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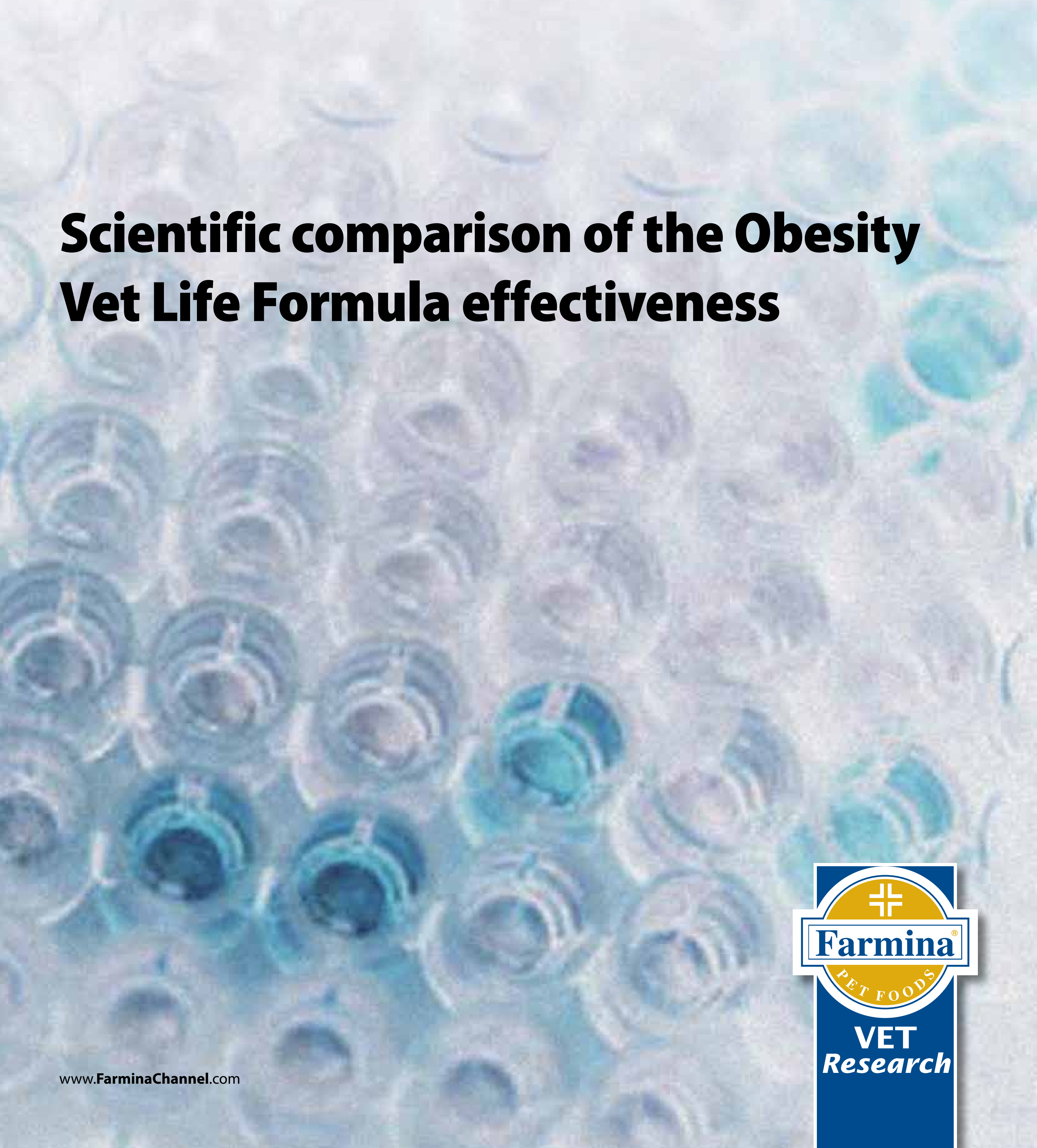
FVR discuss

Farmina Vet Research Journal

Scientific comparison of the Obesity Vet Life Formula effectiveness



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Farmina Pet Foods VET Research

Farmina Vet Research

Farmina Vet Research Group (FVR), with its scientifically demonstrated dietary nutrients (Vet Life Formula), aims to support the Veterinarian with the management of some pathologies commonly occurring in pets.

It also intends to provide valid solutions to dietary problems and scientific consultancy through the cooperation of the Animal Science and Food Control Department of the Faculty of Veterinary Medicine of University of Napoli Federico II.

Farmina Vet Research is capable of maintaining a scientific dialogue with the Veterinary world, delving into clinical and dietary issues.

Farmina Vet Research is part of the scientific division of the Farmina firm supported by the competence and the hard work of several professionals focusing on delivering effective consultancy services.

Farmina Vet Research integrates its production by studying technological innovations and by improving new products through manufacturing processes aimed at keeping up with future challenges. The high quality of its products contributes to the wellbeing and health of our pets.

Study carried out in agreement with Department of Animal Science and Food controll of the University of Naples "Federico II".

Physiology of the digestion

Phases of digestive functions

The digestive system's main function is to digest food and absorb the nutritional elements it contains. Once absorbed, those elements are distributed to the cells all over the system. On the basis of its different functions, it is possible to distinguish three sections:

1. ***Ingestive section*** (mouth, pharynx, oesophagus). In the mouth, food is chewed and mixed with saliva becoming food cud. Differently from other mammals, the salivary glands of carnivorous animals do not secrete ptyalin, an enzyme which initiates the digestion (hydrolysis) of carbohydrates. The food cud goes through the pharynx and the oesophagus to be rapidly transferred in the stomach by means of coordinated muscle contractions by these organs.

2. ***Digestive section*** (stomach, liver, pancreas and small intestine). The food cud comes into contact with the gastric content which is mostly acid, and allows an initial attack of the most soluble nutritious substances. The mixture of food cud and gastric juice is called chyme. Moreover, liver and pancreas ducts flow into in the first section of the small intestine carrying the main digestive enzymes and allowing the simplification of the molecules introduced with the food. Such simplification renders them absorbable by the intestinal walls covered by some particular finger-like projections called villi which increase significantly the surface of absorption.

3. ***Expulsive section (large intestine and rectum)*** in this section, water and nutritive elements are absorbed and intestinal contents are expelled as feces.

The liver performs different vital functions: it helps the emulsion and, therefore, the digestion of lipids, it eliminates toxic substances, it elaborates several proteins which carry out a regulating function on some very important processes such as the erythropoiesis, the coagulation etc.

The pancreas is formed by an exocrine part and an endocrine part. Its main function is to produce pancreatic juice (exocrine part), insulin and glucagon (endocrine part). The function of pancreatic juice is to digest some substances in the small intestine while the function of insulin and glucagon is to control the concentration of glucose in the blood.

Control of digestive function

The digestive system can be considered as a complex chain in which different functions (secretion, absorption and motility) are performed in a synchronous way. The secretion is the release of enzymes, mucus and ions in the lumen and of hormones in the blood stream. The absorption corresponds to the transportation of water, ions and nutrients from the lumen to the blood through the epithelium. The contractions of the smooth muscles guarantee the breaking, the mixing and the progression of the gastric and intestinal content.

The complexity of this system renders the necessary existence of strong systems capable of communication between the different sections of the digestive apparatus and between the digestive apparatus with the central nervous system.

Such control systems derive from the combination of electrical and hormonal messages originating from both the enteric nervous and endocrine systems, and from both the central nervous system and the endocrine glands. The complexity of the control mechanisms of the digestive apparatus is often the cause of digestive problems due to the poor functioning of one or more parts of such mechanisms.

The nervous system significantly influences the performance of the digestion by controlling the motility, the secretion and the absorption. It also influences the gastrointestinal blood flow. Such function is partly controlled by the central nervous system however, it is also partly controlled by the myriad of neurons localised in that area creating the enteric nervous system.

The plexuses or neural network are the main components of this system. They run along the digestive tube from the esophagus to the anus, and can be differentiated into Plexus myentericus (located between the longitudinal and the circular layer of the muscular tunic) controlling the gastrointestinal motility and submucosal plexus (located underneath the submucosal tunic) controlling the lumen environment and regulating the blood flow and the secreting activity. Both plexuses are constituted by a set of motoneurons and interneurons. The main neurotransmitters involved in such process are acetylcholine (stimulating secretion and motility) and norepinephrine (inhibiting).

The enteric nervous system can act either independently from the central nervous system or in connection with it. Such connection is determined in particular by the tenth pair of cranial nerves (vagus nerve).

The connection between the two systems is reciprocal as the enteric nervous system is capable of transmitting information to the central nervous system; on the other hand, the central nervous system supplies the enteric nervous system with information from the external world, by perceiving it though the sensory organs. In general, the parasympathetic nervous system acts as a stimulant whereas the sympathetic nervous system acts as inhibitor of digestive functions.

Further to the two main plexuses, underneath the serous membrane and inside the circular layer of the mucous membrane, there are other minor plexuses mainly constituted by sensitive neurons. Such neurons are, depending on the type of receptor, able to transmit thermal, mechanic, tactile and osmotic information.

The endocrine system is the second control system of the digestive function. This is carried out through the secretion of hormones which, via the blood flow, reach the target cells where they find specific receptors able to modify cells physiology. Such hormones are all produced inside the digestive tube, even if some hormones produced by the endocrinal glands influence the digestive processes too. Among the gastrointestinal hormones there are: gastrin, an acid secretion produced by the gastric mucous membrane; Cholecystokinin and secretin, both produced by the intestinal mucous and aimed at the control of biliary secretion and of the pancreatic enzymes.

Control of food intake

The body lives in a constant condition of hunger only interrupted by food intake. The continuous need to feed is interrupted by some inhibiting stimuli such as the presence of digested food in the gastrointestinal tract and the presence of some nutrients in the blood flow; when the above mentioned stimuli stop, the sensation of hunger starts again.

Central mechanisms aimed at the energetic control

The hypothalamus and the neurons of I and II order

The discovery of leptin has radically changed the understanding of food consumption control and energy consumption. It is a protein (167 aa), belonging to the

cytokines group, discovered in 1994 as a product of the gene OB, contained in the chromosome. It performs a hormonal action and is produced by adipocytes. The hematic concentration of leptin is directly related to the fat mass of the subject and it acts in synergy with insulin, the first hormone historically involved in the appetite control. The secretion of both hormones, which have an anorexigenic action, is rapidly stimulated by the glycemic levels. Although it has recently been highlighted that the level of circulating triglycerides is the fastest hormonal secretion stimulus for leptin (Vettor et al, 2002).

These hormones are differently, although reciprocally, correlated: the presence of insulin is necessary to determine the secretory answer of leptin, from the adipocytes, to the rapid changes of food intake. Also insulin is directly correlated to the adipose deposits, and this correlation finds a physiological justification in the insulin-resistance mechanism . This mechanism exists also at the level of adipocytes and contrasts the action of the hormone on the adipocytary replication.

In synthesis: insulin mainly regulates glucidic homeostasis and the peripheral insulin-resistance can determine the notorious phenomena subsequent to the so called glucotoxicity, whereas leptin regulates the lipidic homeostasis and the conditions of leptin-resistance can determine an accumulation of intracellular lipids. This generates lipotoxicity in the beta cells of pancreas, myocardio and other tissues, determining damages in various organs and apparatus described in obese subjects.

The receptors of these hormones are ubiquitous, however the hypothalamus is the main target of the control action of appetite: through the hemato-encephalic barrier they reach the 3rd ventricle where they act by means of specific receptors, such as tyrosine kinase for insulin and januskinase for leptin, located in the arcuate nucleus on a common enzyme called phosphatidyltriphosphate Kinase (Pi-3K).

In a cellular environment, leptin produces a protein SOCS3 (suppressor of cytokine signaling-3) inhibiting the action on both leptin and insulin (Bares et al, 2004).

It seems that also another hormone of 28 aa acts on the arcuate nucleus which is unique in its own kind and has an orexigenicgen action. It is produced by the oxyntic cells of the stomach in fasting conditions and has been named ghrelin. This hormone is already known as a powerful growth promoter. Recently, it has been demonstrated that in obese subjects, where the blood concentration resulted surprisingly low, ghrelin undergoes a minor inhibiting effect – compared to normal weight subjects – by the meals type. This rendered more comprehensible its physiological function and the physiopathological error present in obese subjects.

Other hormones, mainly deriving from the intestine, also have an action on the arcuate nucleus. Further to the already mentioned ghrelin which, to date, is still the only hormone with an orexigenic action, an anorexigenic role has been associated to peptide YY (3-36), produced by cells L of the small intestine. This peptide belongs to the family of Peptides PP together with the pancreatic polypeptide produced in the pancreas. Inferior quantities of PYY have been found in obese subjects, with the consequent reduction of the sensation of having a full stomach. An anorexigenic action has been long been associated to cholecystokinin, mainly produced in the duodenum and on an empty stomach. Its inhibiting role on food intake was already known in the '80s and, recently, its synergic anorexigenic action with leptin has been demonstrated. Glucagon like peptide-1 and oxyntomodulin are other two important peptides are released by cells L of the small intestine and derive from proglucagon following the enzymatic action of pro-hormone convertase 1-2. Oxyntomodulin, already known for its digestive activities, has also been recognized for its inhibiting action on calories intake, partially mediated by an inhibiting action on ghrelin and by a stimulating action on energetic consumption.

These two hormones have a common receptor, localized in the arcuate nucleus, in the solitary tract nucleus and in several peripheral organs such as kidneys, pancreas, intestine and heart.

Peripheral hormonal information integrate with other metabolic and neurogenic signals: the first are conveyed by the autonomous nervous system transmitting visceral and palatal signals to the solitary tract nucleus, sensitive central station of the Vagus nerve. Metabolic signals are partially received by nervous terminations present in the liver and in the hollow organs which are affected by the metabolic processes happening within them. In fact, nutrients - in the various stages of digestion, absorption and metabolization in the alimentary canal and in the hepatic portal system – have multiple specific sensors and ways of communications directed to the brain.

The arcuate nucleus can also receive metabolic information directly, both from energetic products and nutrients. In fact, it has been demonstrated that an intracellular reduction of ATP levels induces an increase of the enzyme AMP-active protein kinase (AMPK) in the arcuate nucleus and this determines hyperphagia. Confirming the complex network of the mechanisms aimed at the energetic control, AMPK results inhibited by leptin and insulin. These systems of metabolic control are similar to those occurring in a peripheral area, at the muscular level, where in particular Malonyl-CoA inhibits carnitine palmitoyltransferase, an enzyme which transfers fats from cytosol to mitochondria for their oxidation.

Another hormone named PYY (3-36), produced after a meal by cells L of the small intestine, performs an anorexigenic action at the arcuate nucleus level. Therefore, in this nucleus, both anorexigenic and orexigenic information coming from the periphery combine. Neurons are present in this nucleus producing in turn orexigenic and anorexigenic peptides, named 1st order nuclei. Orexigenic nuclei (neuropeptide Y_NPY and Agouti Related Protein_AGRP) inhibited by leptin and insulin and stimulated by ghrelin. On the contrary, the anorexigenic nuclei (melanotin_MC and Cocaine-Amphetamine-Regulated-Transcript_CART) are stimulated by leptin and insulin and inhibited by ghrelin.

Any peripheral stimuli arriving into the nucleus are transmitted to another group of neurons (II order neurons). The efferent pathways start from there which, mediated by the autonomous nervous system and hormones, transmit the subsequent answers to the periphery. II Order neurons are contained in the hypothalamic nuclei which intervene in the control of appetite, creating an extremely refined network by doing so. However, they can also encounter some interruptions in several intermediate stations. The most well-known is the ventromedial nucleus which, if stimulated, induces the sensation of full stomach and, if inhibited, induces hyperphagia. Furthermore, the paraventricular nucleus (nPV) and the lateral hypothalamic areas (LHA; perifornical area: PFA) are extremely important.

Extrahypothalamic control

Noradrenaline is synthesized in the encephalic trunk, in the dorsal vagus complex and in the locus ceruleus projecting adrenergic neurons both behind the spinal cord and rostrally to the hypothalamus; here, noradreline is colocalized with NPY enhancing its orexigenic action, mediated by the alpha 2 receptors, while receptors alpha 1 mediate an opposite anorexigenic action. Leptin inhibits the noradrenalie release with a consequent anorexigenic effect.

The action of dopamine in the context of the food intake control is more complex. Contrasting effects relating to this amine have been described in connection with

the cerebral area studied: in particular, the mesolimbic dopaminergic system containing the neurons of the substantia nigra and the ventro-segmental area which are projected into the accumbens nucleus, in the striatum and in the cerebral cortex are implicated in the hedonistic stimulatory gratification of the food intake. On the contrary, dopaminergic neurons situated in the dorsomedial nuclei and in the arcuate nucleus of the hypothalamus determine an inhibiting effect. Recently in humans was described, using the PET, that obese people has lower level of dopamine than a striatal level than normal weight people.

Moreover, the above described integrated system receives further information and control from cortical and sub-cortical regions through the release, at different levels, of well-known cerebral amines, such as adrenaline, dopamine and serotonin; and also from the endocannabinoid system.

Serotonin is mainly secreted by the neurons of the caudal trunk among which there are the dorsal raphe nuclei widely projected in all the encephalo: the action on food ingestion is of an inhibiting type.

Leptin increases the turnover of this amine which, at least partially, contributes to the anorexigenic action of the hormone.

A further appetite control mechanism has been identified in the endocannabinoid system (anandamide and 2 – Arachidonoylglycerol), present in the hypothalamus, performing a rapid orexigenic action.

Many other neuromodulators have in turn been implied in the control of the energetic balance: galanin and GABA with an orexigenic action, glucagon like peptide with an anorexigenic action. However, in practice, their role results much inferior and vicariant compared to the above mentioned results. Also the choice of macrocontents seems to be influenced by the neurohormonal control system; in particular, insulin and CCK reduce the interest in glucide intake. Instead, such interest is stimulated by NPY and endocannabinoids. Opioids stimulate the intake of proteins and lipids which is insteadinhibites by CCK.

The knowledge of control mechanisms operated by neurotransmitters is further complicated by the experimental realization that environmental factors, such as fasting and unchecked diabetes, can affect the reuptake of neurotransmitters by some specific membrane proteins. This determines a longer time of action at a receptorial level. A recent holistic interpretation the mechanisms implied in metabolic homeostasis sees it integrated with other vital functions such as the immune system, the sexual function and sleep; as a result, also the deriving pathological conditions would result integrated. The environment can affect this complex system by modifying the pace of temporal communication amond the different processes. The functioning of the system, which is imbalanced in favor of a positive energetic balance due to the selection laws, is based on the information received by the brain from the adiposity signals, such as leptin and insulin, which integrate with nutritional signals such as free fatty acids.

In terms of alimentary behavior, the answer should be a reduced intake of food and an increase in energy consumption during periods of abundance, whereas the contrary should happen during periods of famine. This system is also active during the day, theoretically determining the balance between satiety and hungry sentations.

On this biological basis, several social and biological factors could influence the energetic balance control and therefore determine the onset of being overweight.

Study carried out in agreement with Department of Animal Science and Food controll of the University of Naples "Federico II".

Comparative evaluation of two complete enriched feeds for the treatment of obesity.

The World Health Organization (WHO 1997) defined obesity in humans as "the excessive storage of fat involving dangerous consequences for health". Such definition can be also applied to describe obesity in pets (Diez and Nguyen, 2006). In dogs, obesity represents the highest incidence pathology related to food, with a variable incidence ranging from 24% to 44% in dogs (Markwell et al, 1990 Laflamme and Kuhlman, 1995; Robertson, 2003) and was associated to several clinical conditions restraining the quality and the expectancy of pets' life.

The weight gain occurs when the amount of energy provided by the diet exceeds the amount of energy consumed by the body (Crane, 1991; LEgrand-Defretin, 1994; Fetman et al, 1997). Such condition can occur as a consequence of an increased amount of food intake, a reduction of voluntary physical activity, metabolic rate variations or increase effectiveness of digestive utilization. Several risk factor correlated to the onset of obesity have been identified in the last few years. Such factors are: race, genetic predisposition, age, sterilization, endocrinological pathologies, sedentary life style and type of diet.

The treatment of obesity requires the application of alimentary plans aimed at the reduction of the daily calorie intake. The caloric restriction to be followed varies according to the overweight grade, to the estimated time necessary to reach the target weight and to the possible presence of pathologies related to obesity.

In order to reach this goal, it is possible to follow diets with light, medium of drastic caloric restriction corresponding to 80, 60 and 40% of the daily need in order to maintain the ideal weight (Markwell et al, 1990; Edney, 1974; Dzanis, 2000). Weekly weight losses equal to 1-2 % of the initial weigh can be considered satisfactory (Diez & Nguyen, 2006).

The choice of the type of food to use in a diet plan is fundamental in order to prevent nutritional deficiencies and behavioral alterations in dogs (Crowell-Davis et al, 1995). The food must guarantee the intake of sufficient quantities of food able to satisfy all nutritional requirements.

The energy concentration of dog food can be limited by reducing the lipid levels and increasing the ammounts of dietary fiber (Diez & Nguyen, 2003). Nevertheless, such restrictions require particular supplementations aimed to guarantee the correct intake of essential nutrients, such as amino acids, fatty acids, minerals, vitamins and oligo-elements.

In general, the addition of fiber allows a reduction of the energetic concentration in a meal (Lewis, 1978; Hand, 1988). However, the term dietary fiber includes a diverse group of complex carbohydrates which, according to their solubility in water, are classified as soluble and insoluble. In the digestive apparatus of dogs, soluble carbohydrates slow down the gastric emptying, inducing a slower absorption of nutrients (Russel and Bass, 1985). Instead, insoluble fiber increase the transit rate of food in the digestive tube by increasing ingesta volume (Burrows et al, 1982; Fahey et al 1990). This contributes to obtain a full stomach sensation and contributes to the reduction of voluntary energy intake (Jewell et al, 1996; Jewell et al, 2000). Following a hypocaloric diet characterized by high dietary fiber contents and reduced lipid intakes (23% and 9% S.S., respectively), contributes to the loss of fat mass and helps reducing blood pressure and hematic levels of cholesterol (Wolfsheimer et al, 1994; Born et al, 1996).

Beet pulps are particularly indicated for this aim as they are characterized by a dietary fiber level equal to 59-77% of dry matter, represented for ¼ by soluble fiber and for ¾ by insoluble fiber. Also cellulose has a dietetic fiber tenor equal to 86%, totally insoluble.

However, fiber can also have some undesirable effects such as increase of fecal mass, flatulence, diarrhea, low digestibility, less agreeable taste (Meyer et al 1978).

The adoption of hypocaloric diets and the use of diets rich in fiber impose the utilization of higher protein levels compared to the ammounts used in maintenance diets. In humans, this practice has shown several advantages such as: improvement in the body composition (Durrant et al, 1980; Piatti et al 1994; Diez at al, 2002); increased possibility to achieve a full stomach sensation (Louis-sylvestre, 2002) thanks to the slow absorption of amino acids deriving from protein digestion , with a glucogenic purpose with a poor insulin secretion; higher probability to keep the ideal weight (Westerterp-Plantenga et al, 2004).

At the same time, it is necessary to supply an amount of raw products with a high biological value in order to guarantee the essential amino acids, which cannot be produced by the body system, supply, therefore, the amino acids must be introduced by the diet.

The fat content of the diet must be limited (< 25% of energetic intake), nevertheless, it is not possible to adopt completely fat free diets and it is necessary to guarantee a minimal concentration of lipids in order to ensure the intake of essential fatty acids and the transportation of liposoluble vitamins. To this aim, it is preferable to use different lipid sources (animal fat, linseeds, fish oil, vegetal oils) (Diez and Nguyen, 2006).

With reference to the content and quality of digestible carbohydrates (starch and simple sugars), diets aimed at the treatment of obesity must present particular characteristics due to the increased predisposition of obese subjects to develop diabetes mellitus. As it has been demonstrated for human diets (Jesnkins at al, 1981; Koh-Banerjee e Rimm, 2003), it is recommended to use starch sources able to stimulate insulin production in a reduced way, by limiting the accumulation of energy in the form of triglycerides and adipocytes.

At the same time, the consumption of complete feed determining a reduced production of glucose can contribute to limiting the production of insulin which is a lipotropic hormone. To this aim, barley and corn are the best sources of starch, whereas white rice is not recommendable (Sunvold and Bouchard, 1998).

As well as proteins, also concentrations of minerals, vitamins and oligoelements in low-calories food must be higher than in maintenance diet, as the reduced energetic intake can cause a deficiency in those essential elements.

Further to increasing the vitamin and mineral contents of feed, it is also possible to integrate the diet with sepiolite and zeolite (Pellegrini et al, 2009) which not only influence the calcium absorption of but they also seem to help nitrogen retention and improve the fecal composition. Nevertheless, the use of antioxidants such as methionine, zinc and chromium seems to be effective as they can help the maintenance of the lean mass and the loss of the fat mass.

Also L-carnitine has a special role. It is a non-essential amino acid which is synthesized ex-novo at the hepatic and kidney level starting from lysine and methionine, in presence of ascorbate. Such amino acid helps the muscle to draw energy from fatty acids, it also improves azotate retention and modifies the body composition by favoring muscular mass (Gross and Zicker, 2000; Allen, 1998; Sunvold and al, 1998; Caroll and Côté, 2001).

Study carried out in agreement with Department of Animal Science and Food controll of the University of Naples "Federico II".

Experimental Part

Material and methods

The target of this survey was to compare the effectiveness of two types of feed present on the market created for obesity treatment.

To this aim, 12 owned adult dogs have been selected with the following characteristics: neutered, crossbreed, in good health conditions according to the results of the collateral medical investigation (blood count and biochemical profile) and overweight.

After being officially involvement in the survey, the dogs were registered according to age and weight. Moreover, their body conditions score (BCS)were evaluated using a 9 point scale created for dogs (Laflamme et al.,1994) in order to establish the overweight degree. The dogs were then subdivided into two experimental homogeneous groups according to the age, the weight and the overweight level, in which the average values were equal to 8.3 years, 27.6 kg e + 28% of the ideal weight, respectively.

Each owner had been informed about the aim of the survey and, by signing the formal consent to participate, they accepted to feed their pets exclusively the selected food following the recommended ammounts throughout the duration of the experiment. No specific indication was given regarding physical activity. Each group was supplied with acommercial dry food (diet 1 vs 2).Chemical-nutritional characteristics of the diets are shown in the table 1 (AOAC, 2006). In order to obtain a weight loss, the individual rations have been calculated by applying a caloric restriction of 40% of the maintenance requirements indicated by the researchers of the National Research Council (2006) (550 kj of metabolizable energy/kg of ideal metabolic weight). The daily ration was subdivided into two meals given at pre-established times by each owner according to the domestic habits. The dogs were weighed every 15 days, while every two months they underwent a blood test in order to evaluate the metabolic profile, the blood count and the protein formula.

The obtained data were analyzed through the analysis of variance utilizing the PROC GLM of the statistical package SAS (2000).

Table 1 - Chemical and nutritional characteristics of the diets

Diet	Crud protein	Ether extract % t.q.	Crude fiber	Ashe	Metabolizable Energy MJ/kg
1	22,5	7,9	10,2	4,14	12,7
2	21,6	6,2	7,8	7,70	12,4

Results and discussion

During the test, no cases of behavioral alteration related to the request of more food have been reported by the owners. Since the 3rd week of treatment, the owners reported an increased inclination of the dogs to moves spontaneously. The fact that the dogs did not show any signs of sufferance relating to the reduction of calories could be due to the high quantity of crude fibre contributing to make the full stomach sensation last longer. This characteristic is fundamental as, often, the continuous food request by the dog demotivates the owner who might end up giving extra meals or abandon the program of caloric restriction.

Table 2 shows the reported average BCS values, weight recorded at the beginning and after 7 weeks of treatment

The obtained results are in line with those reported in literature by other authors who applied similar caloric restrictions in overlapping periods (Diez et al, 202, Borne et al, 1996).

In table 3, the average values of some biochemical parameters evaluated at the beginning and after 7 weeks of dietetic treatment are shown. There were any statistically significant differences between groups, however it is important to highlight how both diets induced a reduction in the blood levels of glucose, total cholesterol and triglycerides. This is the demonstration that the adoption of diets characterized by high contents of dietary fiber and low lipid intakes helps reducing

Table 2 – Average weight values and BCS recorded in the 2 groups at the beginning and after 7 weeks of treatment in the two groups.

Group	Weight (kg)		BCS (9 point scale)	
	Beginning	End	Beginning	End
1	29,3 ± 7,8	25,7 ± 6,2	7,36 ± 1,08	7,26± 0,98
2	25,9 ± 8,4	22,7 ± 6,2	7,32 ± 2,01	7,18± 1,71

in the two groups. Statistically significant differences did not emerge in any cases and both diets helped to obtain satisfactory weekly weight losses (1.75 ± 0.18 and 1.92 ± 0.32 % of the initial weight, with diet 1 and with diet 2, respectively); as shown in picture 1, the weight loss trend is harmonious in both cases.

cholesterol and triglycerides levels (Wolfsheimer et al, 1994; Borne et al, 1996). The utilization of a cereal like corn, in both formulations, helped reducing the glucose blood levels helping all the subjects, already after 7 weeks of test, to achieve glycemic indexes with the range of reference (Sunvoid and Bouchard, 1998).

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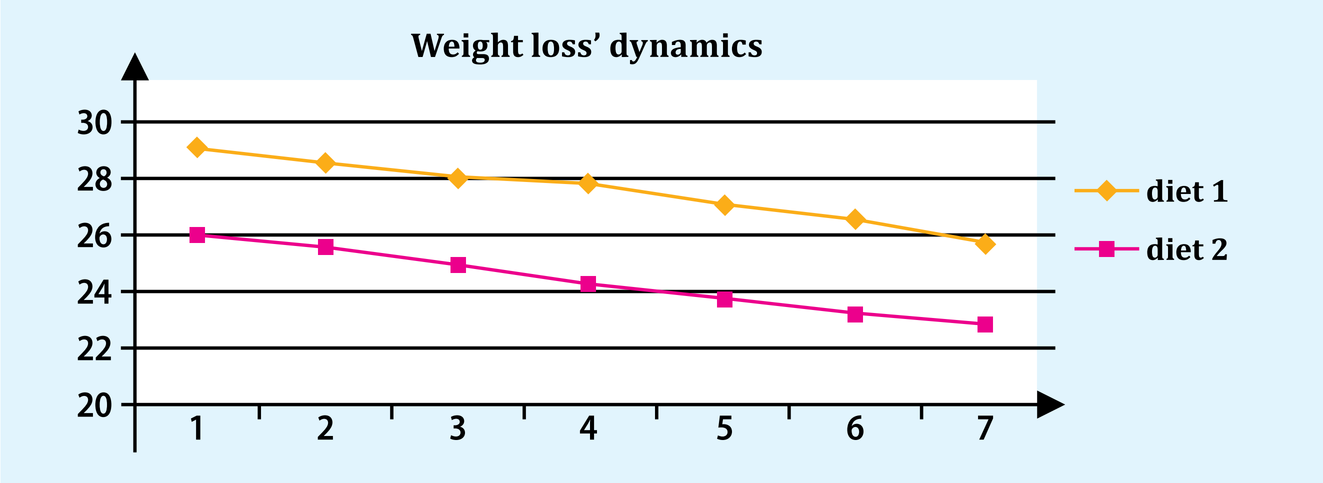
The preliminary results of this survey show that the adoption of diets with a low energetic density, characterized by high contents of fiber, low contents of lipids and a caloric restriction equal to 40% of the



Before: 24 July 2009, Stella, 3.5 years old, weight kg 28.60.
Above: seen laterally, below: seen from above.

After: 5 November 2009, Stella, 3.5 years old, weight 22.60.
Above: seen laterally, below: seen from above.

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Group	Phase	Glycemia	Total Cholesterol (mg/dl)	Triglycerides
1	Inizio	91,47 ±3,98	171,5 ± 27,6	123,3 ± 83,4
	Fine	89,20 ±5,38	155,7 ±13,3	89,2 ± 22,0
2	Inizio	97,53 ±3,50	194,3 ±40,8	125,7 ±68,1
	Fine	93,50 ±8,18	180,4 ±43,2	88,0 ± 37,7

Range of reference for dogs: glycemia 50-100 mg/dl; total cholesterol 140-250mg/dl; triglycerides 50-150mg/dl

On the left: "before" – 15th July 2009, Balu', 8 years old, weight kg 49, seen laterally.

On the right: "after" – 5th November 2009, Balu', 8 years old, weight 40 kg, seen laterally.

On the left: "before" – 15 November 2009, Balu', 8 years old, seen from above.

On the right: "after" – 5 November 2009, Balu', 8 years, weight 40 kg, seen from above.

maintenance needs, in the short term, help improving pets' quality of life by achieving acceptable weight loss and the also the improvement of some biochemical parameters such as the circulating levels of glucose, total cholesterol and triglycerides, very important to guarantee a better life expectancy of pets.

Data partially presented to the – 13th Congress of the European Society of Veterinary and Comparative Nutrition Oristano (Italy) 15-17 October 2009 Cutrignelli M.I. Calabro' s., Tudisco R., Giuglielmelli A., Tartari M.I., Caiazzo C., Piccolo V. – Nutritional Management of obesity in dogs comparison between two different diets Proc. Pag 150.

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