



## Original Research Article

# Calf pneumonia: Antibiotic Treatment and Study of Some Blood Immunological Parameters of the Natural Resistance

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## ABSTRACT

The extensive nature and pastoral farming system in some African countries, including Chad expose young animals to respiratory diseases whose causes are not clearly defined until now. Also livestock breeders often used antibiotic for the treatment of sick animals but did not determine the exact causes of the said pathology. The objective of this study is (i) to elucidate the causes of this disease, (ii) study the sensitivity of the microorganisms isolated from the lungs of calves suffering from bronchopneumonia to antibiotics, (iii) develop an efficient treatment plan of these animals, (iv) study the activity of some immunological parameters of the natural resistance (phagocytic activity of neutrophils and rosette phenomenon). In the experiment 20 (twenty) calves were used and divided into two (2) groups: (i) consists of calves suffering from bronchopneumonia (acute form of the disease), (ii) consists of clinically healthy calves. Blood was taken from the jugular vein on anticoagulant in all animals to determine the number of leukocytes, erythrocytes, hemoglobin and finally realize the complete blood count. Blood immunological parameters were determined through the phagocytic activity of neutrophils according to the method proposed by the Department of Microbiology of Veterinary Academy in Moscow. This method is based on viewing under ordinary microscope the number of bacteria phagocytosed and digested by calves blood neutrophils in the contact process with *Escherichia* and leukocytes on the agar surface. The study showed that several factors contributed to the onset of bronchopneumonia in calves in the industrial livestock complex "Constantinovo". The treatment plan of calves proposed in this study revealed efficient because it has achieved a cure rate of 90% against 70% obtained with the method used in the industrial livestock complex.

## Keywords

Broncho pneumonia, Natural resistance, Phagocytosis, Leukocytes, Lymphocytes

## Introduction

Some authors such as: Alikaev (1974) and Danilevsky (1974) define broncho pneumonia

in young animals as a pathology expressing by inflammation of the bronchi and alveoli

of the lungs accompanied by nasal discharge serous and mucopurulent. The inflammation starts in the bronchi and propagates in the pulmonary tissue. For Danilevsky (1975) Fediuk (1977, 1979) and Baïturina (1957), most cases of bronchopneumonia were observed in calves from 30 to 45 days old. According to Daotrengdat (1974), bronchopneumonia of calves is registered in several countries and in different climatic zones. Based on the literature and experimental data, Danilevsky (1974) and Urazaev (1978) conclude that the bronchopneumonia has a multifactorial nature in terms of etiology. This pathology may be due to adverse weather conditions and animal feed. This is called non-infectious bronchopneumonia. It can also be due to viral and bacterial actions, we are then in the presence of infectious bronchopneumonia (Camoux, 1977; Kovalenko, 1976; Baïturina, 1957).

Danilevsky (1975) divided the causes of bronchopneumonia in 3 (three) groups: (i) the decrease in the natural resistance of the young body, (ii) failure to follow health rules, animal husbandry and hygienic rearing of young animals (iii) the multiplication of microorganisms in the lung tissue. For Tarasov II (1977), non-infectious bronchopneumonia of calves appears due to non compliance with health standards and hygienic breeding and feeding of young animals.

In Chad, as in many African countries, the rural sector occupies a dominant position by its strong participation in the national economy. Agriculture and livestock are the main pillars and contribute to the GDP on average 40%. It employs 80% of the active population of which more than half are women (PNDE, 2009). Animal diseases are still a major constraint to livestock development. Health protection of livestock

has occupied all time and continues to occupy a central place in the actions of the Ministry of Livestock and Animal Resources of Chad. This protection is based primarily on the fight against communicable diseases deemed legally in the Republic of Chad defined by the Act No. 09 / PR / 04, organizing the animal health and collective prophylaxis. To this end, the Government has worked hard with the support of partners to strengthen the capacity of public veterinary services to maintain the achievements and improve animal health (PNDE, 2009).

The extensive nature and pastoral farming in some African countries, including Chad exposes young animals to respiratory diseases whose causes are not clearly defined until now. And breeders are using often antibiotic for the treatment of sick animals but did not determine the exact causes of said pathology. In so to all these elements, we set a goal, (i) clarify the causes of this disease, (ii) study the antibiotic susceptibility of microorganisms isolated from the lungs of calves suffering from bronchopneumonia, (iii) develop an efficient treatment plan of these sick animals, (iv) study the activity of some immunological parameters of natural resistance (phagocytic activity of neutrophils and rosette phenomenon).

## **Materials and Methods**

In the experiment 20 (twenty) calves were divided into two (2) groups: (i) consists of calves suffering from bronchopneumonia (acute form of the disease), (ii) consists of clinically healthy calves. Blood was taken from the jugular vein on anticoagulant in all animals to determine the number of leukocytes, erythrocytes, hemoglobin and finally realize the complete blood count.

The treatment plan of calves suffering from bronchopneumonia proposed in this study consists of inoculating their mixing two antibiotics which are sensitive to lung microflora. To this mixture prepared for an animal head (2 parts of gentamicin and carbenicillin- 1 part) was added a solution of pepsin (200 mg pepsin diluted in 0.5% Novocain). The mixture of antibiotics, pepsin and Novocain is administered to calves in intra tracheal due to daily injection and, for 7 days. But 10 minutes before intra-tracheal administration of antibiotics, calves were injected intramuscularly with eophylin. The treatment method used in this study was compared to that typically used in the livestock complex "Constantinovo" comprising administering intramuscular antibiotics to animals (without making antibiogram testing) 2 times a day and for 14 days. The healing process is determined by the loss in calves with clinical signs (fever, accelerated sweaters, rapid breathing, anorexia, etc).

Blood immunological parameters were determined by the phagocytic activity of neutrophils by the method proposed by the Department of Microbiology (Emelianenko *et al.* 1980). This method is based on viewing under ordinary microscope the number of bacteria phagocytosed and digested by calf's blood neutrophils in the contact process with *Escherichia* and leukocytes on the agar surface. The number of T-cells is defined by the rosette phenomenon according to the method described by Bogün (1968). This method is used in human medicine. The sensitivity of pulmonary microflora to antibiotics used in the experiment is that defined by the Petri dish method. For this, the agar is poured into the Petri dish and inoculated with lung microflora of sick calves. Then placed on the agar surface of the antibiotic disks soaked, the whole is incubated at 37°C for 24–48 hours. In reading, it appears clear

area round discs (*lysis zone*). The diameter of the zone is then measured. The smaller the diameter of the area is large (more than 40mm), the microflora is more susceptible to such antibiotic. For this, 17 soaked with antibiotic discs were used.

In order to study the causative factors of non-infectious bronchopneumonia in calves, metabolism parameters were studied both in dairy cows than in clinically healthy calves and calves suffering from bronchopneumonia. For this, the serum of these animals was analyzed for the detection of the concentration of *carotene*, calcium. Meanwhile, we studied the microclimate (air temperature and humidity of the places where calves are kept).

## **Results and Discussion**

### **Treatment of calves**

By applying the calf processing scheme according to the method proposed in this study yielded a cure rate of 90% against 70% with the conventional method used in the livestock complex (Table 1). The combination of two antibiotics has had a synergistic effect on the microflora of the lungs. Eophylin of injection 10 minutes before administration of antibiotics allows the dilatation of the bronchi and alveoli. The addition of pepsin in solution allows of inflammation to subside thus facilitating penetration and wide diffusion of antibiotics into the bronchi and alveoli.

### **Predisposing factors contributing to the development of bronchopneumonia in calves**

Bronchopneumonia, as a non-infectious disease is widespread; it constitutes 25% of all non-infectious diseases. It ranks second after diseases of the digestive organs. Its appearance is conditioned by the factors that

weaken the organism (predisposing factors). The losses caused by bronchopneumonia are enormous; they consist of: weight loss, decrease in the economic value of the animal, compulsory slaughtered.

During the monitoring it was noticed that all calves are held in places where the temperature is 8°C and once she goes down

to 4°C. It was also noted that the food intake of calves was not adequate, that is to say, did not meet the predetermined standards by the USSR State for the whole of Soviet Socialist Republics. All these factors contribute to the decrease in the natural resistance of young animals. The same observations were also made in Lithuania by Belinsky and Nesmane (1978).

**Table.1** Results of treatment of calves suffering from bronchopneumonia

Treatment methods	Total number of animals used in the experiment	Number of recovered animals	%
Method used in the experiment	10	09	90
Classical method used in the livestock Complex	10	07	70

**Table.2** Dynamics of the number of leukocytes and phagocytic activity of blood cells in clinically healthy calves and calves with bronchopneumonia

Clinically healthy animals	Number of calves in group	Number of leukocytes (10 <sup>3</sup> / ml)	Phagocytic activity indices		Index of phagocytosis completed
			Phagocytosis	Index of phagocytosis	
Healthy animals	10	7.1	86	6.39	0.67
Sick animals (one day before treatment)	10	10.0	64	2.36	0.41
Sick (3 days before treatment)	10	10.2	67	3.6	0.35
7 days after treatment	10	8.1	70	4.53	0.45
14 days after treatment	10	7.9	87	8.18	0.71

**Dynamics of some immunological parameters**

The dynamic study results of some blood immunological parameters are compiled in Table 2, from which we note that there has been increase in number of leukocytes in sick calves. After antibiotic treatment of

animals, this number has declined significantly approximating that of clinically healthy animals. In the count blood count, it was noted that there was predominance of neutrophils count over other cells. This phenomenon appears normal because the reaction of leukocytes in the inflammatory process is a natural defense of the body

element. These observations are similar to those mentioned by Bidjeh (1981) and Emelianenko *et al.*, (1980).

The natural resistance of the organism plays a big role in the etiopathogenesis of bronchopneumonia, at which depends on the reaction of the organism as well as external adverse factors those microorganisms (Lepp, 1978). Note that the cellular factors (phagocytes) and humoral also play an important role in the natural defense processes of the body.

The study showed that several factors contributed to the onset of bronchopneumonia in calves on the farm "Constantinovo". The treatment plan of calves with bronchopneumonia proposed in this study was effective because it has achieved a cure rate of 90% against 70% obtained with the conventional method used in the livestock Complex "Constantinovo".

Treatment of animals with combined antibiotics (gentamicin, carbenicillin) led to the arrest of the inflammatory process in the lungs. At the same time also stops the intensity of the response of neutrophils. However, the percentage of cells engulfing increase dramatically. If this figure is 64% before treatment, seven days after treatment, it reached 70% and 87% 14 days after treatment. In the healing process of calves suffering from bronchopneumonia, it was observed that there had not only enhancement of the phagocytic activity of neutrophils, but also increase the phagocytosis index. Treatment with antibiotics mentioned above improves the functional activities of neutrophils, since the phagocytic activity increased significantly (87%) in calves convalescents, but the number of leukocytes decreased ( $7.9 \cdot 10^3$  / ml) compared with those clinically healthy animals.

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