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The reasons for which a bone is presented to a dog may be summarised as follows:

1. opportunity for the dog to play;
2. development of the puppy's teeth and gums and maintenance of the dentition of an adult dog;
3. plaque removal due to the mechanical action of chewing the bone.
4. anti-stress effects

In the trials carried out with the collaboration of the *Istituto di Alimentazione Animale della Facoltà di Medicina Veterinaria* in Milan (Institute of Animal Nutrition of the Veterinary Medicine Faculty University of Milan) two formats of bone were tested (medium and large) in the type SOFT ('96 model) chicken flavour, produced by Ciuffogatto with starch supplied by Novamont, to evaluate the dog's reaction; and HARD (model '94) or SOFT (model '96) to evaluate the difference in the percentage of starch present in the formula (higher in the model SOFT).

The trials included two different breeds:

- 1. dogs** in order to obtain information regarding attractiveness, effects deriving from administration of bones on the animal,
- 2. pigs** to obtain information regarding eventual damage from the swallowing of a whole bone on the digestive apparatus of the animal.

TRIALS ON DOGS

Aim

The trials on dogs were intended to test the appreciation shown by the animals and to identify any side effects which had not occurred in the trials with pigs.

To this end a varied sample of dogs of disparate breed, age and size were chosen to try the product.

The test involving the maize starch bone in the new chicken flavour formula concerned 15 animals (see enclosures) of various ages and sizes, both dogs and bitches, contacted through veterinary surgeons or by directly contacting the owners, in all cases the dogs were examined at the start and the finish of the trials.

The size of the bone was medium (average weight 77 grams) or large (average weight 137 grams).

For each animal 32 bones were available to be distributed 2 per week over 16 weeks: the first bone to last from Monday to Wednesday, the second from Thursday to Sunday.

As well as checking how long the animal took to consume the bone it was decided that the bone would be made available for less time if it was consumed quickly (e.g. 1st bone for 12 hours per day, if it disappears sooner the availability is reduced).

2. Report on dogs

The dogs involved in the tests are described below together with notes on the owners and veterinary surgeons who assisted in the trials.

In order to render interpretation of the reaction of the animals and their state of health effortless and objective table of evaluation from 1 to 5 was prepared, in which the lowest value indicates no interest in the product and poor health, the highest value shows considerable interest and excellent health.

1. Taro

Maremma sheep dog (dog, 4 years old, large bone, type C, health normal at start and finish of trials): the trial was interrupted after 3 weeks since the dog showed little interest in the product and the owner found it difficult to carry out the trial due to lack of time to spend with the animal. The photograph of the bone shows very little chewing.

Points relative to interest in the product: **1**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

2. Fly

Scottish Terrier (dog, 6 years old, large bone, type B, chronic allergic dermatitis, but otherwise good health at both initial and final examinations): the owner reported an initial yellow colouring of the faeces, often compact and a polydypsia followed by polyuria. The situation however normalised and the dog completed the trials without further problems. On the contrary to the previous case, as can be seen from the photograph, the bone has been largely consumed and show clear signs of prolonged chewing.

Points relative to interest in the product: **4**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **4**

3. Ice

Siberian Husky (dog, 2 months old, medium bone, type F, excellent health conditions in the initial and final examinations, periodically treated with worming tablets): the subject showed interest for the product at first but this diminished over time. However the owner did not report any problems on the animal's behalf. Given the young age of the subject (2 months) chewing could not be very deep, but at the same time it can be seen that the animal has demolished part of one of the extremities of the bone.

Points relative to interest in the product: **3.5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

4. Poldo

Mongrel (dog, 7 years old, large bone, type B, general conditions good, dental plaque, during the second examination the teeth were cleaned and one removed): the owner reported considerable interest in the product in the first days. It must also be noted that the bone was not found because the animal hid it in the garden.

Towards the middle of the trials the animal began to lose interest in the bone. The bone shown in the photograph shows signs of prolonged and vigorous chewing, it has been broken and partly consumed.

Points relative to interest in the product: **3.5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

5. Erik

Basset Hound (dog, 9 months old, medium bone, type F, generally good health conditions, canine milk tooth retained, at the second visit it had fallen out, coprological tests negative): the owner reports that the animal showed interest in the bone for the first weeks of the trials, but this diminished over time. In spite of this lack of interest the trials were completed. The bone shown in the photograph lacks the two extremities, showing assiduous and tenacious chewing by the animal.

Points relative to interest in the product: **3.5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

6. Luna

German Shepherd (bitch, 9 years old, large bone, type A, general health conditions good at both examinations, little plaque, coprological tests negative):

in this case too the animal showed more interest in the product at the start of the trials. The bone shows longitudinal cracks which are the result of its having been held in the mouth, in contact with the saliva, it also shows superficial signs of chewing.

Points relative to interest in the product: **3.5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

7. Chopper

Mongrel (dog, 4 years old, medium bone, type F, good health conditions at both examinations, little plaque, coprological tests negative): The animal showed interest in the product only in the first weeks of the trials. The subject has consumed the bone at one end, partly removing the extremity.

Points relative to interest in the product: **3**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

8. Archibald

Labrador retriever (dog, 9 months old, large bone, type A, general health conditions good at both examinations, treated for filaria): the administration of the product in accordance with the methodology of the trials created considerable interest in the animal, in fact it was often impossible to find remains because they were hidden in the garden. Interest in the product was considerable at the start of the trials and diminished as they went on. The remains of the bone shown in the photograph show signs of vigorous chewing, especially in the central part of the bone.

Points relative to interest in the product: **3**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

9. Beatrice

Belgian sheep dog (bitch, 4½ months old, large bone, type C, general health conditions good at both examinations, treated for filaria): in this case, as in others the animal showed initial interest which diminished as the trials proceeded, however a return of interest induced the owner to continue administering the bone. The bone in the photograph shows evidence of chewing all over the surface even though only one extremity has been removed.

Points relative to interest in the product: **3.5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

10. Giottto

German shepherd (dog, 3 years old, large bone, type C, general health conditions good at both examinations): the animal showed, on the basis of the owner's report lighter coloured and more abundant faeces than usual, sometimes with pieces of undigested bone in them. However the animal completed the trials without showing other signs of disturbance than these. The photograph of the bone shows signs of total consumption of one of the extremities.

Points relative to interest in the product: **3.5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

11. Dick

Basset hound (dog, 5 months old, medium bone, type F, general conditions of health good at both examinations): the animal showed initial interest followed by little interest in the product as the trials continued. The bone shown in the photograph shows superficial chewing.

Points relative to interest in the product: 3

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: 5

12. Truciolo

Mongrel (bitch, 5 years old, medium bone, type F, general health conditions at both examinations): the subject showed initial interest in the product which diminished as the trials proceeded. The owner did not report any abnormalities. In the photograph the bone shows signs of having been chewed superficially over the entire surface.

Points relative to interest in the product: 3

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

13. Lara

Corsican dog (bitch, 2 years old, large bone, type A, general health conditions good at both examinations: the owner reported that the dog consumed the bone very quickly. The owner continued the trials for some weeks, until the dog, employed as a guard dog on a farm showed signs of diarrhoea which the veterinary examination attributed to the consumption of putrid food found on the farm. Following this illness the owner preferred to suspend the trials, even though the product had not caused the intestinal pathology. The photograph shows the remains of a bone with clear tooth marks, indicating vigorous and prolonged chewing.

Points relative to interest in the product: **4**

Consumption time (1 whole bone): short, some hours, always found remainders

Points relative to animal's state of health: **4**

14. Almaglio

Whippet (male, 8 years old, medium bone, type F, general health conditions good at both examinations): the animal showed lively interest in the bone but the trials were interrupted after a few weeks because the owner reported that the dog had injured its nose and it was preferred not to continue. The photograph shows concentrated chewing at both extremities, without the centre of the bone being touched.

Points relative to interest in the product: **4**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

15. Loulou

Mongrel (female, 1½ years old, medium bone, type F, general health conditions good at both examinations: the subject in question showed considerable initial interest for the bones, followed by a period in which attention towards the product diminished. The owner asked if it was possible to have more bones than those foreseen.

The photograph shows signs of consumption of the two extremities, but few tooth marks on the central part of the bone.

Points relative to interest in the product: **5**

Consumption time (1 whole bone): always found remainders

Points relative to animal's state of health: **5**

Except for the three cases, of which one caused by practical questions (dog N° 1), the second due to gastro-enteritis not attributable to the bone (dog N° 13) and the third (dog N° 14) who was injured, none of the animals showed signs of any kind of problem.

This is confirmed by the anatomo-pathological information drawn from the parallel trials on pigs.

It is therefore possible to state that, on the basis of the information gathered so far, that the product is harmless for animals, even when swallowed whole or in large pieces, as may happen with pigs, no lesions to the oesophagus or other parts of the digestive tract were found and no episodes of intestinal block were reported.

The owners of the dogs reported that in most cases the bone or varying residues of the bone were found at the end of each period of administration (1st bone from Monday to Wednesday, 2nd bone from Thursday to Sunday).

The dog's interest in the bone, in most cases, was considerable at first and slowly diminished as the trials went on.

This is probably to be attributed to the initial novelty. Overall it seems possible to identify three patterns of chewing:

- 1) both extremities chewed
- 2) central part of the bone chewed
- 3) whole bone chewed

This behaviour could be related to the size of the animal's mouth, which probably induced them to take the bone into their mouths at one of the extremities, or in the central part.

The puppies showed a greater tendency to chew the extremity of the bone.

TRIALS ON PIGS

Aims

The aim of the trials on pigs was to investigate, in an animal known for its voracity, the probability that the ingestion of a whole bone, or large fragments of the same might cause damage to the digestive system.

1. *The animals*

During the trials 30 pigs in the final fattening stage were used, they were housed in 3 sties containing 10 animals each - live weight between 150 and 160 kg.

The animals in one sty received bones of the SOFT type (model '96), the second sty received bones of the type HARD (model '94). The third sty acted as a control group.

2. *Results*

It was possible to note the interest of the animals which however was different according to the type of bone offered:

- in the case of the HARD BONES the animals, after showing initial interest (first 2 days) paid little attention to the product, in fact when the bones were distributed they did not come to the door of the sty or they came but left the bones untouched. Moreover after the second day of distribution remains of the first days bones were found. This behaviour was repeated, with a variable number of bones, for all the days in which they were administered.
- In the case of the SOFT BONES the animals displayed constant interest and

after initial fear shown on the opening of the sty they began to react to the opening of the door with a conditioned reflex, presenting themselves ready to receive the bones. No remains were ever found in the sty on any of the days in which they were distributed.

- None of the animals in the three sties showed a reduction in appetite.
- No health problems were noticed (no residues or abnormalities in the faeces) which could be attributed to the consumption of the bone, all the animals completed the productive cycle and were sent for slaughter at the end of the trials.

3. Observation on slaughter

When the animals were slaughtered the intestines and where possible the oesophagus of 4 animals per group (CONTROL, SOFT BONES, HARD BONES) were collected.

The following organs were checked:

- oesophagus
- stomach
- duodenum (initial tract)
- Jejunum

The large intestine was palpated without opening (for reasons of hygiene) to discover any portions of bone (no animal in the trials showed signs of intestinal block which would occur if a bone was swallowed whole and this were to end up in the small intestine, considering the small diameter of this tract.

On a macroscopic examination of the mucous of the digestive tract no lesions were noted which could be attributed to the consumption of the bones.

The yellow colour which can be observed in the mucous of some samples is to be

attributed to the foodstuffs administered to the animals on the farm (maize starch, bran, Soya).

4. Inspection of the remainders of the bones

The remainders of the HARD BONES show clear signs of the premolars and the molars of the pigs which indicates vigorous chewing by the animals which did not swallow the bones whole, but chewed them for some time.

In one case it is possible to observe a break in the centre of the bone which occurred 30 minutes after administration, without the animal swallowing the two halves.

The animals swallowed small parts which they broke off after chewing the entire bone.

CONCLUSIONS

From the two trials carried out, on dogs and pigs, it is possible to arrive at certain results regarding the administration of maize starch bones in their formulas SOFT (dogs) and HARD and SOFT (pigs).

As far as the trials on **dogs** are concerned:

- no difference was found with regard to breed, size, age or sex of the animal.
- in particular the interest shown in the bones did not vary between adult dogs and puppies,
- puppies tended to chew the bone on the extremities (see photographs N° 3, 9, and 11)
- the animals showed interest in the product, considerable at first but diminishing as the trials continued,
- in some cases variations in interest were shown, considerable at first, diminishing and then returning,
- one owner reported that he would like to continue offering the bones to his dog (dog N° 15)
- one aspect which might determine the attractiveness of the bone is the flavour, the bones used in the trials were all chicken flavour) which perhaps, if varied by administering bones with different flavours during the week would maintain constant interest.

As far as the **pigs** are concerned:

- no health problems were reported
- all the animals completed their productive cycle and were slaughtered
- no reduction in appetite or inferior performance was noted

SUMMARY OF BONES OFFERED TO DOGS

| N° | Vet | Dog | | | | Notes |
|----|--------------|------------------------------|-----|-----------|----------|--|
| | | Breed | Sex | Age | Bone | |
| 1 | Dr Conti | Maremma sheep dog (Taro) | M | 4 years | Large C | Returned for lack of interest in the bones and practical problems |
| 2 | Dr Conti | Scottish Terrier (Fly) | M | 6 years | Large B | Devoured the bones, polydypsia, polyuria, then normal |
| 3 | Dr Conti | Siberian Husky (Ice) | M | 2 months | Medium F | no problems reported |
| 4 | Dr Conti | Mongrel (Poldo) | M | 7 years | Large B | nor problems reported |
| 5 | Dr Squizzato | Basset Hound (Erik) | M | 9 months | Medium F | no problems reported |
| 6 | Dr Squizzato | German Shepherd (Luna) | F | 9 years | Large A | no problems reported |
| 7 | Dr Squizzato | Mongrel (Chopper) | M | 4 years | Medium F | no problems reported |
| 8 | Dr Ardagna | Labrador (Archibald) | M | 8 months | Large A | Initial interest diminishing |
| 9 | Dr Ardagna | Belgian Sheep Dog (Beatrice) | F | 5 months | Large C | Initial interest diminishing and then returning |
| 10 | Dr Bigli | German Shepherd (Giotto) | M | 3 years | Large C | Initial interest diminishing |
| 11 | Dr Bigli | Basset Hound (Dick) | M | 5 months | Medium F | Initial interest diminishing |
| 12 | Dr Bigli | Mongrel (Truciolo) | F | 5 years | Medium F | Initial interest diminishing |
| 13 | Dr Giorgi | Corsican dog (Lara) | F | 2 years | Large A | Devoured without leaving traces, intestinal problems for other reasons, bones returned |
| 14 | Dr Fanchi | Whippet (Almaglio) | M | 8 years | Medium F | Initial interest diminishing |
| 15 | Dr Giorgi | Mongrel (Lou Iou) | F | 1.5 years | Medium F | Initial interest diminishing and then returning |