World Rabbit Science

World Rabbit Sci. 2006, 14: 33 - 38

PREVALENCE OF TRICHOBEZOARS IN ANGORA RABBITS IN SUB-TEMPERATE HIMALAYAN CONDITIONS

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Abstract: Trichobezoars (formations of hair balls that can not pass through the pyloric valve) are responsible of some of deaths observed in Angora rabbirs. A total of 160 trichobezoar deaths corresponding to 28.6% of total deaths were recorded during a reported period of five years. The highest mortality due to hair balls was recorded in 2001 (36.4 %) and was least in 1999 (9.4%). Of the four breeds, the highest trichobezoar death records were obtained in Russian Angoras and the lowest in German Angoras. Trichobezoars occur more frequently in winter months than other months. Besides trichobezoars, other causes of death recorded were pneumonia, suppurative pneumonia, peritonitis, rupture of stomach, gastroenteritis, cardiac failure and a small number of miscellaneous causes. In most of the cases, large, single trichobezoars were located in the stomach. The stomach contents of the trichobezoar deaths were mainly watery and scanty faeces and hard semisolid faeces. The ball obstructed the stomach occupying the opening of the pyloric valve. Pathomorphological lesions were noted in stomach, liver, lungs, heart and kidney.

Key Words: trichobezoars, hair ball, Angora rabbits, prevalence.

INTRODUCTION

Trichobezoars are formations of hair balls that combine with the stomach contents inside the stomach and can not pass through the pyloric valve, resulting in the death of the rabbit. In the Angora rabbit, trichobezoars are not caused by one abnormal ingestion of wool, but are rather the cumulative ingestion of small quantities of hair through licking of fur, failing to be evacuated through the digestive tract. Angoras are the rabbits most affected, but shorthaired breeds are not immune. Hair balls are formed by ingestion of the rabbits' own wool as well as that of other members of its group, and indigestible foreign matter like plastics and polythene. These effectively obstruct the gastrointestinal tract (Spalding and McLelland, 1990). Rabbits naturally ingest some of their own wool as the coat grows, so it is a habitual and behavioral problem. Amount of light available, population status, and genetic factors may have an influence on the incidence of hair balls. The condition is more prevalent when rabbits are reared in wire-mesh cages (Lebas *et al*., 1986). Rabbits also pluck their own hairs, mainly from breast, milk gland and feet, and use it to build their nests at the third stage of pregnancy, and occasionally swallow some of the wool. Imbalanced feed with low fiber content and lack of essential amino acids may induce rabbits to eat their own hair. In most cases, the rabbits die either of impaction of the hair ball or starvation (Rashwan and Marai, 2000). Mortality due to trichobezoars accounts for about 20 to 45 percent of total deaths. In this study an attempt has been made to determine the incidence of breed, sex, age, year, and year season on hair balls formations, as well as post mortem investigation of hair ball death cases.

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Received *January 2005* - Accepted *September 2005*.

MATERIAL AND METHODS

Collection of data

The necropsy records of four breeds viz. German, Russian, British and their crosses (A1) of Angora rabbits maintained at the North Temperate Regional Station of Central Sheep and Wool Research Institute, Avikanagar, Rajasthan for a period of five years (1999-2003) were analyzed to study the prevalence of trichobezoars. The Station is located at latitude 31.58° N, longitude 77.20° E, with an average annual rainfall of about 840 mm. It has typical sub-temperate climatic conditions with a maximum temperature of 30 to 34°C and minimum of –2 to –4°C, with occasional snowfalls. The Station is situated at a height of 1400-2100 meters above mean sea level. The relative humidity of this area varies from 65-100%.

The rabbits are housed in individual hanging cages in different buildings. A close observation for the occurrence of disease and apply treatments was kept. *Post mortem* studies were made immediately after the death of rabbits in order to diagnose diseases. Pathomorphological lesions in different visceral organs, especially the stomach, small and large intestines, liver, lungs, kidney, heart, gall bladder... were noted. Sizes of hair balls were classified into four groups, viz. (a) glass ball to small marble size, classified as small, (b) table tennis ball size as medium, (c) from more than table tennis ball size to nearly size of full stomach was categorized as large, and (d) hard balls of full stomach size with hair and feed content coated with mucus were categorized as very large. Death from other causes in the presence of hair balls was also noted as a second diagnosis. The entire year was divided into three main seasons, viz. March to June as summer, July to October as rainy and November to February as winter. The Equivalent Average mortality (Death) Rate (EADR) per 1000 animals days was calculated as: EADR = (Total mortality cases reported / Total animals days at risk) X 1000.

Statistical and data Analysis

The data were analyzed using the chi-square method as described by Snedecor and Cochrane (1989) for studying the effect of breed, sex, year, month and season on various epidemiological parameters.

RESULTS

Incidence of trichobezoars

Out of a total of 560 deaths, 160 trichobezoar cases were recorded during the five-year period. The mortality rate due to hair balls was estimated to be 28.6% of total deaths. The incidence of hair balls among various breeds and years was significantly different ($P< 0.05$). The highest values for mortality rate (36.4%) due to the condition were obtained in the year 2001 and the lowest (9.4%) in 1999. The incidence of hair balls by years was erratic in nature (Table 1).

The values for the EADR were the lowest in 1999 (0.09065) and highest in 2003 (0.2340). Considered by breed, the highest hair ball deaths out of total mortality were in Russian Angoras (46.5%) followed by cross breeds (45.5%), British Angoras (42.9%) and German Angoras (25.0%). Any significant effect of sex on hair balls vulnerability was found, but femals showed slightly greater frequency (55.6%). Except for one grower, all the 159 hair ball cases were observed in adult rabbits. Therefore, the problem seems to be confined to adult rabbits. By month, the highest number of hair ball deaths occurred in January (21, 13.1 %) for the reported five-year period, and the lowest deaths in April (4, 2.5 %). It was observed that hair balls are more prevalent in colder months in comparison to the warm and rainy months (Table 2). By season, the highest incidence of hair ball occlusion occurred in winter (68, 42.5 %) followed by the rainy season (54, 33.75%) and summer (38, 23.75%). The variation in the incidence of hair balls for different months and seasons was statistically non significant.

Table 1: Incidence of trichobezoars in Angora rabbits.

Year	GA	RA	BA	A1	Male	Female	H deaths	Total deaths	%H deaths	Animal days	EADR
1999	6 (95)	2 (8)	-(3)	3 (11)	5 (60)	6 (57)	11	117	9.4	67635	0.1626
2000	19 (59)	9 (20)	2 (4)	4 (11)	12 (36)	22 (58)	34	94	35.0	60937	0.5579
2001	30 (87)	2 (4)	1 (3)	3 (5)	17 (48)	19 (51)	36	99	36.4	54421	0.6615
2002	27 (96)	2 (2)	2 (4)	-	13 (59)	18 (43)	31	102	30.4	61167	0.5668
2003	34 (126)	5 (9)	4 (7)	5 (6)	24 (80)	24 (68)	48	148	32.4	66636	0.7203
Total	116	20	9	15	71	89	160	560		310796	0.5148
Total deaths	463	43	21	33	283	277					
%H	25.0	46.5	42.9	45.5	25.0	32.1			28.6		

Breed (χ^2=7.81, P<0.05). Sex (χ^2=3.84, P<0.05).
H: Hair balls.
GA, RA, BA and A1: German, Russian, British and their crosses of Angora rabbits.
Number of death rabbits appears in brackets.
EADR: Equivalent average mortality rate per 1000 animals days.

Second causes of death

A total of 66 (44.25%) Angoras died for other diseases as primary cause, in the presence of hair balls. The other causes of death recorded were pneumonia (31, 19.4 %), suppurative pneumonia (6, 3.8 %), peritonitis (4, 2.5 %), rupture of stomach (3, 1.9 %), gastro-enteritis (, 3.1 %), cardiac failure (4, 2.5%) and others (13, 8.12 %). It was observed that most of the time a single hair ball was formed (153, 95.6%), but in 7 cases (4.4 %) there were multiple hair ball occlusions. Of these 7 cases, three cases had two balls, three cases had three and one case was found with four small hair balls causing occlusion of the pyloric valve/stomach.

Table 2: Incidence of trichobezoars in function of the experimental month and year.

	1999	2000	2001	2002	2003	Total	%
January	2	3	6	8	2	21	13.1
February	-	2	4	12	2	20	12.5
March	1	1	-	2	4	8	5
April	1	-	-	-	3	4	2.5
May	-	4	1	1	9	15	9.4
June	-	4	4	2	1	11	6.8
July	2	5	1	1	5	14	8.7
August	1	4	5	3	2	15	9.4
September	-	3	4	-	8	15	9.4
October	1	1	2	1	5	10	6.2
November	-	4	2	-	4	10	6.2
December	3	3	7	1	3	17	10.6
Total	11	34	36	31	48	160	100.0
Total death	117	94	99	102	148	560	

Year (χ^2 = 9.49, P<0.05); Month (χ^2 = 16.00; P<0.05).

Table 3: Pathological lesions in visceral organs.

	Condition of small intestine				Condition of large intestine			Liver	Lung	Kidney	Heart
Year	E&G	C	Y	S&C	E&G	C	S	C&H	P&S	C&H	C&H
1999	2	1	-	3	2	3	-	4	3	-	-
2000	12	4	7	10	14	5	10	25	5	1	-
2001	26	2	29	3	15	3	19	31	15	2	-
2002	19	3	13	9	13	3	12	14	11	3	4
2003	9	32	6	23	9	31	20	40	36	19	22
Total	68	42	55	48	53	45	61	114	70	25	26

E&G: Empty & gas; C: Congestion; Y: Yellowish colour; S&C: Scantyfeces & collapse; S: Scantyfeces ; C&H: Congestion & hemorrhagic; P&S: Pneumonic & suppuration

Size of trichobezoars

Regarding the size of hair balls observed, the number of small, medium, large and very large types were 57, 7, 84 and 9, respectively, corresponding to 35.62, 4.37, 52.5 and 5.62 percent, respectively. It was also noted that large hair ball formations are more common. These cause complete blockage of the passage of ingesta towards the small intestine, leading to inevitable death due to inanition and complications.

Nature of stomach content and occlusion at death

The nature of stomach contents were of two types, (a) watery and scanty and (b) hard, semisolid with mucus coating. Of these two types, 80 cases (50%) were semisolid, mucoid content whereas, in 66 cases (41.3 %) the stomach contents were watery and scanty. The remaining 14 cases (8.8%) were in between these two conditions. Of the 160 hair ball death cases, 115 (72 %) occluded at the pyloric end of the stomach, blocking the pyloric sphincter orifice and in 45 (28%), the ball occluded at different points of the stomach and pyloric sphincter.

Pathomorphological changes in viscera

Investigation of the nature of the contents of the small intestine revealed empty of contents with accumulated gas (68, 42.5%), yellowish intestine (duodenum due to secretion of bile into the empty small intestine (55, 34.4 %), collapsed intestine, scanty faeces without gas (48, 30%), and congested and haemorrhagic intestinal wall and muscles (42, 26.3 %) (Table 3). Similarly, the lesions of the large intestine with scanty faeces (61), empty and accumulation of gas (53), congestion and haemorrhaging (45). In addition to lesions in the gastrointestinal tract, the pathomorphological effects of trichobezoars on other affected organs were congestion, haemorrhaging and fatty changes in liver (114, 71.2%), congestion of lungs, haemorrhagic pneumonia and suppurative changes in lungs (70, 43.8 %). Kidney (25, 15.6%) and heart (26, 16.3 %) were also found to be affected with pathological lesions such as congestive and haemorrhagic changes.

DISCUSSION

Incidence of trichobezoars

Trichobezoar deaths are very common in Angora rabbits. Almost a quarter of the total deaths in the Angora rabbit population was due to this non–infectious cause of death. The mortality due to this condition was mostly confined to adult rabbits, as the disease process requires a prolonged time of

continuous eating of small amounts of indigestible hair from their own and neighbours' body coat (Harkness and Wagner, 1977). Trichbezoars are not caused by ingestion of abnormal quantities of hair, but rather by the failure to evacuate the ingested wool on account of the consumption of too great a quantity of concentrate (Rougeot and Thebault, 1977). It has been reported that of the deaths from specific diseases, the highest mortality in Angora rabbits was due to hair ball occlusion (Annaul Report, 2002-2003). Hair ball deaths are more common during pregnancy and in the moulting season and cause significant financial losses (Okerman, 1988). Of the four Angora breeds, the highest hair ball deaths were found in Russian Angora (46.52%) and the lowest in German Angora (25.0%). The main cause of this variation may be due to the variation in the wool-shearing interval. In the German Angora, shearing is done at 75-day intervals whereas, for other breeds it is done at 90-day intervals. The higher occurrence of hair balls in the winter months, may be due to post partum hunger and the stress of parturition in females, coupled with the shedding of wool. The skin infection with mange that mostly occurs in the pre-winter period, causes itching and consequently the swallowing of loose hair, resulting in the occlusion of the ball in the stomach in winter (Mondal *et al.,* 2005).

Secondary causes of death in the presence of trichobezoars

In a number of cases of death due to trichobezoars, there were found to be other organs involved in the death. The characteristic lesion and damage to these organs may also have caused the death of the rabbit and could possibly be termed as a secondary cause of death. The stomach is one of the vital organs and serves for the storage and digestion of feed. The presence of trichbezoars in the stomach alters both these functions. The blockage of the pyloric end with a hair ball leads to stagnation of feed and other materials in the stomach. Anorexia follows with gradual weakness and starvation, leading to bacterial fermentation and toxicity. As the liver stores many nutrients, it undergoes changes due to lack of nutrients caused by the obstruction. This starts with fatty degeneration of the liver. The lack of nutrients causes a lowering of the immune status and other organs become affected (Okerman, 1988). The lungs are directly connected with the environment and become affected by different microorganisms, leading to death from pneumonia and suppurative pneumonia. The hair ball can sometimes become too large for the stomach and with bacterial fermentation causes digestion of the stomach wall, resulting in rupture of the stomach and immediate death. The contents of the ruptured stomach on contact with the abdominal cavity and peritoneum cause peritonitis. Deaths due to cardiac failure, gastritis, hepatitis, septicemia, debility may also occur with hairball obstructions.

Number and size of trichobezoars

Generally, hair balls occur in a single ball obstruction, but in this study it was found that seven hair ball deaths were due to multiple obstructions. Hair balls obstruct the passage of ingesta from stomach to the intestine. The pyloric sphincter acts as a gate between stomach and intestine. Once the pyloric valve is blocked, the movement of ingesta is impossible. The incidence of large hair balls was highest (84, 52.5%), followed by small (57, 35.6%), very large (9, 5.6%) and medium (7, 4.4%).

Pathomorphological changes

Rabbits suffering from this condition take scanty feed and subsequently show symptoms of starvation. Intestinal content remained comparatively low in the affected rabbits and intestinal motility increased. The small intestine showed four different pathological conditions, including (a) empty with accumulation of gas (68, 42.5%), (b) congestion and haemorrhagic (42, 26.25%), (c) yellowish intestinal wall (55, 34.37%) due to secretion of bile in the empty intestine and (d) collapsed small intestine with scanty faeces (38, 30%) due to blockage of digested or semi digested feed from stomach (Hinton, 1979). For the same reason, there are small amounts of fecal mass in the large and small intestines. In this study three different pathomorphological changes were noted. These were: (a) empty with

accumulation of gas in the large intestine, especially in the caecum (53, 33.1%), (b) congestion and haemorrahagic lesions (45, 28.1%) and (c) scanty faeces (61, 38.1%). Besides the effects on the gastrointestinal tract, other visceral organs were found to be affected. The most frequently affected organ was the liver (114, 71.25%) with pathomorphological lesions of congestion, haemorrahges and fatty degeneration. Lungs were the second most affected organs, with pathological lesions of congestion, pneumonic and suppurative pneumonic lesions (70, 43.8 %). Heart (26, 16.25%) and kidney (25, 15.62%) were almost equally affected with pathological lesions of congestion and haemorrhagic changes. If the feed particles do not move out of the stomach, bacterial fermentation and toxicity occur in the gastric environment. Most of the animals die of infection, stress, starvation and organ failure. Similar observations were also reported by Spalding and McLelland (1990).

CONCLUSIONS

In this work, mortality due to trichobezoars in Angora rabbits in the sub-temperate Himalayan conditions of Himachal Pradesh was studied for a period of five years. Based on breed, the highest mortality was found in the Russian, followed by the hybrid, British and German rabbits. The rabbits proved to be more susceptible to trichobezoars in the winter months in comparison to other months. Necropsy findings revealed that 66 Angoras died of causes other than trichobezoars, viz. pneumonia, suppurative pneumonia, peritonitis, rupture of stomach, gastritis, cardiac failure and other miscellaneous causes. In most of the cases, the size of the hair ball was large and obstructed the pyloric end of the stomach. The pathological lesions in intestines were congestion, haemorrhages, yellowish intestinal wall, empty of content and scanty faeces. Pathological lesions were also found in liver, lung, kidney and heart.

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