We summarized the data from a mutual relief livestock insurance program, an insurance system applied under the Law of Compensation for Agricultural Damage, to determine the incidence of equine acute abdomen in the Hidaka district, a major horse-breeding region of Japan. A retrospective survey was conducted over a three year period, from January 2001 to December 2003. During this time, the number of cases of acute abdomen was 8,481 out of a total of 53,756 cases of diagnosed diseases (15.8%). During the same period, the number of cases of death due to acute abdomen was 306 out of a total of 1,106 deaths (27.7%). When a provisional population was calculated from the number of horses insured in November 2002 (45,624), the annual rates of “disease or injury” and “death or disuse” due to acute abdomen were 18.6% and 0.7%, respectively for the three year period. The most common forms of acute abdomen were intestinal tympany and constipational colic (5,455 cases, 64.3% of all acute abdomen cases); and volvulus was the most frequent cause of death (108 cases, 35.3% of the number of deaths due to acute abdomen). The incidence of intestinal obstruction, intestinal narrowing, intussusception and volvulus was highest from May to August (79 cases, 53.4% of a total of 179 cases). The mortality rate of acute abdomen was highest in those horses older than 21, followed by the range in age from 16 to 20. The removal of the factors associated with acute abdomen which are indicated in this report may be useful for prevention of acute abdomen.

Key words: acute abdomen, breeding region, colic, horse

This article was accepted November 14, 2005
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Materials and Methods

The Hidaka Agricultural Mutual Relief Association manages a mutual relief livestock insurance program based on the Law of Compensation for Agricultural Damages in the Hidaka district of Hokkaido, Japan, underwriting insurance for more than 15,000 “general horses” annually. Stock farmers choose whether their farm is to be enrolled and if he or she decides to join the insurance program all animals on the farm must be enrolled with the system according to an “open policy”, for which all the animals fed are enrolled in the program. If an illness, disease, injury or accident occurs in an insured horse, it is classified for insurance purposes as “a case of disease or injury”. If an insured animal dies or is moribund, or the animal becomes unfit for use due to loss of feeding value, the animal is treated as “a case of death or disuse”. Medical records of these cases in the mutual relief insurance program are maintained on computers. A retrospective examination was performed on the data collected from January 2001 to December 2003.

The number of horses insured was 15,208 on February 2nd in 2002, the mid-point of the research period. The age composition was as follows: 4,843 foals (horses under one year of age), 2,615 yearlings (one-year-old horses), 317 two-year-old horses and 7,433 horses older than 3 years of age. Foals are enrolled in the mutual relief program in the third month after they are born. According to the list of breeding horses issued by the Hidaka Breeders Association, the number of horses bred within the Hidaka district in 2002 was 6,901. Therefore, insured foals accounted for 70.2% of the total number of foals. Most foals were kept within insurance coverage when they became yearlings, but nearly half of them were not insured at the time of this survey in November because they were sold at the yearling sale in the following summer. Less than 10% of the study population was comprised of 2, 3 and 4-year-old, the age at which Thoroughbreds race. The group of horses greater than 3 years of age was comprised of 269 males and 7,164 females. Most were broodmares.

From the data we sampled diseases which are encompassed by the definition of acute abdomen: gastric ulceration, gastric dilatation, gastric rupture, pyloric constriction, intestinal obstruction, intestinal narrowing, volvulus, intussusception, enteritis, intestinal ulcer, intestinal tympany and constipation, intestinal rupture, spasmodic colic and other intestinal diseases, gastroenteritis, peritonitis, mesenteric vascular occlusion, which are categorized as gastrointestinal diseases; diaphragmatic hernia, which is categorized as a respiratory disease; rotavirus infection, which is categorized as a viral disease; and ascariasis, which is categorized as a parasitic disease.

Results

The number of “disease or injury” cases in insured horses was 53,756 in the period from 2001 to 2003. Of these, there were 9,089 cases that corresponded to gastrointestinal disease and 8,481 that fell into the acute abdomen category described above. In this period, the number of “death or disuse” cases was 1,106. Of these, the number of cases which corresponded to acute abdomen was 306. When the total number of horses insured, 15,208, was taken as the population parameter, the annual rates of “disease or injury” and “death or disuse” due to acute abdomen were 18.6% (8,481/[15,208 × 3]) and 0.7% (306/[15,208 × 3]), respectively.

The number of cases of “disease or injury” by acute abdomen category are shown in Fig. 1. For “disease or injury”, intestinal tympany and constipation accounted for 64.3% of all cases. Enteritis was the next most common cause of acute abdomen accounting for 20.8% of all cases.

The number of cases of “death or disuse” by acute abdomen category are shown in Fig. 2. The most common cause of “death or disuse” was volvulus, of which there was 108 cases, followed by 57 cases of intestinal rupture. Of the 26 horses in which gastric rupture occurred, 12 were foals. Twenty cases, which consisted of 12 cases of gastric rupture and 8 cases of gastric ulceration, corresponded to “death or disuse” due to gastro-duodenal ulceration in foals.

In spring through summer (March to August), “death or disuse” cases of acute abdomen increased. The incidences of obstruction, strangulation (intestinal obstruction, intestinal narrowing, intussusception and volvulus) and intestinal rupture by month are shown in Fig. 3. The incidence of obstruction, narrowing, intussusception and volvulus was highest from May to August, with its peak incidence occurring in June. Seventy-nine cases occurred in the period of May to
August accounting for 53.4% of the total number of annual cases (179 cases). Numerous episodes of intestinal rupture were observed from March to May, with peak incidence occurring in April. Thirty-six cases occurred in the period of March to May accounting for 63.2% of the total number of annual cases (57 cases).

Figure 4 shows the mortality rate due to acute abdomen by age group, each of which were calculated by dividing the number of cases of "death or disuse" due to colic by the number of horses insured on November 2nd, 2002 in each category. The mortality rate due to acute abdomen was highest in horses older than 21 years of age, a value of 9.0%, followed by horses in the 16–20 years of age category, 4.5%. The rates of "death or disuse" due to acute abdomen in foals and yearlings were relatively low, both equaling 1.5%.

Discussion

In this study, the clinical course in each case was not examined separately because only disease names were retrieved from the data collected by the livestock mutual relief insurance program. There were therefore no inspections carried out by the researcher to determine whether colic episodes were seen in each case or whether the episodes were consistent with acute abdomen as defined above. The results of a survey suggest that 72% of equine colic is not clearly diagnosed as spasmodic [6], and another report suggests that a specific diagnosis is not made for 81% of colic episodes [7]. In the present study we also include cases in the "disease or injury" category for which surgery or an autopsy was not performed to confirm diagnosis. We conducted the survey due to the importance of gaining an overview of the incidence of gastrointestinal disease in more than 15,000 horses over a three year period.

In the three years of the survey, the retrieved cases for which the diagnosis fell under our category description of acute abdomen totaled 8,481, accounting for 15.8% of the total of 53,756 "disease or injury" cases for these years. For "death or disuse", 306 episodes of acute abdomen were seen over these years, accounting for 27.7% of the total of 1,106 "death or disuse" cases. This result suggests that acute abdomen
Fig. 2. Case numbers of “death or disuse” due to acute abdomen.

Fig. 3. Incidence of “death of disuse” due to acute abdomen by calendar month.
is one of the main causes of death in horses within the breeding region of Hidaka.

When the number of insured horses, 15,208 animals, was taken as the population parameter, the annual rate of "disease or injury" corresponding to acute abdomen was 18.6% \( \frac{8,481}{15,208 \times 3} \). In systematic surveys performed on cases of colic in the recent decade, the crude incidence density rate of colic was found to be 10.6 cases/100 horses per year [7], and the annual national incidence of colic in the United States horse population was estimated to be 4.2 colic events/100 horses per year [9]. The incidence rate found by the present study was considerably higher than either of the two previously mentioned results. A recent change in diet [3, 4], feeding high levels of concentrate [8], being a Thoroughbred [7] and the presence of parasites [2, 10] have been reported as risk factors associated with colic. In the Hidaka district, where there are seasonal changes in roughage feeding due to climatic conditions, relatively high levels of concentrate are fed, and most horses are Thoroughbreds. It is clear that the factors affecting the horse population examined in this study may put individuals at a greater risk of developing colic, leading to a higher disease incidence.

The incidence rate of "death or disuse" was determined to be 0.7%. This result corresponds to the report stating that the mortality rate for colic was 0.7 deaths/100 horses per year [7].

As for disease categories, volvulus was the most common "death or disuse" cases, accounting for 35.3% of total events, while intestinal tympany and constipation accounting for 64.3% of all cases of "disease or injury". The significant difference between fatal colic and the most common colic suggests that an accurate differential diagnosis is necessary to identify cases that need laparotomy among the numerous colic cases for preventing death due to acute abdomen.

Seasonal variation was observed in the incidence of "death or disuse" due to acute abdomen. The highest number of cases of intestinal rupture in March to May is supposed to indicate that most of them were caused by delivery. Forty-two of 57 cases with intestinal rupture were female horses over 6 years old.

Half of the annual cases of obstruction and strangulation occurred from May to August, with the peak incidence occurring in June. This peak coincides with the season during which a large amount of feed is given in the form of fresh forage [5]. Research in the United Kingdom found that although there was seasonal variation in the number of colic cases, no statistically significant correlation was found when the
seasonal incidence of colic was compared with monthly temperature, change in monthly temperature, monthly rainfall or rainfall weighted for temperature [6]. In the present study, the seasonal variation of the incidence of colic in horses in the Hidaka district was much more marked than those of the previously mentioned studies in the UK and USA [6, 7]. Asai et al. reported that long-time grazing in summer increased digestible energy intake of horses in the Hidaka district [1]. The observed seasonal variation of the incidence of colic is clearly associated with feeding management. Careful feeding management in colic outbreak seasons is needed in the Hidaka district, where the roughage fed varies markedly according to season.

The incidence of “death or disuse” due to acute abdomen by age was highest in horses older than 21 years of age. Outside Japan, results have shown that the number of surgical colics in horses over 15 years old is significantly higher than those in other age groups [6]; that one of the risk factors significantly associated with colic was age over 8 years [4]; and that a horse over the age of 10 years is at increased risk of developing colic [6]. This study similarly confirms that aging increases the risk of “death or disuse” from acute abdomen.

The results in the present study also show that acute abdomen is one of the most common causes of death in Hidaka, a horse-breeding region. Further and more detailed research is likely to reveal which risk factors are associated with an increased incidence of acute abdomen and thus facilitate a decrease in the rate of disease or death related to acute abdomen in the breeding region.

Acknowledgments

The author thanks Kate Sawford for her assistance with preparation of the manuscript.

References