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Anthrax. E. N. Shlyakhov Pages 261-270

Anthrax is an acute infectious disease, affecting domestic animals basically, from which man can be infected.

ETIOLOGY

The agent of anthrax was first detected in 1855 in the blood of ailing animals by Russian F. Brayell, and is regarded as a bacillus, as a result of which the vegetative and spore-bearing forms of it must be distinguished.

The vegetative form is a coarse(rough) bacillus (1.5 X 5-8 microns), aerobic, gram-positive, non-motile, easily tinted by all the basic aniline dyes. In the organism of the animal the bacillus is surrounded by a capsule which can be seen in slides of fresh material, taken from a corpse. The virulence of the agent is connected with the presence of the capsule. The bacilli anthrax grow well in aerobic conditions on ordinary nutritive mediums (MPB, MPA, MPO), distributed in smears in single units, by pairs, or in long chains. In the chains there is noted an expressed trimming of the ends of the bacilli, facing each other. The chains look like bamboo sticks. Optimal pH is 7.2-7.6, but the bacilli can be grown at pH 7.0-8.0.

The spores of the agent of anthrax form outside the organism of the animal during the presence of an abundance of oxygen and a required amount of moisture, at the temperature of 12-15 to 40 C., best of all at 30-35 C. The nucleus of the bacilli does not deform the spore, which distinguishes it from the spores of botulinus and tetanus. No spores can be found in the organism of ailing animals, or in their corpses, but, around the natural apertures of the animal, or in various points onto which excretion might fall, the spores are quickly detected.

I In external conditions (soil, water, hides, furs, etc.) the spores of the anthrax agent can sustain for years and tens of years. Spores located in the soil, under favorable conditions (presence of organic nutritive materials, moisture, temperature and pH), can germinate; forming vegetative forms which are capable of sporulation again, and this process can be repeated many times. This explains the long virulence of pastures, which were used for grazing or burying of animals affected by anthrax.

The vegetative forms do not differ by any great stability to various physical and/or chemical actions; they quickly die at a temperature above 70 C. (after several minutes), under the action of mercuric chloride, phenol, formaline and chlorine, in ordinary concentrations, such as those used in the disinfection of centers of tick infection.

EPIDEMIOLOGY

The source of infection by anthrax lies in the ailing animal. Soviet Scientists Vladimir, Mirotvorski and others proved the soil, impregnated with the bacilli of anthrax, acts as an auxiliary reserve.

All grass eating animals, domestic and wild, are susceptible to anthrax. Of the domestic animals the hog, dog and cat are less often affected.

White mice and guinea pigs are very susceptible to experimental infection with anthrax.

With domestic animals the alimentary canal is the main path of infection. Healthy animals, feeding or drinking, are infected by the agent which has been deposited by an ailing animal. In the autumnal period the transmission of anthrax is increased by the flying vectors (fly, etc.), mainly between healthy and ailing horses and livestock.

In these cases the skin (carbuncular) form of disease appears. Irregardless of the mode of infection (intestinal or transmissional),

anthrax in animals progresses at first as an internal or circuncular form, ending, as a rule with sepsis, leading to death.

During the course of the illness the animal deposits the agent through the urine, faeces, saliva, and after death, through excretions of the natural apertures, into the soil, water, etc.

The development of epizootics are observed mainly in June-Aug; during this period more than half of the years mortality rate is accounted for. During dry years the infection rate among livestock increases.

This is tied in, on one side, with the more intensive multiplication of the agent in the soil, on the other hand-by the fact that cattle have to graze closer to the ground, thus, the soil and spores are swallowed more than usual.

Man is infected directly from the ailing animal, its corpse, or any product of the animal. Rarely is man infected through the soil.

Man to man infection is rarely encountered. Anthrax is encountered among humans sporadically, sometimes there are group infections. As with the sporadic, so with the group infections, they are in direct epidemiological contact with the source of the infection, soil or animal as the case may be. In approximately half of the cases of skin infection the anthrax infection appears during the skinning of the animal, fallen from anthrax, or during removal of its carcass, or even while caring for it during its illness. In more than 1/3 of the cases man is infected through the skin or hide of the animal, through various items of by products; caps, boots, etc.

Infections by bites of blood-sucking vectors, soil, water or such are less than 1/10 of all cases.

During all cases of the above said methods of infection, except the transmissional, the leading role is held by dirty, infected hands.

The intestinal form of anthrax is most prevalent during the use of contaminated meat, or its by products.

The lung form is, evidently, a result of inhalation of dust, containing spores of anthrax.

Anthrax in humans is distinguished by a 'way of life' and professional character. More often infections are encountered in those areas where rules for the removal of the corpse are not followed and where secret killing of the animal is a practice. Professional infections are encountered by herders, feeders, or anyone coming in contact with the animal, or part of it, after death or while it is infected.

Anthrax is noted to repeat itself seasonally (Jun-Sep), which confirms its zoonotic character.

The basic reasons for the dissemination of anthrax among man are: lack of a line of prophylactics, sanitary-veterinary rules and organized measures of prevention.

In everyday life man can be infected with anthrax during caring for ailing animals, secretly killing them for the hide, meat or other products.

Infections occur also during inadequate control over enclosures, feed, pastures, etc.

Infections in production levels come from any source; improper rules in handling, transportation, storage of the hides and carcasses. All this enhances the need for informing people, mainly of the need for sanitary-technical measures and prophylactics.

From the organizational point of view the dissemination of anthrax among humans is aided by the lack of information given veterinary workers and organs of health, in regard to registering all cases, proper care, in particular among all livestock concerned.

DIAGNOSTICS

NOTE: PAGE 265 OF THE ORIGINAL ARTICLE IS MISSING

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It is necessary to differentiate between anthrax and glanders, tularemia, plague, carbuncle, furuncle, erysipelas of the skin, and sepsis, etc.

The diagnosis of the skin form of anthrax in man, in a majority of the cases, can be established clinically, but, for its confirmation it is necessary, as with the confirmation of the intestinal or suspected cases, to conduct bacteriological studies.

With the skin form the contents of the vesicles, carbuncles or ulcer is studied. Before taking the material from any of the above, they should be cleaned with alcohol, then sterile methods and instruments should be used.

With lung types the study is made of the mucus, which is collected in sterile jars, besides this, two smears are made on glass.

With the intestinal form it is necessary to study the feces of the patient, for this purpose it is necessary to collect them in sterile containers.

In the labs it is necessary to place samples of the hide and skin into sterile jars.

The jars should be seal with stoppers, filled with parafine or druggists resin, and wrapped as a drug purchase, with parafine, wax or parchment paper. Each object should have a label, showing name, time and place of taking of material and preliminary diagnosis.

The objects are packed in metal or wooden containers, marked on top 'UP-CAREFUL' and sent to the labs. In the containers there should be documents for each container, giving all data available.

Results on the lab analysis should be ready in one day, in case of necessity the results may be delayed 3-4 days.

TREATMENT

Anti-anthrax serum is used for treatment, it is heated to 35-37 C. and injected subcutaneously or intramuscularly in doses of 100-200 ml., one time, then it is injected again, in the same dosage, after 1-2 days until the infection breaks. In severe cases the serum is given intravenously.

Veterinary serum can be given in the absence of the above medical serum. It is advisable not to shake the bottle before use.

Serotherapy can be considered with the application of 'Novarsenal' intravenously in doses of 0.01 for each kg of weight of the patient.

Penicillin is widely used for the treatment of anthrax (500 000 to 1 million units per day, intramuscularly, 3 times a day at regular intervals); recently biomyacin has been used.

The scabs should be covered with dry or salved bandages.

The patient is considered ready for termination of treatment when clinical appearances and the epithelization of the skin so indicate.

PROPHYLACTICS

Prophylactics of anthrax in man are directly dependent on the prophylactic measures conducted by the local veterinary organs on local animals.

These organizations should:

1. establish an exact diagnosis of the anthrax in cattle and conduct epizootological observations;
2. immediately notify authorities of infections;
3. initiate anti-epizootic measures in aggravated areas;
4. initiate 15 day quarantines in contaminated areas;

5. properly dispose of corpses, burning is recommended;
6. conduct disinfection of all possibly contaminated areas;
7. properly dispose of hides, skins, etc.;
8. control killing of the livestock;
9. enforce anthrax control measures;
10. conduct classes on sanitation and control;
11. vaccinate all susceptible animals, especially new born.

At the present time vaccination is conducted with a live vaccine, ST1, prepared by Ginsburg, Tamzin and co-workers, from a virulent strain obtained by selection of non-capsule variants of anthrax bacilli. The dry live vaccine is of a dried spore anthrax strain H112G.

The use of this vaccine proved it harmless and effective.

This vaccine is also issued to humans (subcutaneously and cutaneously).

The vaccination of humans is done first on those people working with the animals, mainly on the farms, and also in the hide and meat processing plants.

The vaccination is one time, usually subcutaneously.

The instructions on the ampule indicate the method of injection.

As a rule the cutaneous vaccination does not raise any reaction; the subcutaneous injections give a general reaction, inability, headaches, increase of temperature, and general sickness. These last 2-3 days.

A doctors control is maintained over the inoculations. records are kept of the inoculations, reactions, etc.

The following should be conducted in the event of a possible anthrax epidemic:

1. notification of authorities;
2. isolation of patients;

3. disinfection of all centers according to the Ministry of Health, USSR, 11 Jun 48;

All items with which the patient was in contact should be included in this disinfection, those not disinfected should be burned.

4. observations for the source and method of infection;

5. observations of all persons connected with the source of infection for 7 days. 25-40 ml of anti-anthrax serum are given these people;

6. control the isolated areas against internal infection (hospitals, etc.);

7. release patients after complete clinical improvement;

8. properly dispose of patients after death;

9. conduct inoculations with STI vaccine in the event of an epidemic;

10. maintain adequate supplies of vaccine.

Any case of infection by anthrax is registered in the journal of infectious diseases (Form 60) and progress is recorded on Forms 85-87.