Proceedings of the
Second International Congress of Somali Studies
University of Hamburg
August 1-6, 1983

edited by
Thomas Labahn

VOLUME IV

STUDIES IN HUMANITIES AND NATURAL SCIENCES

HELMUT BUSKE VERLAG HAMBURG
In all countries serological investigations are necessary to detect or to control epidemics, because there are losses of domestic or wildlife animals, and sometimes human beings are infected by animals. Organizations for technical cooperation have the opinion, that there are no problems to establish laboratories in developing countries. In practice unforeseeing difficulties are existing: In conducting field service, veterinaries have not enough time to arrange laboratories. No technical attendants, no standardized reagents a.s.o. complicate working.

To lose no time by this handicap, we organized a collaboration between the field service of the veterinary laboratory in Kismayu, the capital town of the Lower Juba Region in south Somalia, and the veterinary public investigation office in Giessen, Federal Republic of Germany. The field service collected blood samples of cattle, goats, sheep, dromedaries and occasionally of human beings, driving through the Lower Juba Region of south Somalia (see figure I). The veterinaries of the field service arrived at spots, where herds stayed to rest or to pasture or to drink.

In addition of the treatment of suffering animals, veterinaries collected blood samples and centrifuged the coagulated blood with a manual driving centrifuge to separate serum at once. Some blood samples were collected in the veterinary clinic and in the slaughter house of Kismayu. All serum samples were deepfreeze stored in the veterinary laboratory in Kismayu and sent to Giessen by air mail.
arriving in an excellent condition.
In the veterinary public investigation office in Giessen
we started serological investigations of serum samples into
antibodies against brucella, coxiella and chlamydia, using
international accepted methods.

First method: Agglutination test to detect antibodies against
brucella: Prescription is published in the law gazette of
1053-1060. The test is basing on the following reaction:
Blood serum of a brucella infected animal contains macro-
molecular proteins which are able to agglutinate brucellae
(specific antibodies). To detect these agglutinines, blood
serum is mixed with a test solution, consisting of especially
cultivated brucellae, suspended in buffered sodium
chloride solution and standardized with a positive serum

control. The mixture remains for 24 hours in an incubator
with 37° C. During this time agglutinines of serum are
able to agglutinate brucellae, and these agglomerates are
sinking on the bottom of the test-tube

Figure 2. Agglutination Test

NEGATIVE POSITIVE NEGATIVE
REACTIONS

Therefore we have a solution, looking like water, in the
test-tube. But if there are no agglutinating antibodies in
the serum, brucellae remain suspended, and the fluid looks
like skin milk. It is very easy to differentiate between
positive and negative reactions. But there are problems in
producing the test solution. Sometimes you get charges,
that are reacting unspecifically. In the Federal Republic
BRUCELLA AGGLOMERATES

of Germany we gathered experiences in producing test solution since 1956. All the institutes in our country get test solution, produced in the Federal Public Health Office in West Berlin. The excellent quality of this test solution is internationally certificated. With this test solution you are able to detect specific antibodies against brucellae. Moreover, it is possible to quantize the antibodies by diluting serum, until there is no more agglutinating effect. Those dilution factors, that are still able to agglutinate, in technical term you say titer, are correlating with the different quantities of antibodies (see figure 5). It is necessary to perform titer analyses in epidemiological studies and other things else.

If we have had uncertain results in the agglutination test, we used additionally the micro complement fixation test, our second method, to get undoubted results. Performing this test we used prescription and reagents of the Federal Public Health Office in West Berlin. This method is basing on the following phenomenon: Injecting sheep erythrocytes into rabbits, we have an antibody reaction against these erythrocytes. These antibodies are able to dissolve sheep
erythrocytes (hemolytic antibodies). Heating these antibodies, we make them incomplete. That means, they are not yet able to dissolve erythrocytes. But if we put unheated guinea pig serum to the incomplete antibodies, we make them complete again, and now they are able again to dissolve sheep erythrocytes. The substance in serum of guinea pig, that can complete an incomplete antibody, is therefore called complement. This complement is able to complete all antibodies for example an antibody against brucellae. Researching serum with an incomplete antibody against brucellae, we put at first complement to this serum, to complete the brucella antibodies. In a second step, we put incomplete hemolytic antibodies to the mixture. But there is no more complement to complete the hemolytic antibodies. If I put now sheep erythrocytes into this mixture, there is no complete hemolytic antibody and the erythrocytes remain intact. With this positive reaction we have detected brucella antibodies, researching serum with uncertain or positive results in the agglutinations test (see Figure 6).

We also used the second method, the micro complement fixation test, to detect antibodies against coxiella burnetii (Q-fever), but applying prescription and reagents of the Behringwerke L.C. in Marburg/Lahn, because they are internationally accepted (see Figure 7).

In the third method (micro complement fixation test) to detect antibodies against chlamydia, we also used prescription and reagents of the Behringwerke L.C. in Marburg/Lahn.

The results of our investigations will be demonstrated in the following tabulations (see Figure 8). Only 3% of cattle are infected with brucella abortus and not with brucella melitensis, that we detected with agglutination test, using one time brucella abortus test solution and the other time brucella melitensis test solution. We get maximal titers...
Fig. No 7:
MICRO COMPLEMENT FIXATION TEST

To detect antibodies against coxiella burnetii and chlamydia.
1 (positive), 2 (negative) serum
from animals

†: positive, -: negative control serum

CONTR. A-G: negative control antigen

HS: hemolytic system
CP.U.: complement units

<table>
<thead>
<tr>
<th>species</th>
<th>samples of blood serum</th>
<th>positive results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human beings</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Cattle</td>
<td>197</td>
<td>6 (against bruc. abort.)</td>
</tr>
<tr>
<td>Goats</td>
<td>74</td>
<td>1 (against bruc. abort.)</td>
</tr>
<tr>
<td>Sheep</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Dromedaries</td>
<td>17</td>
<td>-</td>
</tr>
</tbody>
</table>

Using brucella abortus test solution. The one goat had antibodies against brucella abortus, too. It may be, that this animal had guzzled cow milk, infected with brucellae. Two cattle with high antibody titers had abortioned.

In contrast to brucellosis we detected much more infections with coxiella burnetii, also named Q-fever (see Figure 9). In all investigated species we found antibodies against Q-fever: 19% of the goats, 7% of the cattle; reagents in sheep, dromedaries and also in human beings.

Like brucellosis also Q-fever causes abortion and sterility in animals. With Q-fever or brucella infected human beings fell ill and are suffering. Often the cause of suffering remains unknown and without therapy, so that the illness grows up to a chronic phase, combined with irreparable defects.

Also abortion and sterility cause infections with chlamydia in goats (53%) (see Figure 10). But there is no danger of infection for human beings.
Figure 9. Antibodies against Coxiella burnetii

<table>
<thead>
<tr>
<th>species</th>
<th>samples of blood serum</th>
<th>positive results absolute</th>
<th>positive results relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human beings</td>
<td>11</td>
<td>1</td>
<td>(9%)</td>
</tr>
<tr>
<td>Cattle</td>
<td>197</td>
<td>13</td>
<td>7%</td>
</tr>
<tr>
<td>Goats</td>
<td>74</td>
<td>14</td>
<td>19%</td>
</tr>
<tr>
<td>Sheep</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dromedaries</td>
<td>17</td>
<td>1</td>
<td>(6%)</td>
</tr>
</tbody>
</table>

Looking where the infections come from, we have to differentiate: Drinking unboiled milk from cows, goats or sheep, infected with brucella or coxiella, there is a danger of infection. During abortion, caused by brucella, coxiella or chlamydia, countless germs are secreted and able to infect other animals or human beings concerning brucella or coxiella. But the very intense ultraviolet rays in Somalia are killing very quickly germs, that are out of animals. However, the direct contact, especially during copulation, is suitable to infect male and female animals.

Figure 10. Antibodies against Chlamydia

<table>
<thead>
<tr>
<th>species</th>
<th>samples of blood serum</th>
<th>positive results absolute</th>
<th>positive results relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goats</td>
<td>61</td>
<td>32</td>
<td>53%</td>
</tr>
<tr>
<td>Sheep</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

A very important focus of Q-fever infections are the blood-sucking ticks. Human beings and animals are tortured by these ectoparasites. Cankovic (1982) has found 22 species of ticks, parasiting on domestic animals of Somalia. Some specimens of these ticks, gathered from cattle, goats and sheep in the surrounding of Mogadishu are pictured.

Figure 11 and 12. Ticks, parasiting on domestic animals of Somalia

11: ventral view

12: dorsal view
There are ticks preferring only one species of host animal, and other are parasiting on three or more species. The adult male and female ticks have eight legs, and the pad of each leg is armed with two sharp claws (see Figure 17 and 18), anchoring in the skin of the host. Therefore it is very difficult for the host to remove the ticks.

Figure 13 and 14. Ticks, parasiting on domestic animals of Somalia.

13: ventral view

14: dorsal view

Figure 15 and 16. Ticks, parasiting on domestic animals of Somalia.

15: dorsal view

16: dorsal view
The head of the tick is equipped with cutting and sucking organs (see Figure 19 and 20). Sometimes the sucking tube has barbed hooks, so that it rips off, if the tick is brutish removed. Then the sucking tube remains in the skin of the host animal and causes suppuration. Therefore host animals are suffering in anaemia, because ticks are able to suck great quantities of blood.

Figure 19. Cutting and sucking organs of ticks
Our investigations today are concerning ticks, separated into species, homogenized and injected into guinea pigs, to detect coxiella burneti in the ticks. Only infected guinea pigs are producing antibodies against coxiella burneti, that are to detect by the complement fixation test. So we get results about species of ticks that are important for infections of human beings and animals with Q-fever, to combat these parasites with suitable acaricides.

Discussing the results we have the opinion that in south Somalia is only a low percentage (c. 3%) of brucella infected animals. Hussein, Singh and Haji (1978) reported investigations into blood samples from farm and nomadic animals during October 1976 till March 1977. They found reduced percentages of bovine brucellosis as compared with 1974. 23% of farm animals with antibody titer against brucella abortus in 1974 decreased to 2.7% reagents in 1976. The percentage of reagents of nomadic animals reduced from 39% in 1974 to 11.9% in 1976. The authors regard to continue in slaughtering all reagents.

Andreani, Prosperity, Salim and Arush published in 1982 investigations into 660 cattle, 250 sheep, 340 goats and 250 dromedaries. In 15.5% of the cattle, 7.2% of the sheep, 5.3% of the goats and 10.4% of the dromedaries they detected antibodies against brucella abortus. Comparing with our results, only 3% positive cattle, there is a great discrepancy. It may be possible that the higher percentages of the other authors are caused by unspecific reactions in the agglutination test. Therefore it is necessary to compare the results of agglutination test with the complement fixation test, as we have done it.

In future it may be possible to stamp out brucellosis, if all positive reacting animals will be slaughtered. Therefore it is unnecessary to apply brucella vaccines.

Often there are antibodies against coxiella burneti in all investigated species. The most important danger of infection are ticks. Therefore programs are necessary to control the tick-plague.

More than 50% of the goats are infected with chlamydia. In connection with these results there are questions about the cause of abortion and sterility. To answer these questions clinical investigations will be necessary.
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John A. Distefano

AN ENQUIRY INTO THE HISTORY OF QAT

For centuries the qat plant (Catbah edulis f.) has been widely cultivated and its leaves consumed for their stimulating psychoactive effects in several African and Arabian countries, primarily Yemen, Ethiopia, Somalia and Kenya. The plant is known by various names: khat in Somali; qat or k'at in Arabic; chat in Amharic (Ethiopia); and miraa or mirungi in Kenya, with additional forms of these names also in common usage (Heacock 1974:64). The Arabic qat is obviously related to the Amharic chat. Tradition has it that the word chat in turn derives from an Arabic word meaning sustenance or driving principal; El Mahi (1962) suggests that the Arabic word kahve (coffee) and kaffa (the leaves of qat) derive from the place name 'Kafa' in Ethiopia where both plants flourish and perhaps originated (Getahun / Krikorian 1973:353).

The qat plant thrives on moist mountainous slopes at an elevation of between 5000 and 8000 feet, usually growing to a height of twenty feet, but occasionally reaching eighty feet or more (UN 1956:9). It grows wild in several highland areas of southwestern Asia. It is reported to occur sporadically in Turkestan, Afghanistan, Hadhramaut, and northern Hejaz. In Africa, qat grows wild in many of the eastern mountain regions from the Eritrean highlands near the Red Sea, to the Sneuebergen mountains of the Republic of South Africa (including northern Ethiopia, Kenya, Uganda, Ruanda, Burundi, Tanzania, Zaire and Zimbabwe). Commercial qat cultivation is primarily limited to Ethiopia, Yemen and Kenya. In Ethiopia, qat is grown on small farm plots at