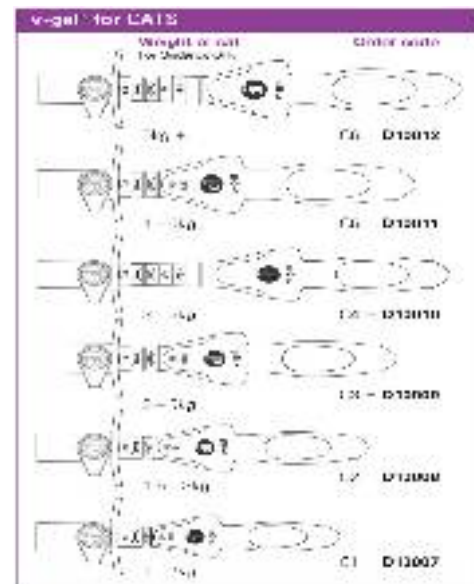


Cat v-gel[®] advanced size choice



CAT v-gel[®] Sizing Guide

Size	Ideal body weight of cat	Product code
C0	0.5 – 1kg (1 – 2lb)	D40000
C1	1 – 2kg (2.5 – 4.5lb)	D40001
C2	1.5 – 3.5kg (3 – 8lb)	D40002
C3	3 – 5kg (6.5 – 11lb)	D40003
C4	4.5 – 6kg (10 – 13lb)	D40004
C5	6kg+ (13lb+)	D40005



Rabbit v-gel[®] advanced size choice



RABBIT v-gel[®] Sizing Guide

Size	Ideal body weight of rabbit	Product code
R1	0.6 – 1.5kg (1.3 – 3.5lb)	D30001
R2	1 – 2kg (2 – 4.5lb)	D30002
R3	1.8 – 3.5kg (4 – 8lb)	D30003
R4	2.5 – 4kg (5 – 9lb)	D30004
R5	3.5 – 5kg (8 – 11lb)	D30005
R6	4.5kg+ (10lb+)	D30006



Rabbit airway device placement

1. 20mins prior to drugs – mouth flush and remove all food
2. Anaesthetise patient to optimal plane – lose reflexes
3. Pre-oxygenate
4. Visualise mouth with otoscope (swab out food/check teeth)
5. Apply Lidocaine to larynx (Dilute to 0.5%, do not exceed 7mg/kg total dose)
6. Lubricate selected size of device
7. Gently pull tongue forward (avoid incisors)
8. Place v-gel[®] (airway channel on tongue), ensure skirt is splayed out
9. Slowly advance through the resistance of para-glottal arch until a drop into the pharynx is felt.
10. Confirm patent airway using: capnograph, gentle squeeze on rebreathing bag, respiratory monitor, fur/cotton wool movement
11. Secure device in place and support circuit weight.



Opportunities

v-gel® Advanced - opportunities

For those vets already using v-gel®

- Go into clinics and inspect original stocks
- Increase their species/size range
- Recommend for dental procedures with the extra benefits

For those vets not using v-gel®

Open question to determine why?

- Cost
- Not many cases seen
- They don't understand concept of another method
- Cat friendly clinics



Is changing to v-gel[®] Advanced easy? **YES!!**

For those vets already using v-gel[®]

Techniques of using v-gel[®] advanced is very similar

- Optimal plane of anaesthesia... lose reflexes
- Lubricate device
- Place airway opening on tongue
- *Ensure v-gel skirt is splayed outwards (pic 1) not folded under (pic 2)*
- Advance the v-gel[®] forward until the shoulders are against the pharyngeal arch or you feel the drop into the pharynx.
- Check for patent airway

For those vets not using v-gel[®]

Instruction videos and information readily available on DI website and FB page.



(pic 1)



(pic 2)

v-gel[®] Advanced - single use

- Product has been extensively tested for a variety of procedures of various length, and we know it to be safe
- v-gel[®] advanced materials are not autoclavable
- AAHA accredited practices are advised against re-use of single use devices
- Single use devices doesn't limit number of procedures/day
- Less cost outlay to stock entire size range
- Not damaged due to being sterilised incorrectly

Some vets will try to re-use the devices – nothing we can say/do will stop this

v-gel[®] Advanced - environmental impact

- v-gel[®] advanced is made from recyclable plastics
- All packaging is recyclable
- Local waste guide lines should be followed;
 - Where a used v-gel[®] is classified as clinical waste it will be incinerated
 - Washed and placed in recycle point.

Use of single plastic should be minimised/prioritised

Use of plastics to keep patients safe and infection-free **IS** a priority

Use of plastics for food packaging, coffee cups, straws, and so on is not!

v-gel[®] Advanced - is more expensive than an ETT

Superior product, not comparing like with likeWhy ?

ETTs

1. Human products
2. No R&D costs to recoup for ETTs
3. Inexpensive to make in volume

v-gel[®] advanced

1. Made for Veterinary Market. v-gel[®] devices are species-specific (anatomically correct)
2. 9+ years of R&D
3. Expensive tooling machines required.

Vets should consider

- Avoid anaesthetic morbidity/mortality!
- Cost/benefit
- Better seal -> No leakage -> Less volatile agent used -> Save money!
- Make cost neutral to the clinic!
 - Add on to anaesthetic fee
 - OR pass cost on to client – no need to charge mark-up necessarily
- Don't necessarily have to use on every case
- Give choice to individual clients

v-gel[®] around the World



- Sold to over 30 countries
- 27 countries have established distributors
- Placed and taught in over 60 Vet Schools and Universities
- Included in new anaesthesia

More Information

<http://docsinnovent.com>

- Guide on v-gels
- Webinars (airway management & v-gels)



Docsinnovent Ltd-the home of v-gel