Clinical Disorders Observed in a Beagle Breeding Colony

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Disorders in a beagle breeding colony were discussed, based on 472 clinical charts made in 1974–1983. In 201 neonates less than a week old, hypothermia associated with pneumonia was mostly seen. In 31 puppies from one week to two months old and in 46 young dogs from two months to a year old, pneumonia, canine parvovirus infection, dermal abscess and dermatosis were mostly found. In 91 dogs aged from one to five, trauma, intervertebral disc protrusion, dermal abscess, dystocia, claudication and othematoma were frequently noted. In 103 animals over five years old, intervertebral disc protrusion, tumors, abscess, trauma and othematoma were observed most often.

About 120 dogs have been kept for research planning in the beagle breeding colony of our institute. It is necessary and important to undertake individual diagnoses and treatments for various diseases in order to keep the colony normal and prevent dogs from infections.

The disorders were classified into several age groups from the clinical charts made in our breeding colony during the past ten years (1974–1983) and were discussed from the aspect of subjects for breeding colonies of beagles for experimental animals.

Materials and methods

The beagle breeding colony consists of almost the same number of males and females at various ages, including about 15 females and five males for mating. Breeding has been repeated by way of inbreeding since 1972, and 423 neonates have been obtained from 64 deliveries.

Four hundred and seventy-two clinical charts, including those on 201 neonates less than a week old and 271 older puppies and dogs have been accumulated since 1974 (Table 1). These charts were classified into several age groups as follows: neonates under a week old, puppies from one week to two months old (up to weaning) and from two months to a year old (from weaning to young adulthood), adult dogs of one to five years old and older dogs aged five or more.

Table 1. Clinical cases in the beagle breeding colony

Age	No. of dogs	No. of clinical cases
Neonates	201	201
Over one week old	222	271
Total	423	472

All animals were housed in stainless steel cages, 70×70×70 cm, and kept in an air-conditioned room where the temperature was 22±4°C and the relative humidity 55±10%, and in an alternating 12-hour light-dark cycle. They were exercised daily for one hour in groups of 30-40 dogs. All cages were washed in hot water and disinfected daily. Feces and urine were cleaned up at intervals of 4-6 hours with the automatic clean system (Tokiwa kagaku Co. Ltd.). All dogs were fed on a commercial dog diet (CD-5, Clea Japan Inc.) and given water *ad libitum*.

For health care, the conditions of appetite, behavior and excreta were observed daily for all animals. When dogs were exercising, simple palpations were done. The body weights were measured every day for neonates, puppies and young dogs under three months old, twice a month for young dogs of 3-6 months old and once a month for dogs over six months old. Furthermore, as a medical checkup at regular intervals, blood and serum biochemical examinations were done four times a year, as well as parasitic

examinations twice a year. Vaccinations, against canine distemper, hepatitis and leptospirosis were routinely undertaken at two and a half to three months. That for canine parvovirus infection began from 1983.

When dogs showed untoward signs, careful observations, blood tests and other close examinations were carried out. Roentgenography was done for dogs with suspected intervertebral disc protrusion, claudication, fracture, dislocation and pneumonia. Myelography was employed for intervertebral disc protrusion. Biopsies and pathological examinations were carried out for tumors and abscesses. The antibody values of canine parvovirus, canine distemper, hepatitis and leptospirosis have been checked routinely since 1983. Microbiological examinations have not been done, except for significant infectious diseases.

Autopsies and pathological examinations were undertaken when dogs died. The diseases were finally diagnosed from the results of clinical and pathological examinations.

Table 2. Clinical and autopsy findings of neonates under one week old

Clinical and autopsy findings	Number of cases	Causes
Death from traumatic asphyxia or bite	20	Immature childcare by bitches
Pneumonia, pulmonary edema, aspiration pneumonia, peritonitis, intracranial bleeding	21	Technical mistakes by animal caretakers(aspiration of milk, drop neonates on the floor)
Hypothermia	150	Immature childcare by bitches (refusal of embrace), technical mistakes by animal caretakers (misjudgement of setting temperature of warming box)
Stillbirth	10	Malformation, pyometra (bitch)

Results

1. Disorders in the neonates

Clinical and autopsy findings on disorders of 201 neonates are shown in Table 2. One hundred and seventy neonates (170/201=84.6%) died within one week after birth. In many cases, clinical signs such as chilling and hypothermia were frequently observed, associated with pneumonia

or pulmonary edema as well as death from traumatic asphyxia. Hypothermia could be recovered only by keeping the animals in a warmer condition at 32-34°C. Neonates who died during artificial feeding were often noted to have peritonitis. Generally, the administration of antibiotics and infusion of solution had few remarkable effects. As estimated from clinical and autopsy findings, the causes of untoward symptoms and death

Table 3. Clinical disorders in beagles over one week old

Diseases, Clinical signs	Total number of cases	Puppies (1 week- 2 months)	Puppies (2 months- 1 year)	Adult (1-5 years)	Elderly (more than 5 years)
Trauma	30	2	1	19	8
Abscess	23	2	3	8	10
Hematoma	4	0	0	3	1
Othematoma	11	0	0	4	7
Claudication	5	1	0	4	0
Fracture	1	0	1	0	0
Dislocation	1	0	1	0	0
Intervertebral disc protrusion	42	0	0	9	33
Pneumonia	27	5	17	1	4
Cystic calculosis	6	0	0	5	1
Hematuria	5	0	1	1	3
Dermatosis	11	5	2	3	1
Inflammation of nictitating membrane	8	0	2	5	1
Conjunctivitis	4	0	1	2	1
Glaucoma primarium	1	0	0	0	1
Peritonitis	1	1	0	0	0
Endometritis	1	0	0	1	0
Pyometra	1	0	0	1	0
Dystocia	8	0	1	7	0
Mammitis	1	0	0	1	0
Tumor	10	0	0	1	9
Papilloma	16	0	0	0	16
Anorexia	17	2	2	7	6
Diarrhea	4	2	1	1	0
Death from shock	1	0	0	0	1
Canine distemper	4	0	3	1	0
Canine parvovirus	21	11	10	0	0
Coccidiosis	7	0	0	7	0
	271	31	46	91	103

were considered to be either immature childcare by bitches, or careless technical mistakes (for example, aspiration of milk, misjudgement of temperature setting of warming boxes during artificial feeding) by animal caretakers, or by both.

2. Disorders in the puppies from one week to two months old

Thirty-one cases are summarized in Table 3. Trauma and claudication were caused by biting of their mothers. Peritonitis and abscess on the knee joint might have been the result of puppies' crawling on a wooden board or in box for delivery. A few cases of pneumonia and dermatosis with pustule, scab, alopecia or erosion were often seen in the puppies at one and a half to two months, when they were given "baby food" (powdered commercial dog food). A prevalence of canine parvovirus infection was observed in 1983, and 11 puppies aged 42-58 days before vaccination were attacked by this infection. The clinical signs were vomiting, diarrhea and marked dehydration. All animals died within 1-13 days after the onset.

3. Disorders in the puppies or young dogs from two months to one year old

Forty-six cases are summarized in Table 3. Pneumonia was seen in 17 dogs. Canine parvovirus infection occurred in 1981, when 10 dogs of about five months old were attacked by the disease; five of them eventually died. Abscess, fracture of the tibia, and dislocation of the hip joint were caused either by fights during the exercise time or by mechanical problems with the automatic clean system. Fatal canine distemper was seen in puppies at two to three months, just after they were vaccinated.

4. Disorders in the adult dogs of one to five years old

Ninety-one cases are recorded in Table 3. Thirty-eight of them, including

trauma (19 cases), abscess (8 cases), hematoma (3 cases), othematoma (4 cases) and claudication (4 cases), were mainly caused by fights when the dogs were exercising or when two or three dogs were housed together in one cage. Most of them were males. The injured sites of the body showing trauma or abscess tended to be located on the head and/or face of the stronger dogs, while they were often seen on the hip and/or hind limbs of the weaker ones. Intervertebral disc protrusion was noted in nine dogs more than three years old [7]. Dystocia was seen in many animals who showed uterine inertia and stricture of the parturient canal. Cesarean section was done in eight cases. Prolonged anorexia was observed in seven cases. Three of these dogs died after they lost their appetite or became lean. In the autopsy, nephromegaly, nephrosclerosis, or lack of a kidney was seen in these three dogs. In two other cases, the intraperitoneal administration of warmed solution and massage of the abdomen were effective. In the remaining two cases, the anorexia was considered to be because they could not eat sufficiently due to stronger dogs housed in the same cage. Cystic calculosis was seen in five cases, one of them showing the recurrent (five times) type [6]. Inflammation of the nictitating membrane was observed in five cases. They could be surgically treated and recovered effectively with antibiotic therapy. Coccidium infection with diarrhea occurred accidentally in seven animals.

5. Disorders in dogs aged more than five years old

One hundred and three cases are shown in Table 3. Intervertebral disc protrusion was seen on the thoracolumbar (31 cases) and cervical (2 cases) regions. Most of the affected dogs showed mild or moderate clinical signs, such as gait abnormality with flaccid paralysis, decreased or complex lack of reflexes, or kyphosis, and then recovered slowly but completely within one

Table 4. Tumors observed in older beagles

Individual No.	Diagnoses	Age	Others
1. 72-168	Hemangiosarcoma	9 years	Whole body, death
2. 75-04	Mastocytoma	7 years	Localized, sacrificed
3. 71-183	Mammary fibrosarcoma	11.5 years	Localized, living
4. 75-46	Histiocytoma	4 years	Localized, sacrificed
5. 73-12	Lymphosarcoma	7 years	Whole body, death
6. 71-181	Fibrosarcoma	12.5 years	Localized, death
7. 74-04	Fibrosarcoma	8 years	Localized, sacrificed
8. 75-32	Leiomyoma	8.8 years	Localized, death
9. 75-38	Renal and thyroid carcinoma	8 years	Localized, death
10. 74-25	Hemangioma	8 years	Localized, living

month after the onset by adequate nursing alone. Laminectomy was carried out in some cases and their prognoses were good. Although abscess, trauma and othematoma were often seen, these also occurred as a result of fights, the same as in the younger dogs described above.

Tumors were seen in 10 cases, as shown in Table 4. All of the animals except one (No. 4) were over five years old and the tumor could be easily discovered except in one case (No. 9). Case No. 9 had been clinically diagnosed as anemia, but the tumor was noticed only after the autopsy and pathological examination. Five cases, including No. 1 (whole body hemangiosarcoma), No. 5 (whole body lymphosarcoma), No. 6 (metastatic fibrosarcoma), No. 8 (localized leiomyoma) and No. 9 (renal and thyroid carcinoma) were fatal cases. Case No. 1 showed metastasis from the primary tumor on the blepharon to the whole body and died six months after the fifth surgical removal. Case No. 6 also showed metastasis from the primary tumors on the cheek to the liver and spleen, and died two months after the second surgical removal. Two cases, including No. 3 (mammary fibrosarcoma) and No. 10 (hemangioma on the hind leg) were treated by surgical removal, and recurrence has not yet been seen. The other three cases were sacrificed. Additionally, subcutaneous papillomatosis

was seen in 16 other dogs over five years old, although it did not show tumorous growth (Table 3).

Discussion

In this colony, 170 of 201 neonates under a week old died in a short time either with or without clinical signs. The incidence of death in the neonates as a whole ($170/423=40\%$) was higher than in other colonies [1]. The most prominent clinical symptoms of these neonates were chilling or hypothermia, followed by pneumonia and pulmonary edema. In many cases, treatment using antibiotics and infusion of solution was not effective. Keeping the pups warm at $32-34^{\circ}\text{C}$ often showed good effects. It is important not only to pay sufficient attention to the environmental conditions, such as room temperature, moisture, ventilation and cleanliness of the cage, but also to control artificial feeding [4, 10, 16], as well as the nutritive conditions for neonates [15].

Dermatosis and pneumonitis, suspected to have resulted from allergic symptoms, were often seen in the weanling puppies, but not after powdered "bady food" changed for a cooked diet and the body surface was washed sufficiently.

Canine distemper in the puppies was considered to have occurred before the

effect of vaccination was manifested, similar to other reported cases [20]. Canine parvovirus infection in 1983 occurred before the planned vaccination. These results suggested that periodic examinations for various infectious agents and the planned vaccinations by ourselves were necessary for the prevention of these diseases in the breeding colony. Findings in the regular parasite examination were always negative. However, coccidium infection arose accidentally as a result of human carelessness. Control of experimentalists in addition to daily health care for dogs is also thought to be important. Heartworm was seen in at eight-year-old at autopsy. Other parasites have not been detected yet.

In the adult dogs over one year old, trauma, abscess, hematoma and othematoma were frequently observed and associated with fights. Moiser reported that the incidence of trauma in beagles was higher than in other dogs (11.1%) and the injured sites of the body tended to be distributed on the head or face and hip or hind limbs, respectively, in keeping with our observations [11]. Fox mentioned that the beagle was a kind of dog that showed a typical weak agonistic behavior, and this behavior was not related to sexes [5]. However, such agonistic behavior was frequently seen in the male dogs of this colony, particularly when they were either exercising together or were reared in a cage. The high incidence of intervertebral disc protrusion is thought to have been enhanced either by the disturbance of motion from housing two to three dogs together in a cage, by their jumping against cages, doors and nets surrounding the playground or by repeated fights, in addition to senile changes [7].

Histopathological examinations of spontaneous lesions and age changes of beagles including elderly ones were performed in this colony [17]. Ten cases of various types of tumors have been documented, while cutaneous papillomatosis was seen in 16 cases (Tables, 3 and 4). MacEwen

reported that the incidence of all tumors in dogs was about 0.38%, 35% of which were malignant ones [12]. The incidence of all neoplasms in this colony was 11.7% (26/222) of dogs over a week old. The incidence of lymphosarcoma was reported to be 5-7% of all tumors [3,13] and mammary tumors 20% [8,12]. It was also described that mastocytoma was frequently seen in dogs [9] and fibrosarcoma was often noted in beagles [2]. Two cases of localized mastocytosis in the tracheobronchial lymph nodes of beagles in this colony were observed in the pathological examinations [18]. In general, tumors increase with age [14], and are frequently observed in dogs of 6-14 years old [19]. All tumors in our cases were observed in dogs of 4-12.5 years old, as shown in Table 4. Therefore, the age distribution in tumor incidence was not different from that of other reports. Metastases from the primary tumors were observed after surgical removal in two cases (No. 1 and No. 6). Therefore, rapid clinicopathological diagnosis and treatment by a combination of surgical removal and chemotherapy or irradiation will be required.

Except for 32 cases of infections, 239 clinical disorders have been documented among 264 clinical charts for dogs over one week old. About half of these dogs were repeatedly diseased, i. e., at least three times. It is of the utmost importance to observe individual dogs carefully and detect unusual signs as soon as possible, even if they are slight. In order to keep the breeding colony including older dogs normally, periodical measurement of body weight, biochemical examinations of blood and urine, and also a checkup with x-ray radiographs, particularly in older dogs, should be carried out, in addition to the prevention of infections.

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実験用ビーグルの繁殖コロニーにみられた疾病

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放射線医学総合研究所のビーグルの繁殖コロニーにおいて、1974～1983年の10年間に発生した472例の疾病に関する臨床記録を年齢別に分類した。生後1週齢以内の201例の新生子には、低体温症が、1週齢～2カ月齢の31例と2カ月齢～1歳齢の46例の子犬には、肺炎、イヌ

パルボウイルス感染症、皮膚病および膿瘍が多くみられた。1～5歳齢の成犬91例には、外傷、椎間板突出症、膿瘍、難産、破行および耳血腫が、また5歳齢以上の老齢犬103例には、椎間板突出症、腫瘍、膿瘍、外傷および耳血腫が多くみられた。