DEALING WITH CAPSULE REGURGITATION

REGURGITATION

Regurgitation is a normal physiological process for cows for digesting their food. During the rumination process, food goes through the 1st and 2nd stomach chambers (rumen and reticulum) and then returns to the oral cavity in cuds. So, the oesophagus functions bidirectionally in ruminants, allowing them to regurgitate their cud for further chewing.

The process of rumination is stimulated by the presence of roughage in the upper part of the reticulorumen. The chest cavity is stretched, forming a vacuum in the gullet that sucks the semi-liquid stomach content into the oesophagus. From the oesophagus it is taken back to the mouth with retro peristaltic movements[1].

Due to capsule size and wings, capsule regurgitation is a rare phenomenon. The mechanics of rumination related to cud chewing can bring the capsule back into the animal's mouth.

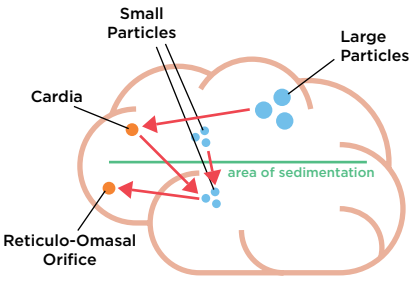

Figure 1.
Diagram of feed particles cycle in the rumen. Long and buoyant newly ingested particles form a raft in the dorsal sac (inescapable pool). As particles are digested and ruminated, particles become less buoyant, allowing them to sink ventrally into the escapable pool. Adapted from Beauchemin (2018)[2].

RISK FACTORS FOR CAPSULE REGURGITATION

Cattle diet

- High dry matter diet (low humidity)
- Long fiber length
- Restricted water access

Cattle size

Capsule regurgitation will be easier for bigger animals

Wings integrity

Plastic wings at one end of the capsule are present to help prevent regurgitation[3]. Some factors could affect the wing's integrity:

- Colder temperatures will increase the likelihood of brittle fractures, whereas warmer temperatures will result in the material behaving in a more ductile manner.
- The Rumensin™ Capsule design is bend direction sensitive: An upwards bend is more likely to create a fracture

THE RUMENSIN™ CAPSULE

The Rumensin™ Capsule is an intraruminal controlled release capsule designed to deliver a constant dose of monensin to the reticulorumen of cattle, where it influences the rumen microflora resulting in reduced incidence of ketosis and reduced severity and incidence of pasture bloat

In order to provide the animal with the correct dose of monensin the Rumensin™ Capsule must:

- Be successfully administered to the rumen
- Be retained in the rumen for at least the duration of release
- Encapsulate the core until it is released

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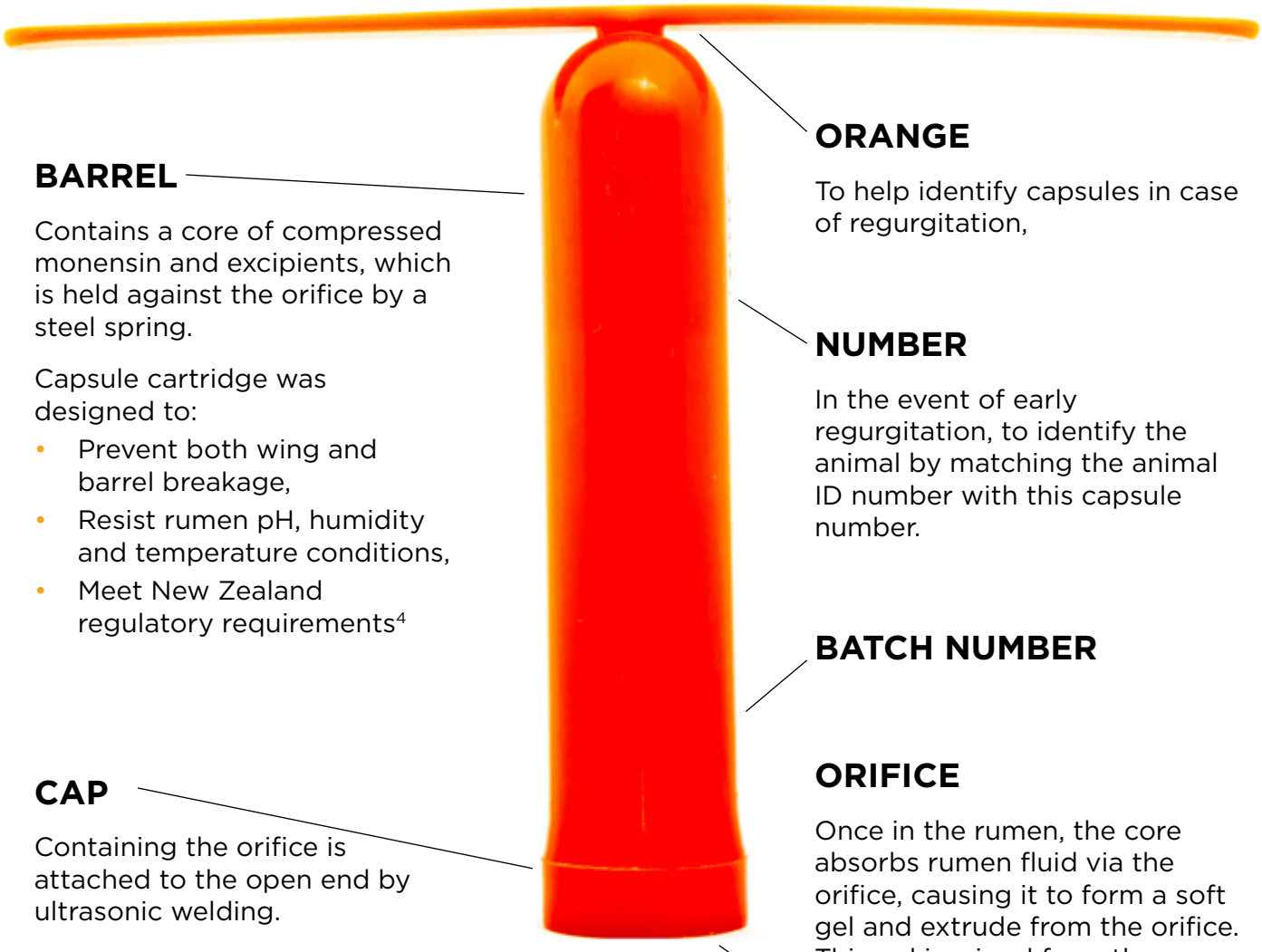
WINGS

- have to be folded against the barrel for administration, minimising the capsule diameter until the capsule reaches the rumen
- must open upon reaching the rumen, creating a 'T' shape that prevents regurgitation.
- appropriate length to ensure retention in the rumen and
- flexible enough to withstand the rigours of dosing and retention in the rumen without breaking.



BARREL

Contains a core of compressed monensin and excipients, which is held against the orifice by a steel spring.

Capsule cartridge was designed to:

- Prevent both wing and barrel breakage,
- Resist rumen pH, humidity and temperature conditions,
- Meet New Zealand regulatory requirements[4]

ORANGE

To help identify capsules in case of regurgitation,

NUMBER

In the event of early regurgitation, to identify the animal by matching the animal ID number with this capsule number.

BATCH NUMBER

CAP

Containing the orifice is attached to the open end by ultrasonic welding.

ORIFICE

Once in the rumen, the core absorbs rumen fluid via the orifice, causing it to form a soft gel and extrude from the orifice. This gel is wiped from the orifice by movement of digesta, resulting in continuous release of gel and the monensin therein.

WHAT WE MUST DO

FOLLOW THESE 7 STEPS FOR SAFE, EASY ADMINISTRATION OF THE RUMENSIN™ CAPSULE

1 Administer a single Rumensin™ Capsule orally 3 to 4 weeks prior to expected calving or at least 7 days prior to grazing bloat risk pasture. Restrain the animal to limit forward and backward movement whilst allowing her head to be held in the forward extended position, without pressure on her neck to prevent choking. Before administering the capsule, record the capsule number located on the capsule body with the corresponding animal identification number so that, should a capsule be regurgitated, the animal can be identified.

2 If the capsule has been stored in a cold place, or the capsule is being administered on a cold day, the wings may lose flexibility and become brittle. *Colder temperatures will increase the likelihood of brittle fractures, whereas warmer temperature will result in the material behaving in a more ductile manner.* Place the capsule wing-end down in warm water for 5-10 minutes to improve wing flexibility. Keep the open end of the capsule above water.

3 Wearing gloves while handling the capsule, carefully fold the wings down along the capsule body. Insert the capsule into the appropriate administration tool, orifice end first. *Do not upwards bend wings, they will be more likely to fracture.* Administer the capsule as soon as possible to ensure that the capsule wings spring back into place after administration to reduce regurgitation.

4 Stand to one side of the animal. Restrain animal with the head and neck stretched forward and held firmly against your side. Grasp the animal with one hand in the corner of her mouth. Introduce the administration tool into the mouth avoiding the front teeth. To avoid trauma and damage to the pharynx and oesophagus, do not use excessive force.

5 Insert the administration tool past the base of the tongue making sure to avoid the molar teeth. As the animal swallows, the administration tool will move easily over the base of the tongue. DO NOT USE EXCESSIVE FORCE. If resistance is encountered, withdraw the tool slightly and repeat the procedure.

6 Be sure the head of the administration tool is past the base of the tongue. When the animal swallows, eject the capsule from the administration tool. Wash hands and exposed skin after handling boluses.

7 After capsule administration, keep treated animal in a confined area for at least 1 hour to observe for failure to swallow or regurgitation.

WHAT WE MUST DO

RE-ADMINISTER

For regurgitated capsules, check the capsule number against the animal identification number and re-administer the capsule if it is undamaged.

Do not re-administer if

- The capsule or end cap has cracks or teeth marks,
- The wings are damaged or
- The capsule number and animal identification number do not match.

Recheck treated animals for up to 4 days after dosing to observe for signs of the capsule lodging in the oesophagus.

CAPSULES ELIMINATION

If you decided not to re-administer the capsule – based on previous criteria or because the capsule content is empty- please discard it as soon as possible.

RUMENSIN™ CAPSULE SAFETY MESSAGE

Do not allow dogs, horses, other equines or guinea fowl access to formulations containing monensin. Consumption of intraruminal device contents can be fatal in these species.

Do not allow access of these animals to the stored product.

Do not allow access of these animals to areas with treated cows, especially in the followings days to the Rumensin™ Capsule administration.

Recover the regurgitated capsule as soon as possible.

REFERENCES: 1 Stevens CE, Sellers AF (1960) Pressure events in bovine oesophagus and reticulorumen associated with eructation, deglutition and regurgitation. American Journal of Physiology-Legacy Content 199(3): 598-602. 2. Beauchemin KA. 2018. Invited review: Current perspectives on eating and rumination activity in dairy cows. J. Dairy Sci. 101:4762–4784. 3. Duffield T (1998). Influence of Monensin on Post-Partum Health and Production. https://wcds.ualberta.ca/wcds/wp-content/uploads/sites/57/wcds_archive/Archive/1998/ch08.htm. 4. Ph. Eur. monograph for carbomers (04/2009:1299). 5. Moran NE, Ferketich AK, Wittum TE and Stull JW. 2017. Dogs on livestock farms: A cross-sectional study investigating potential roles in zoonotic pathogen transmission. Zoonoses and public health, 65(1):80-87. 6. Anderson ML, Andrianarivo AG and Conrad PA. 2010. Neosporosis in cattle. Animal Reproduction Science 60–61:417-431.