Disturbances of Appetite, Food Intake, and Nutritional Status

Hunger is a purely local subjective sensation arising from gastric hypermotility caused in most cases by lack of distension by food.

1- **Appetite** is a conditioned reflex depending on past associations and experience of palatable foods, and is not dependent on hunger contractions of the stomach.

The term appetite is used loosely regarding animals and really expresses the degree of hunger as indicated by the food intake. When variations from normal appetite are mentioned, it means variations from normal food intake, with the rare exception of the animal that demonstrates a desire to eat but fails to do so because of a painful condition of the mouth or other disability. Variation in appetite includes increased, decreased, or abnormal appetite.

2- **Hyperorexia**, or increased appetite, caused by increased hunger contractions, is manifested by **polyphagia** or increased food intake. Partial absence of appetite (inappe tence) and complete absence of appetite (anorexia) are manifested by varying degrees of decreased food intake (anophagia).

3- **Undernutrition** can be defined as a pro longed inadequate supply of nutrients to sustain good health and, in the case of immature or underweight animals, growth potential. For comparison, malnutrition is a deficit, imbalance, or excess of nutrients with consequential adverse effects on health and growth potential.

4- **Abnormal appetites** include cravings for substances, often normally offensive, other than usual foods. The abnormal appetite may be perverted, a temporary state, or depraved, the permanent or habit stage. Both are manifested by different forms of **pica** or **allotriophagia.**

Thirst

is an increased desire for water manifested by excessive water intake (**polydipsia**). The two main stimuli for thirst are increased plasma osmolalityhypovolemia/hypotension.

Osmolality is monitored by receptors in the anterior hypothalamus that are outside the blood-brain barrier, whereas "pressure" is monitored by high- and low pressure baroreceptors in the vascular system and heart. Clinically, diabetes insipidus produces by far the most exaggerated polydipsia.

Specific observations in ponies have shown that water intake is increased in response to either an increase in the osmotic pressure of tissue fluid (from previous water deprivation) or a decrease in the volume of their body fluids (such as from intravenous furosemide administration). Equidae can accommodate and rapidly recover after 72 hours of water deprivation, particularly donkeys and burros, and, consequently, can be considered desert-adapted animals.

The clinical syndrome produced by water deprivation is not well defined. Animals supplied with saline water will drink it with reluctance and, if the salinity is sufficiently great, die of salt poisoning. Cattle at pasture that are totally deprived of water usually become quite excited and are likely to knock down fences and destroy watering points in their frenzy. On examination they exhibit a hollow

abdomen, sunken eyes, and the other signs of dehydration. There is excitability with trembling and slight frothing at the mouth. The gait is stiff and uncoordinated and recumbency follows. Abortion of decomposed calves, with dystocia caused by failure of the cervix to dilate, may occur for some time after thirst has been relieved and cause death in survivors. At necropsy there is extensive liquefaction of fat deposits, dehydration, and early fetal death in pregnant cows.

Experimental water deprivation has been recorded in camels, lactating and nonlactating dairy cows, and sheep. In camels death occurred on the seventh to ninth day of total deprivation; BW loss was about 25%. Lactating cows allowed access to only 50% of their regular water supply become very aggressive about the water trough, spend more time near it, and lie down less. After 4 days milk yield is depressed to 74% and body weight to 86% of original figures. There is a significant increase in serum osmolality with increased concentrations of urea, sodium, total protein, and copper. The PCV is increased, as are activities of creatinine kinase and serum aspartate aminotransferase (AST) activity. With complete deprivation for 72 hours, the changes are similar but there are surprisingly few clinical signs at that time. The composition of the milk does not change markedly and plasma electrolyte concentrations return to normal in 48 hours. Sheep, even pregnant ewes, are capable of surviving even when access to water is limited to only once each 72 hours, but there is a significant loss (26%) of BW. Deprivation of water that allows access to water only once every 96 hours is not compatible with maintaining the pregnancy.

POLYPHAGIA Starvation, functional diarrhea, chronic gastritis, and abnormalities of digestion, particularly pancreatic deficiency, may result in polyphagia. Metabolic diseases, including diabetes mellitus and hyperthyroidism, are rare in large animals but are causes of polyphagia in other species. Internal parasitism is often associated

with poor growth response to more than adequate food intakes. Although appetite is difficult to assess in animals, it seems to be the only explanation for the behavior of those that grossly overeat on concentrates or other palatable feed.

ANOPHAGIA OR APHAGIA Decreased food intake may be caused by physical factors, such as painful conditions of the mouth and pharynx, or to lack of desire to eat. Hyperthermia, toxemia, and fever all decrease hunger contractions of the stomach. In species with a simple alimentary tract a deficiency of thiamin in the diet will cause atony of the gut and reduction in food intake. In ruminants a deficiency of cobalt and a heavy infestation with Trichostrongylidae helminths are common causes of anophagia, and low plasma levels of zinc have also been suggested as a cause. In fact alimentary tract stasis from any cause results in anophagia.

Some sensations, including severe pain, excitement, and fear, may over ride hunger sensations and animals used to open range conditions may temporarily refuse to eat when confined in feeding lots or experimental units. Some sheep that have been on pasture become completely anophagic if housed.

The cause is unknown and treatment, other than turning out to pasture, is ineffective. A similar clinical sign is feed aversion, seen most commonly in pigs, which is rejection of particular batches of feed that are contaminated by fungal toxins, e.g., Fusarium spp., or by the plant Delphinium barbeyi. One of the important aims in veterinary medicine is to encourage adequate food intake by sick and convalescing animals.

Alimentary tract stimulants applied either locally or systemically are of no value unless the primary disease is corrected first. To administer parasympathomimetic drugs parenterally when there is digestive tract atony caused by peritonitis is unlikely to increase food intake. In cattle, the intraruminal administration of 10 to 20 L of rumen juice from a normal cow will often produce excellent results in adult cattle that have been anorexic for several days, provided the primary cause of the anorexia is corrected.

The provision of the most palatable feed available is also of value. Parenteral or oral fluid and electrolyte therapy is indicated in animals that do not eat or drink after a few days. For animals that cannot or will not eat, or in those with intractable intestinal disease, the use of total intravenous feeding (parenteral nutrition) may be indicated. The subject of therapeutic nutrition for farm animals that cannot or will not eat appears to have been ignored. However, in most cases farm animals will begin to eat their normally preferred diets when the original cause of the anophagia or aphagia is removed or corrected.

Intensive fluid therapy may be necessary during the convalescence stage of any disease that has affected feed intake and that may result in a mild depression of serum electrolytes. A reduced feed intake in high-producing dairy cattle during the first few days or weeks of lactation and in fat beef cattle in late pregnancy may result in fatty infiltration and degeneration of the liver and high mortality. Treatment with glucose parenterally and propylene glycol orally to minimize the mobilization of excessive amounts of body fat is indicated. In nervous anophagia the injection of insulin in amounts sufficient to cause hypo glycemia without causing convulsions is used in human practice, and in animals the use of tranquilizing drugs may achieve the same result. In ruminants the effects of blood glucose levels on food intake are controversial, but it seems probable that neither blood glucose nor blood acetate

levels are important factors in regulating the appetite. The anorexia that is characteristic of acetonemia and pregnancy toxemia of ruminants appears to be the result of the metabolic toxemia in these diseases. Electrolytic lesions in the hypothalamic region can stimulate or depress food intake depending on the area affected. This indicates the probable importance of the hypothalamus in the overall control of appetite.

Pica or Allotriophagia

Pica is the ingestion of materials other than normal food and varies from licking to actual eating or drinking. It is associated in most cases with dietary deficiency, either of bulk or, in some cases, more specifically fiber, or of individual nutrients, particularly salt, cobalt, or phosphorus. It is considered as normal behavior in rabbits and foals, where it is thought to be a method of dietary supplementation or refection of the intestinal bacterial flora.

Boredom, in the case of animals closely confined, often results in the development of pica. Chronic abdominal pain caused by peritonitis or gastritis and CNS disturbances, including rabies and nervous acetonemia, are also causes of pica. The type of pica may be defined as follows: **osteophagia**, the chewing of bones;

infantophagia, the eating of young;

coprophagia, the eating of feces.

Other types include **wood eating** in sheep, **bark eating**, the eating of **carrion, and cannibalism**. Salt hunger can result in **coat licking**, **leather chewing, earth-eating**, and the drinking of urine. **Urine drinking** may also occur if the urine is mixed with palatable material such as silage effluent. Bark eating is a common vice in horses,

especially when their diet is lacking in fiber, e.g., when they are grazing irrigated pasture.

Cannibalism

Cannibalism may become an important problem in housed animals, particularly swine, who bite one another's tails, often resulting in severe local infections. Although some cases may be caused by dietary deficiencies in protein, iron, or bulk, many seem to be the result of boredom in animals given insufficient space for exercise. A high ambient temperature and generally limited availability of food also appear to contribute. Male castrates are much more often affected than females, and the bites are also much more severe in males. Provision of larger pens or a hanging object to play with, removal of incisor teeth, and the avoidance of mixing animals of different sizes in the same pen are common control measures in pigs. In many instances only one pig in the pen has the habit and his removal may prevent further cases.

One common measure that is guaranteed to be successful in terms of tail biting is surgical removal of all tails with scissors during the first few days of life, when the needle teeth are removed. Unfortunately the cannibalistic tendency may then be transferred to ears. As in all types of pica, the habit may survive the correction of the causative factor.

Infantophagia

Infantophagia can be important in pigs in two circumstances. In intensively housed sows, especially young gilts, hysterical savaging of each pig as it is born can

cause heavy losses. When sows are grazed and housed at high density on pasture it is not uncommon to find "cannibal" sows who protect their own litters but attack the young pigs of other sows. This diagnosis should be considered when there are unexplained disappearances of young pigs.

Significance of Pica

Pica is defined as a depraved or abnormal appetite and may result from a nutritional deficiency or boredom. It may have serious consequences:

- cannibalism may be the cause of many deaths; poisonings, particularly lead poisoning and botulism, are common sequelae;
- foreign bodies leading to reticulo peritonitis or lodging in the alimentary tract leading to a luminal obstruction;
- accumulations of wool, fiber, or sand may cause obstruction;
- perforation of the esophagus or stomach may result from the ingestion of sharp foreign bodies;
- and grazing time is often reduced and livestock may wander away from normal grazing.

In many cases the actual cause of the pica cannot be determined and corrective measures may have to be prescribed on a trial and error basis. The majority of observational studies identify a relationship between phosphorus deficiency and pica, particularly in ruminants. Horses exhibiting pica may have iron or copper deficiencies.

Starvation

Complete deprivation of food causes rapid depletion of glycogen stores and a change over in metabolism to fat and protein. In the early stages there is hunger, increase in muscle power and endurance, and a loss of body weight.

In sheep there is often a depression of serum calcium levels sufficient to cause clinical hypocalcemia. The development of ketosis follows associated with increased fat utilization and an increased serum concentration of NEFAs.

Plasma and urine concentrations of allantoin are decreased in goats and sheep during fasting as a result of depressed microbial protein production in the forestomach. A marked reduction in feed intake in pony mares in late pregnancy is often a pre cursor of hyperlipemia.

In a case series of chronically starved horses, a low body condition score was accompanied with a lower serum urea nitrogen concentration (caused by low protein intake), a normocytic and normochromic anemia, and an increased serum total bilirubin concentration.

The serum urea nitrogen to creatinine concentration ratio is considered a better index of protein wasting than serum albumin or total protein concentrations, with a ratio deprivation is increased serum concentrations of triglycerides, cholesterol, and glutamate dehydrogenase, which reach a peak by the eighth day of fasting but quickly return to normal when feeding is resumed.

This degree of change in blood lipids appears to be a characteristic of ponies and horses; it is much higher than that in pigs. In lactating cows, a short period of starvation results in depression of plasma glucose and an increase in plasma lipid concentrations. Milk yield falls by 70%. On refeeding most levels return to normal

in 5 days but blood lipid and milk yield may take as long as 49 days to recover to normal levels.

In horses, fecal output falls to zero at day 4 and water intake is virtually zero from that time on, but urine volume is maintained. In spite of the apparent water imbalance there is no appreciable dehydration, and plasma protein levels and PCV stay at normal levels. A significant loss of skin turgor (increase in skin tenting) caused by the disappearance of sub cutaneous fat as cachexia develops may occur. Muscular power and activity decrease and the loss of body weight may reach as high as 50% to 60%. The metabolic rate falls and is accompanied by a slowing of the heart and a reduction in stroke volume, amplitude of the pulse, and blood pressure.

The circulation is normal as indicated by mucosal color and capillary refill. In the final stages, when fat stores are depleted, massive protein mobilization occurs and a premortal rise in total urinary nitrogen is observed, whereas blood and urine ketones are likely to diminish from their previous high level. Great weakness of skeletal and cardiac musculature is also present in the terminal stages and death is caused by circulatory failure. During the period of fat utilization there is a consider able reduction in the ability of tissues to use glucose and its administration in large amounts is followed by glycosuria.

In such circumstances readily assimilated carbohydrates and proteins should be given in small quantities at frequent intervals but fatty foods may exacerbate the existing ketosis. Diets for animals that have been through a period of great nutritional stress because of deprivation of food or because of illness are described in the following section.

Starvation of farm livestock is an animal welfare issue with economic and ethical considerations. When starving animals are identified by a neighboring farmer

or veterinarian they are commonly reported to the appropriate authorities, which may be provincial or state-appointed inspectors (animal care officers) who have the authority to take appropriate action. The animals are examined and corrective action is taken, including possession of the animals and relocating them to a commercial feeding facility. Predicting survival of starved animals is a major challenge. Economics becomes an important aspect because the financial costs of stabilizing a group of starved horses may exceed their free market price. Responsible management of chronically starved commercial animals should include options for immediate euthanasia. Ethical considerations include deciding if certain severely starved animals should be euthanized. In some cases, enforcement officers may be reluctant to recommend mass euthanasia of otherwise healthy horses based on personal aversion. Chronically starved horses lose body weight, become weak, and their body condition score may decline to below 2 on the basis of 1 to 9, and death is common, especially during cold weather. Chronically starved horses frequently respond poorly to refeeding. About 20% of severely malnourished horses can be expected to die in spite of attempts at refeeding.

Recovery of severely malnourished horses to an average body condition score may require 6 to 10 months.