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Description

[0001] This invention relates to means for use in a method of treatment to facilitate food intake and food retention in a mammal and to a local anesthetic and a pharmaceutical formulation thereof for application on a pharyngeal, esophageal, and/or gastric mucous surface of a mammal.

[0002] This invention addresses medical problems related to reduced food intake despite sufficient availability of food. Those problems are the main symptoms occurring in disorders such as anorexia, cachexia, sarcopenia, postoperative ileus and postoperative complications in food processing. Anorexia-cachexia is reduced food intake and reduced utilization of ingested food. It is an illness that may occur in terminal stages of many chronic illnesses including cancer, chronic heart failure, chronic renal failure or chronic obstructive pulmonary disease. Sarcopenia is general deterioration of muscle mass and quality occurring at old age. It is believed that the lack of exercise and loss of appetite are important characteristics of sarcopenia or frailty at old age. Postoperative ileus is decreased motor activity of the GI tract unrelated to any mechanical cause. It can occur often as a postoperative complication of abdominal surgery. After surgery the start of food intake is a delicate moment in recovery. The optimum moment of starting intake of solid food is important for recovery, whereby early acceptance of a solid meal at the proper moment is helpful in initiating all the processes involved in digestion, including intestinal motility, that is, it improves resumption of food transit and recovery.

[0003] Current medicinal treatments of mentioned disorders are based on anabolic enhanced protein formation or on stimulation of intestinal motility by a prokinetic drug, such as metoclopramide. Other therapeutic approaches explored currently for anorexia-cachexia disorders are treatment with melanocortin-4 receptor antagonists, myostatin inhibition, beta-blockers, IL-6 antagonism, synthetic ghrelin and vitamin D.

The present invention provides for a local anesthetic drug for a use according to the claims to facilitate food intake and food retention in a mammal by applying a sufficient dose of a local anesthetic drug to a surface or in the lumen of the pharynx, esophagus, and/or stomach before, during or shortly after eating. The facilitation of food intake and food retention can be an increase in the size of a meal, an increase in the frequency of meals or a better acceptance, tolerance, intake and/or retention of food. A mammal can be a human person. The invention is preferably used for human patients. Without committing to a particular explanation, we believe that the facilitation is brought about by reduction of signals originating in the tissue layers facing the lumen of the pharynx, esophagus, stomach and/or duodenum. Such signals provide the organism information to determine food intake, for example for initiation, termination or prolongation of a meal. Signals arising from these tissues can contain information on the quality or amount of food having passed the pharynx or esophagus, or the quality or amount of food being present in the stomach or duodenum. Meal size in particular is determined by satiety signals arising from different receptors in brain and gastrointestinal tract. For example, the duodenum signals filling with food and produces cholecystokinin. Cholecystokinin passes the signal to the afferent vagus nerve, which passes the information to the brain in order to terminate eating. A similar signal originating from the gastrointestinal tract is arising from glucagon-like peptide which is produced in the gastrointestinal cell wall and activates the vagus afferents. Further signals are transmitted to the brain by the vagus nerve arising from the degree of stomach distension measured by stretch receptors in the wall of the stomach. Other hormones that control digestion and eating behavior are gastrin and secretin. Another important hormone for regulating appetite is ghrelin, which is produced in the stomach and upper intestine in the absence of food in the digestive system and stimulates appetite. Peptide YY is produced in the digestive tract in response to a meal in the system and inhibits appetite. Other hormones are also studied that may play a part in inhibiting appetite, including leptin, oxyntomodulin (+), and pancreatic polypeptide. We do not have a complete and certain explanation for the mechanism of action of the local anesthetic in facilitating food intake and retention. It may be that satiety signals originating from the surface of the pharynx, esophagus, stomach and/or duodenum are blunted by the local anesthetic and that this incites the treated subject to postpone termination of a meal. Another possibility is that the local anesthetic reduces an aversive or repulsive signal arising from some constituents in food, and which constituents or signals would normally inhibit further intake or even initiate repulsion or sensations of aversion influencing the future perception of same or similar food.

[0004] Some observations of effects of local anesthetics on stomach or esophagus in the context of food intake were described in the prior art, without the possibility to derive from those observations the effect disclosed in the present description. Uneyama et al. (Am. J. Physiol. - Gastrointestin. & Liver Physiol., Vol 291, pp 1163-1170, 2006) described chemosensing of glutamate in the stomach wall, signaled to the central nervous system by the gastric branch of the vagus nerve. Uneyama reported that this chemosensing signal can be blocked by lidocaine. However, it is known that glutamate in food induces overeating so Uneyama's result could suggest, if anything on food intake, a reduction of food intake by blunting the signal arising from chemosensing glutamate. Chee et al (Chemical Senses, Vol 30, pp 393 - 400, 2005) reported on observations on the effect of local anesthetic on the pharynx on eating and swallowing. It was observed that swallowing speed was reduced, swallowing interval prolonged and swallowing capacity unchanged, leading to the conclusion of the authors of this disclosure that chemosensory input influenced swallowing function. Balfour et al. (Gastroenterology, Elsevier, Amsterdam, NL, vol. 23, no. 2, 1 January 1952, pp. 257-262) describes the use of procaine hydrochloride in the treatment of gastric and duodenal ulcers. SILK A D et al., 1953 (Gastroenterology, 23(2):301-3)

reports on the use of procaine for the treatment of dysphagia from the severe esophago-pharyngitis after Lysol poisoning. Damien Mcnally et al., 2012 (Journal of Pharmacy and Pharmaceutical Sciences, 15(2):281-294) teaches that lozenges containing amylmetacresol 2,4-dichlorobenzyl alcohol (DCBA) and lidocaine decrease the difficulty in swallowing in patients with acute sore throat due to upper respiratory tract infection. Joy E Gaziano, 2002 (Cancer Control, 9(5):400-9) relates to the treatment of dysphagia as a symptom of head and neck cancer or sequelae of its management. The effect obtained with the use of the local anesthetic according to the claims has the advantage to facilitate food intake and retention also under circumstances that the treated subject is not inclined to eat a particular food although that type of food would be particularly healthy for the treated subject under the circumstances. Thus, in combination with nutrients of optimal composition the treated subject can gain strength and recover from lack of appetite. There are various medical conditions and circumstances in which a treated subject will benefit from the effect obtained from the invention. Patients with various causes for lack of appetite or lack of motivation to eat a sufficiently sized meal will benefit from the present invention. In particular in the elderly population and patients in various nutrient-depleted conditions of disease require stimulation of food intake. By taking a meal of sufficient size the further processing functions of the digestive system will also be stimulated, such as intestinal motility and secretion of digestion stimulating juices and hormones. Such patients can be diagnosed as suffering from anorexia, cachexia, sarcopenia or postoperative ileus. Also, a postoperative period shortly following on surgery is a period during which it can be helpful to use the effect obtained from the present invention. In particular after surgery on the intestinal tract or after caesarian section early postoperative feeding is helpful for recovery. Under those circumstances recovery is assisted if a patient has solid food in the digestive tract in order to improve resumption of food transit by stimulating in time the process of intestinal motility and any other processes important for digestion. Early postoperative feeding aided by use of a local anesthetic according to the disclosure can prevent postoperative gastroparesis syndrome (PGS) and it can prevent postoperative nausea and vomiting (PONV). Currently metoclopramide is often used in those circumstances. However this compound has a narrow therapeutic window for this use and requires systemic administration so that the drug is present in the whole organism. In contrast, the effective concentration of a local anesthetic used according to the disclosure can remain restricted to the luminal surface of the upper parts of the digestive tract.

Local anesthetics that can be used are lidocaine and ropivacaine. Most preferred is lidocaine.

A local anesthetic use according to the disclosure can optionally be combined with antioxidants to prevent myopathies. The disclosure also provides for the manufacture of a medicine comprising a local anesthetic drug of the treatment of anorexia, cachexia, sarcopenia, postoperative ileus and postoperative complications in food processing. The local anesthetic for the effect of the invention is preferably administered via the oral route of access to the surface to be influenced by the local anesthetic. Accordingly, in one embodiment the disclosure relates to orally administered anesthetics. Although the local anesthetic can be applied in solid form, it is preferably formulated in solution or suspension in a vehicle that allows the local anesthetic to penetrate into the tissue forming the surface of the pharyngeal, esophageal, and/or stomach. The formulation can be prepared to be most suitable for retention by the mucous surface of these parts of the feeding tract. Improvement of absorption by mucous tissue can be improved by penetration enhancers and by prolongation of the exposure time of the tissue to the drug. A viscous and hydrophilic vehicle facilitates retention of the formulation on the mucous surface. In one embodiment, the local anesthetic is dissolved or suspended in a viscous solution of alginate. In another embodiment the local anesthetic is added to food. In another formulation solid particles of the local anesthetic are encapsulated in a taste masking composition and administered in a tablet, suspension or as food additive. The taste masking compositions should be made such that the taste protecting layer disintegrates or releases the local anesthetic near the surface to be influenced, for example by pH sensitivity. Polymers of methylaminoethyl-methacrylate and neutral methacrylate ester monomers (Eudragit E-100 and others) have such properties.

A suitable dosage is selected to obtain effective meal size increase or food retention with the selected local anesthetic drug and type of pharmaceutical formulation. The exact dose depends on the local anesthetic drug selected for use. Factors relating to the characteristics of the pharmaceutical formulation, the type and severity of the disorder, and the age of the patient should be taken into account in dose selection. Since the local anesthetic is not applied by injection into the tissue but influences the tissue by exposure of the surface to the drug, the amount of drug needed for the effect according to the invention is usually at the higher end of the dose range which is known to be effective for the particular selected local anesthetic drug. Preferred concentrations for lidocaine and ropivacaine are 20 mg/ml fluid and 7.5-11.25 mg/ml fluid, respectively. Preferred concentration for ropivacaine is 7.5 mg/ml.

The treatment with the local anesthetic drug should be given shortly before, within or shortly after a meal in order to have the effect of interfering with physiological signals which would otherwise terminate a meal or would lead to expulsion of food by vomiting. The time before the meal should be determined by what is customary for the duration of action of a local anesthetic. The onset and duration of action of the selected local anesthetic drugs determine the suitable time of administration. An administration between an hour, preferably half an hour and shortly before a meal is suitable for the effect according to the invention, for example 60, 30, 25, 20, 15, 10, 5 minutes before a meal is preferred, and more preferred is 18, 15, 12, 9 or 6 minutes before initiating a meal. When the local anesthetic is administered after a meal this should preferably be done immediately after a meal. Some delay may be introduced, but in general the administration

after a meal is preferably within the period from 0 to 30 minutes after termination of a meal, possibly 5, 10, 15, 20 or 25 minutes after termination of a meal.

[0005] As indicated here before the effect of the use of the local anesthetic according to the claims might be due to facilitating filling and distension of the stomach by inhibiting signals from stretch or even pain receptors. Such a mechanism will operate more effectively at early stages, or even at the first administration only, of a series of administrations, in view of a persisting effect on the capacity of the stomach to distend without inducing signals of excessive distension or even pain. This means that a single treatment i.e. a single , or alternatively, a few, say, 2 , 3 or 4 administrations, are preferred and separate embodiments of the invention.

The use of local anesthesia in the pharynx, esophagus, and/or stomach can be combined with instructions and advice on life regimes with dietary and behavioral instructions and advice. More intake of nutrient-rich food and energy expending exercises (resistance and endurance training) in combination with the enhanced intake effect by local anesthesia will optimally improve the condition of patients suffering from the consequences of reduced food intake. In circumstances of postoperative care the use according to the disclosure can be combined with advice on intake of food that may be less attractive for appetite, but is more suitable for the gastrointestinal system for recovery of intestinal functioning.

[0006] The terms used in this specification are used according to their usual meaning in medical practice. In case of doubt our use of the terms can be further understood as follows.

The surface of the pharynx, esophagus, stomach or duodenum is the tissue facing the lumen of the pharynx, esophagus, stomach or duodenum and which comprises the epithelium and deeper layers which may comprise autonomic musculature and myenteric nerve plexi.

A meal is a short time period of food intake. Taking a snack or small quantity is having the same meaning as a meal, but the meaning of the term meal does not extend to intake of a candy or goody merely selected for pleasure, irrespective of its nutritive quality. A meal is started by a decision of the subject to be treated or by the physician or other person supporting the said subject in taking a meal, and having food available. A meal is terminated by a decision of the subject to be treated or by the physician or other person supporting the said subject in taking a meal or the meal is terminated upon termination of the period of availability of food for the subject to be treated.

Facilitation of food intake and food retention does not only mean an increase in the volume of a meal, but also of an increase in the total volume of food intake during a within-one-day interval by shortening of intermeal interval(s) or shortening of time spent on a meal with concomitant increase in frequency of meals. Food intake can be considered facilitated if a meal is taken more rapidly compared to untreated individuals or if it is prevented that food is expulsed by vomiting.

Food in the present context does not necessarily mean appetitive nutritious solid matter, but may also be in fluid form and may have a non-nutritious composition or may not necessarily be appetitive. The latter circumstances may arise in the context of a need of intake of medically useful non-nutritious filling material in the intestinal system or food having become less attractive due to supplements for therapeutic effects. The intake of such food can be aided by using the effect obtained by using the present invention.

EXAMPLES

Methods general

[0007] In the following examples food intake tests were run with cohorts of 32 Wistar rats having food intake sessions in two groups of 16 rats in parallel. There were 8 rats per experimental group. The rats weighed in the range of 260 - 370 grams. Rats were acclimatized to the housing conditions in our laboratory for at least one week after arrival from the breeder. The rats were housed in pairs in Macrolon cages of 42X26 cm and 15 cm high, with standard food and water available ad libitum. The day-night cycle was not reversed (lights on at 7:00 AM, off 19:00 PM). Food intake tests were run in the same room wherein the rats were housed in the light period of the diurnal cycle of the rats. In a further period the rats were habituated to human handling and to the manner of presentation of mealworms in the food intake tests. Food intake was measured with rats without food deprivation. Food intake tests were done by placing the rats from their home cage individually into clean Macrolon (42x26x15 cm) cages without bedding. A weighed amount of at least 15-20 g living mealworms in a petri dish was placed in the middle of the cage and rats were allowed 30 minutes for eating mealworms. During the 30 minute test for food intake no drinking water was available. Injection treatments were administered at determined times before the food intake test. After drug administration the rats were returned to their home cage. Both rats of a pair in a living cage were assigned to the same treatment groups. Otherwise allocation of rats to experimental groups was done such that the treatments were equally and randomly spread over the duration of an experiment. The experimenter remained in the test room for the duration of an experiment. This allowed observation of general behavioural effects of the treatments. Abnormalities were recorded.

[0008] The use of rats in several tests, separated at least one week was not excluded.

Drugs

[0009] For drug administration commercially available stock solutions in vials were used:

lidocainehydrochloride 20 mg/ml injection fluid (Fresenius Kabi) ;
procainamidehydrochloride 100 mg/ml injection fluid (Apotheek Haagse Ziekenhuizen);
ropivacainehydrochloride 7.5 mg/ml injection fluid (Fresenius Kabi) ;
metoclopramine (Sigma) was weighed and dissolved for use. Drugs were administered in volumes of 1 ml/kg rat.

[0010] Vehicle: for local anesthetics the commercial physiological saline solutions for injection were used directly or the solution was diluted with distilled water. Alginate for a 2% viscous alginate solution was added 18 hours before use of the solution for injection. The solution was prepared to a viscous solution by allowing 18 hours of slow mechanical mixing.

[0011] Metoclopramide was dissolved in physiological saline.

[0012] For administration of the drug into the lumen of the esophagus the injection fluid was administered by entering a thick needle with rounded tip via, and into the esophagus just above the lower esophageal sphincter and retreating during injection to release the volume to be injected just behind the pharynx. The stainless steel needle for injection into the esophagus was 26 mm long, 1 mm thick and had a rounded thickened tip of 2 mm diameter.

[0013] For administration into the stomach a similar 1 mm thick needle with a 2 mm tip and 60 mm length was introduced into the stomach via the esophagus as customary for oral administration in rats.

[0014] For administration subcutaneously (sc) the injection fluid was injected with a sharp thin needle under the skin in the neck.

[0015] Although we do not base our conclusions entirely on statistical tests, P values are reported as obtained with independent two-sided Student's t-tests for equal variances.

Example 1: Effect of doses 1 - 10 mg/kg of lidocaine into the esophagus.

Groups:

[0016]

A: Placebo 1 ml/kg esophagus
B: Lidocaine.HCl 1 mg/kg esophagus
C: Lidocaine.HCl 3 mg/kg esophagus
D: Lidocaine.HCl 10 mg/kg esophagus

[0017] Rats weighed 290-365 g rats. Treatments were administered 30 minutes before the start of the food intake test. The data of one rat in the 1 mg/kg lidocaine group were accidentally lost.

[0018] Grams of mealworms eaten (AVG is average of group; SEM is standard error of the mean; N is number of rats per group; significance refers with * to < 0.05 and ** to < 0.01

	placebo 1 ml/kg esophagus	Lidocaine.HCl 1 mg/kg esophagus	Lidocaine.HCl 3 mg/kg esophagus	Lidocaine.HCl 10 mg/kg esophagus
AVG	**15.38**	**14.85**	**14.46**	**14.54**
SEM	**0.22**	**0.54**	**0.49**	**0.54**
N	**8**	**7**	**8**	**8**
p-value		**0.3531**	**0.1059**	**0.1708**
significance				

[0019] Conclusion: the dose of the anesthetic lidocaine in this procedure should be above 10 mg/kg

Example 2: Effect of dose of 20 mg/kg of lidocaine.HCl into stomach or esophagus

Groups:

[0020]

A: Placebo 1 ml/kg esophagus
B: Lidocaine.HCl 20 mg/kg esophagus 30 minutes before start of food intake test
C: Lidocaine.HCl 20 mg/kg stomach30 minutes before start of food intake test
D: Lidocaine.HCl 20 mg/kg esophagus 15 minutes before start of food intake test

[0021] Rats weighed 262-371 g rats. Treatments were administered 15 (Group D) or 30 (Groups A-C) minutes before the start of the food intake test.

Grams of mealworms eaten

[0022]

	placebo 1 ml/kg esophagus	Lidocaine.HCl 20 mg/kg esophagus	Lidocaine.HCl 20 mg/kg stomach	Lidocaine.HCl 20 mg/kg esophagus 15 min
AVG	**14.08**	**17.14**	**16.28**	**16.91**
SEM	**0.89**	**0.72**	**0.51**	**0.72**
N	**8**	**8**	**8**	**8**
p-value		**0.0186**	**0.0498**	**0.0267**
significance		*	*	*

[0023] Conclusion: The dose of 20 mg/kg lidocaine is effective. The application in the esophagus is more effective than application into the stomach.

Example 3: The effect of procainamide and ropivacaine into the esophagus on food intake

Groups:

[0024]

A: Placebo 1 ml/kg esophagus
B: Procainamide 20 m/kg esophagus
C: Ropivacaine 1.25 mg/kg esophagus

[0025] Data of group D are not relevant in this context.
[0026] Rats weighed 268 - 310 grams. Treatments were administered 30 minutes before the start of the food intake test.

Grams of mealworms eaten

[0027]

	placebo 1 ml/kg esophagus	Procainamide (for comparison) 20 m/kg esophagus	Ropivacaine 1.25 mg/kg esophagus
AVG	**12.63**	**12.11**	**13.40**
SEM	**0.87**	**1.30**	**0.71**
N	**8**	**8**	**8**
p-value		**0.7417**	**0.5090**
significance		//	//

[0028] Conclusion: The dose of procainamide should be higher than 20 mg/kg in this procedure; The dose of ropivacaine should be higher than 1.25 mg/kg in this procedure.

Example 4: The effect of 100 mg/kg procainamide and 3.75 and 7.5 mg/kg into the esophagus on food intake

[0029]

A: Placebo 1 ml/kg esophagus
B: Procainamide 100 m/kg esophagus
C: Ropivacaine 3.75 mg/kg esophagus
D: Ropivacaine 7.5 mg/kg esophagus

[0030] Rats weighed 258 - 309 grams. Treatments were administered 30 minutes before the start of the food intake test

Grams of mealworms eaten

[0031]

	placebo 1 ml/kg esophagus	Procainamide (for comparison) 100 m/kg esophagus	Ropivacaine 3.75 mg/kg esophagus	Ropivacaine 7.5 mg/kg esophagus
AVG	**11.53**	**10.55**	**12.08**	**13.58**
SEM	**1.11**	**0.77**	**0.69**	**0.77**
N	**8**	**8**	**8**	**8**
p-value		**0.4816**	**0.6792**	**0.1517**
significance		//	//	//

[0032] Conclusion: Ropivacaine enhanced food intake in this procedure at 7.5 mg/kg in the esophagus.

Example 5: Ropivacaine in stomach or esophagus

Groups:

[0033]

A: Placebo 1 ml/kg esophagus
B: Ropivacaine 7.5 mg/kg esophagus
C: Ropivacaine 11.25 mg/kg esophagus
D: Ropivacaine 7.5 mg/kg stomach

[0034] Rats weighed 292 - 337 grams

Grams of mealworms eaten

[0035]

	placebo 1 ml/kg esophagus	Ropivacaine 7.5 mg/kg esophagus	Ropivacaine 11.25 mg/kg esophagus	Ropivacaine 7.5 mg/kg stomach
AVG	**12.45**	**13.24**	**14.44**	**10.72**
SEM	**1.24**	**0.67**	**0.84**	**0.96**
N	**8**	**8**	**8**	**8**
p-value		**0.5830**	**0.2046**	**0.2878**
significance		//	//	//

[0036] Conclusion: Ropivacaine in the esophagus at 7.5mg/kg and 11.25 mg/kg is effective in increasing meal size, in particular when administered in the esophagus. The difference between amount eaten by groups B (esophagus) and D (stomach) is having a P value < 0.01 (Significance **).

Comparable Example 6: Effect of subcutaneous metoclopramide at 3, 10 and 30 mg/kg

Groups:

[0037]

A: Placebo 0.9% NaCl 1 ml/kg sc
B: 3 mg/kg sc metoclopramide
C: 10 mg/kg sc metoclopramide
D: 30 mg/kg sc metoclopramide

[0038] Rats weighed 284 - 332 grams. Treatments were administered 30 minutes before the start of the food intake test.

Grams of mealworms eaten

	placebo 0.9% NaCl 1 ml/kg sc	metoclopramide 3 mg/kg sc	metoclopramide 10 mg/kg sc	metoclopramide 30 mg/kg sc
AVG	**15.69**	**11.86**	**1.25**	**0.22**
SEM	**0.76**	**0.83**	**0.15**	**0.05**
N	**8**	**8**	**8**	**8**
p-value		**0.0043**	**0.0001**	**0.0001**
significance		**	**	**

[0039] Conclusion: Metoclopramide subcutaneously at doses above 3 mg/kg inhibits food intake.

Comparable Example 7: Effect of subcutaneous metoclopramide at 0.1 - 1 mg/kg

Groups:

[0040]

A: placebo 0.9% NaCl 1 ml/kg sc
B: 0.1 mg/kg sc metoclopramide
C: 0.3 mg/kg sc metoclopramide
D: 1 mg/kg sc metoclopramide

[0041] Rats weighed 295 - 356 grams. Treatments were administered 30 minutes before the start of the food intake test

Grams of mealworms eaten

	placebo 0.9% NaCl 1 ml/kg sc	metoclopramid e 0.1 mg/kg sc	metoclopramid e 0.3 mg/kg sc	metoclopramid e 1 mg/kg sc
AVG	**12.26**	**13.51**	**12.23**	**15.76**
SEM	**1.16**	**0.76**	**1.41**	**0.54**
N	**8**	**8**	**8**	**8**
p-value		**0.3791**	**0.9882**	**0.0159**
significance		//	//	*

[0042] Conclusion: Subcutaneous injection of 1 mg/kg metoclopramide increases food intake. 0.1 and 0.3 mg/kg subcutaneously are ineffective in this procedure.

P A T E N T K R A V

1. Lokalbedøvelsesmiddel til anvendelse i en fremgangsmåde til behandling af (i) anoreksi, (ii) kakeksi, (iii) sarkopeni og (iv) postoperative komplikationer i fødemiddelforarbejdning efter operation på tarmkanalen eller efter kejsersnit, omfattende at benytte en tilstrækkelig dosis af lokalbedøvelsesmidlet til en overflade af svælget, spiserøret, og/eller maven for at fremme fødemiddelindtag og fødemiddelretention hos et pattedyr, lokalbedøvelsesmidlet er lidocain eller ropivacain.

2. Lokalbedøvelsesmiddel til anvendelse i en fremgangsmåde til behandling af (i) anoreksi, (ii) kakeksi, (iii) sarkopeni og (iv) postoperative komplikationer i fødemiddelforarbejdning efter operation på tarmkanalen eller efter kejsersnit, omfattende at benytte en tilstrækkelig dosis af lokalbedøvelsesmidlet i svælghulrummet, spiserøret, og/eller maven før eller under eller efter spisning, for at fremme fødemiddelindtag og fødemiddelretention hos et pattedyr, lokalbedøvelsesmidlet er lidocain eller ropivacain.

3. Lokalbedøvelsesmiddel til anvendelse ifølge et hvilket som helst af krav 1-2, k e n d e t e g n e t ved, at lokalbedøvelsesmidlet benyttes på en overflade af spiserøret.

4. Lokalbedøvelsesmiddel til anvendelse ifølge krav 1, k e n d e t e g n e t ved, at lokalbedøvelsesmidlet benyttes på en overflade af maven.

5. Lokalbedøvelsesmiddel til anvendelse ifølge et hvilket som helst af krav 1-4, k e n d e t e g n e t ved, at lægemidlet er formuleret i en opløsning eller suspension i et fremføringsmiddel, som fremmer retention af formuleringen med et slimhindepitel fra et pattedyr.

6. Lokalbedøvelsesmiddel til anvendelse ifølge krav 5, k e n d e t e g n e t ved, at lokalbedøvelsesmidlet er opløst eller opslæmmet i en opløsning af alginat.