



Anthrax: Distribution, Knowledge, Attitude, and Practice Among Pastoralists In Jawhar, Qalimow, and Adan Yabal, Somalia

Anthrax: Distribusi, Pengetahuan, Sikap, dan Praktek di Kalangan Penggembala di Jawhar, Qalimow, dan Adan Yabal, Somalia

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ABSTRACT

Background: Anthrax is a zoonotic disease affecting both humans and animals. The disease is responsible for causing a higher morbidity and mortality rate in Middle Shabelle, Somalia. It has been reported that the disease is endemic in many parts of the region, affecting the pastoralists with an incidence of more than 30% of their livestock production. **Purpose:** This study aims to determine the status of anthrax in pastoralists in three selected areas of Middle Shabelle, namely Jawhar, Qalimow, and Adan Yabal, involving 42 herds. **Methods:** The three selected areas of this study were the those with the highest livestock populations in Middle Shabelle. A structured questionnaire was used to assess the knowledge, attitude, and practice among pastoralists regarding the anthrax disease. The survey was cross-sectional involved focus group discussions (FGDs) and interviews with informants between May 2020 and April 2021. A total of 400 households were visited for personal interviews, while the others were through informational interviews. **Results:** This study estimated that 18.1% of camel herds, 34.3% of cattle herds, and 47.6% of small ruminant flocks were affected by anthrax. The findings highlighted a significant knowledge and practice gap among pastoralists regarding the anthrax disease. **Conclusion:** This study concluded that the majority of pastoralists engaged in poor practices within the livestock community, contributing to the spread of anthrax. It is, therefore, recommended to raise awareness among pastoralists regarding the disease characteristics and control measures through training programs and outreach efforts. Furthermore, this study emphasizes the need for enhanced assessment and control measures to effectively address the anthrax threat.

ABSTRAK

Latar Belakang: Anthrax adalah penyakit zoonosis yang menyerang manusia dan hewan. Penyakit ini bertanggung jawab dalam menyebabkan tingkat morbiditas dan mortalitas yang lebih tinggi di Shabelle Tengah, Somalia. Telah dilaporkan bahwa penyakit ini endemik di banyak bagian wilayah, mempengaruhi para penggembala dengan insiden lebih dari 30% dari produksi ternak mereka. **Tujuan:** Penelitian ini bertujuan untuk mengetahui status antraks pada penggembala di tiga wilayah terpilih Shabelle Tengah, yaitu Jawhar, Qalimow, dan Adan Yabal, dengan melibatkan 42 kawanan. **Metode:** Tiga daerah yang dipilih dari penelitian ini adalah yang memiliki populasi ternak tertinggi di Shabelle Tengah. Kuesioner terstruktur digunakan untuk menilai pengetahuan, sikap, dan praktik di kalangan penggembala mengenai penyakit antraks. Survei ini melibatkan diskusi kelompok terfokus (FGD) lintas bagian dan wawancara dengan informan antara Mei 2020 dan April 2021. Sebanyak 400 rumah tangga dikunjungi untuk wawancara pribadi, sementara yang lain melalui wawancara informasi. **Hasil:** Penelitian ini memperkirakan bahwa 18,1% ternak unta, 34,3% ternak sapi, dan 47,6% kawanan ruminansia kecil terkena antraks. Temuan ini menyoroti kesenjangan pengetahuan dan praktik yang signifikan di antara para penggembala mengenai penyakit antraks. **Kesimpulan:** Studi ini menyimpulkan bahwa mayoritas penggembala yang terlibat melakukan praktik buruk dalam komunitas ternak, berkontribusi terhadap penyebaran antraks. Oleh karena itu, disarankan untuk meningkatkan kesadaran di kalangan penggembala mengenai karakteristik penyakit dan langkah-langkah pengendalian melalui program pelatihan dan upaya penjangkauan. Selanjutnya, penelitian ini menekankan perlunya peningkatan penilaian dan langkah-langkah pengendalian untuk secara efektif mengatasi ancaman antraks.

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INTRODUCTION

Anthrax is a highly contagious and virulent disease that affects humans, livestock, companion animals, and wild animals. Although all mammals are susceptible to the disease, certain avian species are particularly close to *Bacillus anthracis* (Ahmed et al., 2022). The infection is most common in both wildlife and domestic animals, including cattle, sheep, goats, camels, and antelopes. In addition, the disease also can occur in humans through contact with infected tissue from infected animals. The clinical manifestations may also differ. In herbivores, the disease is frequently associated with acute septicemia with a high fatality rate, and accompanied by hemorrhagic infection. In dogs, humans, horses, and pigs, the infection is typically less acute and potentially fatal (Bezymennyi et al., 2014).

Bacillus anthracis can remain in soil for many years. During this period, it can act as a potential source of infection for grazing animals. While these animals do not generally presents an immediate risk of to humans, it is possible for them to become infected when they ingest sufficient amount of *Bacillus anthracis* in the soil. Moreover, the transmission of infection occurs predominantly through direct contact, and biting flies may mechanically transmit the infection agent from one animal to another. Subsequently, the infection persists in the bloodstream. If the infection has been delayed on the index ranch, contaminated feed or other meals from infected animals can act as a source of infection for animals residing in the contaminated soil (Bianco et al., 2021).

The spores can survive in the environment under adverse condition for several years and initiate infection when favorable conditions are provided. Therefore, the disease can be transmitted from animals to humans by direct or indirect contact with their byproducts (Abbas and Hafez, 2021). The livestock sector is a significant contributor to the livelihood of the majority of rural residents in many developing countries. However, the disease can have a detrimental economic impact in the regions where it is prevalent. Anthrax is the second most highly prioritized zoonotic disease in Somalia due to its negative impact at the household level, causing disease and production losses in livestock and severe disease in both animals and humans (Alam et al., 2022). The disease is also characterized by septicemia, enlargement of the spleen (splenomegaly), and infiltration of subcutaneous tissue by gelatinous materials (Antwerpen et al., 2019).

There are areas where the disease is endemic with more frequent outbreaks, while other areas are subject to the disease due to different possible causes, such as weather changes. This may lead to the spore of anthrax being initially inactive in the soil and rising to the surface, affecting animals and other related environments. As a consequence, the outbreak can easily have detrimental effects on human livelihoods and livestock systems (Baldacchino et al., 2014). The disease can have different clinical manifestations depending on the bacteria host factor and infection route. In

vertebrates such as deer, koalas, and certain bird species, as well as invertebrates such as crickets and caterpillars, the disease can present as an acute septicemia, characterized by hemorrhagic lymphadenitis. In other animals such as horses, pigs, dogs, and humans, the disease can be less acute and fatal. The three most common clinical transmission routes are skin (cutaneous transmission), ingestion (gastrointestinal), and inhalation (pulmonary transmission) (Barro et al., 2016).

In humans, the infection is typically transmitted through direct or indirect close contact with infected animals or by examining the infected tissue from infected animals during laboratory examination. Anthrax is a rare disease that can be found among the veterinarians, agricultural workers, and those engaged in the production or handling of animal products, such as wools and honey. The cases of anthrax in humans occur both accidentally and intentionally (Bengis and Frean, 2014). In Somalia, anthrax cases have been reported from all parts of the country, with certain regions, such as Middle Shabelle, experiencing a particularly high incidence. In addition, other cases have been reported, including Rift Valley fever (RVF) and foot and mouth disease (FMD). It is, therefore, important to develop and implement a strategy to prevent anthrax and other diseases in the region.

MATERIAL and METHOD

Materials

The study was conducted in Jawhar, Qalimow, and Aden Yabal in Middle Shabelle, Somalia. These selected areas have the highest livestock and pastoralists population in the region. In addition to these three districts, there are other districts in the region. Furthermore, the herds were randomly selected from these districts based on certain criteria. The Middle Shabelle region was established as the Hir Shabelle State in 2016, which considers itself an autonomous state within the larger Federal Republic of Somalia. The regional capital is Jawhar, which is 84 km (52 miles) to Mogadishu. Other regions are located in close proximity to Mogadishu.

Methods

A cross-sectional survey was conducted concurrently with focus group discussions and key informant interviews between May 2020 and April 2021. A total of 400 respondents participated in the questionnaire survey. Of these, 300 were local community members, while 20 were professionals working at animal health services. The structured questionnaire was developed and used to assess the knowledge, attitude, and practice (KAP) of pastoralists regarding anthrax.

Data Analysis

The questions were translated into the native language and dialects of the respondents, and only pastoralists were interviewed. The questionnaire was distributed to farm heads. Most of the questions were close-ended. In addition, qualitative data were collected using Microsoft Excel and were entered into tables in both Microsoft Word and Excel.

RESULTS

Feed Consumption

A total of 35 pastoral farms were included in this study to determine the knowledge, attitude, and practice (KAP) of pastoralists regarding anthrax. Livestock such as small ruminants, camels, cows, chechens were kept in the herds (Table 1). Pastoralists in the Jowhar District also kept different breeds of cattle. The majority of the pastoralists were aware of the anthrax disease, while the minority were not.

Table 1. Pastoral Livestock Systems in Jawhar, Qalimow, and Aden Yabal in Middle Shabelle.

Districts	Camels	Cattle	Sheep	Goats	Chechen	Total
Jawhar	76 (53%)	94 (37%)	144 (38%)	142 (37%)	15 (19%)	471
Qalimow	28 (18%)	81 (32%)	139 (36%)	139 (36%)	48 (80%)	435
Adan Yabal	42 (30%)	80 (31%)	99 (26%)	101 (26%)	3 (4%)	325
Total	145	260	382	380	66	1,233

Nearly two-thirds (67%) of the population in the selected districts in Middle Shabelle were males aged between 45 and 58 years. The level of education was relatively low, with the majority (75.3%) having no formal education. Only 1.5% of the population attended university, as shown in Table 2.

Table 2. Demographic Characteristics of Pastoralists in Jawhar, Qalimow, and Adan Yabal.

Variables	Level	Number	Proportion (%)
Sex	Male	26	66.5
	Female	134	33.5
Total		400	
Age Group	18-50	75	19
	31-44	108	27
	45-58	111	28
	>58	106	26
Total		400	
Education	Not attended school	301	75.2
	Elementary	38	9.5
	Middle	31	7.8
	Secondary	24	6
	University	6	1.5
Total		400	

Level of Knowledge of Anthrax

Anthrax was well-known in the three selected districts in Middle Shabelle, Somalia. The pastoralists used the local name of the disease which refers to the cutaneous form of anthrax. The level of knowledge was 57.7% in Jawhar, 69.8% in Qalimow 69.8%, and 46.9% in Adan Yabal. Clinical symptoms of anthrax were divided into chronic, acute, and per-acute. Per-acute infection is more common in cattle and sheep, is characterized by sudden death, and is rapidly fatal to animals. In domestic animals such as cattle, sheep, and goats, the common characteristics included staggering, dyspnea, trembling, collapse, convulsive movements, and death following infection. Meanwhile, acute infection was more common in cattle and sheep than other domestic animals. The characteristics of acute infection included rapid onset, fever, lethargy and fatigue, cardiac distress, staggering, seizures, and death. These usually happened in the selected herds. Rapid infection was observed and some animals were found dead in some herds. It was found that their body temperature reached

Table 3. Level of Knowledge of Anthrax among Pastoralists in Jawhar, Qalimow, and Aden Yabal .

Level of Knowledge	Jawhar	Qalimow	Adan Yabal
Poor	15 (10.1%)	1 (0.9%)	21 (14.5%)
Moderate	48 (32.2%)	31 (29.3%)	56 (38.6%)
Good	86 (57.7%)	74 (69.8%)	68 (46.9%)
Very Good	37 (21.1%)	21 (10.2%)	15 (8.3%)
Total	186	127	160

Table 4. Clinical Manifestations of Anthrax in Jawhar, Qalimow, and Aden Yabal.

Districts	Frequency	Clinical Manifestations of Anthrax According to Pastoralists		
		Sudden Death	Dyspnea	Abrupt Onset of Fever
Jawhar	12	16	6	14
Qalimow	13	13	3	3
Adan Yabal	10	7	2	2
Total	35 herds	25 (59.2%)	11 (24.3%)	19 (43.2%)

41.5°C (107°F), rumination stopped, milk production significantly reduced, and pregnant animals had miscarriage. The most commonly affected areas of the infection were the ventral region of the neck, thorax, and shoulders. Other signs of infection reported by the pastoralists from the three selected areas of this study included sudden death, bleeding, and skin nodule as shown in Figure 1. Sudden death was equally reported in all the three selected study areas, while bleeding and skin nodule were differently reported.

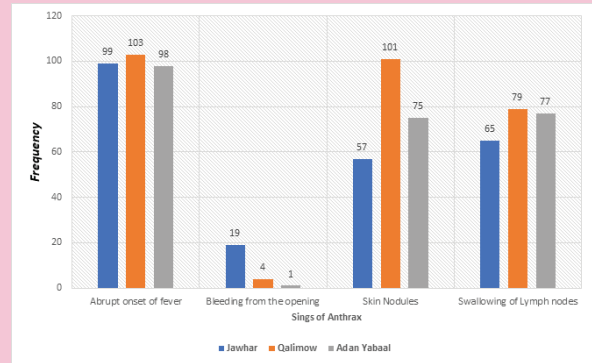


Figure 1. Reported Signs of Anthrax by Pastoralists in Jawhar, Qalimow, and Adan Yabal

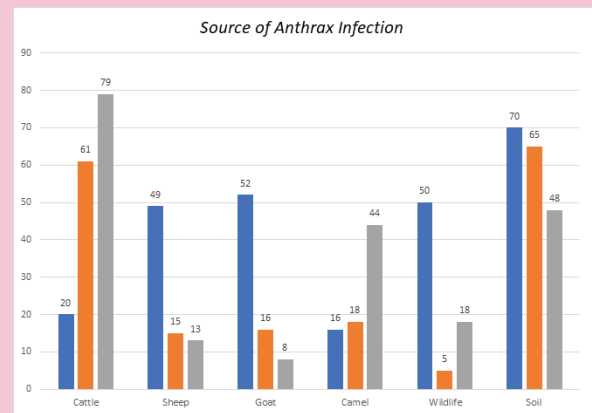


Figure 2. Sources of Anthrax Infection by Pastoralists in Jawhar, Qalimow, and Adan Yabal

Sources of Anthrax Infection

Figure 2 shows the sources of anthrax infection according to the pastoralists in the three selected study areas, including domestic livestock as well as the soil. Humans can also be infected after contact with contaminated carcasses or animal products. In the selected study areas, slaughter and sanitation issues also existed. It was estimated that each affected cow resulted in up to 10 cases of infection in animals. The risk of human infection in these settings was comparatively lower in more developed economies, partly due to the awareness of the infection.

Modes of Anthrax Transmission

Anthrax has been reported on almost all continents and is the most prevalent in agricultural regions with neutral and calcareous soils. In those regions, the epizootic of the infection periodically emerged among the susceptible domestic and wild animals. This study found that the modes of transmission of the infection were totally different from other species. It was found that the agent of infection is *Bacillus anthracis*, which is a large, gram-positive, aerobic, and spore-forming bacillus.

This study found that after wound inoculation, ingestion, or inhalation, the spores will infect macrophages to germinate and proliferate in the blood stream. The infection usually proliferates and occurs at the site of infection and in the lymph nodes draining the site of infection. Therefore, as the bacteria multiply in the lymph nodes, toxemia progresses and bacteremia may occur. As toxin production increases, the potential for disseminated tissue destruction and organ failure increases. However, some of the modes of transmission showed a higher frequency others, including consumption of infected animal products (34%), direct contact with the infected livestock (21%) and handling or dealing with the infected carcasses by post-mortem investigations (28%), as shown in Table 5. Furthermore, according to the pastoralists, infected aerosol form of anthrax from the lungs was estimated at 6%.

Table 5. Mode of Transmission of Anthrax in Jawhar, Qalimow, and Adan Yabal

Districts	Direct Contact with Infected Animals	Inhalation	Handling of Infected Animal	Eating Infected Animals
Jawhar	62 (46%)	87 (27%)	81 (30%)	6 (10%)
Qalimow	22 (16%)	128 (40%)	26 (32%)	16 (27%)
Adan Yabal	49 (31%)	105 (33%)	52 (63%)	37 (63%)
Total	133	320	159	59

Attitude Towards Anthrax

The pastoralists in the study sites had negative attitude towards anthrax. They believed that the disease had a significant effect in both humans and animals. Therefore, they did not talk about the disease since the disease is very dangerous. However, some pastoralists in Jawhar and Adan Yabal consumed the meat of animals dying due to anthrax. They believed that cooking and throwing the intestines could protect them from anthrax infection. In addition, most of the pastoralists had negative attitude about anthrax vaccine.

More than a third (34.5%) of the pastoralists reported that they had self-treated their animals against anthrax, while 7.3% had chosen the wait-and-see attitude towards the disease (Table 6). Professionals reported that one of the challenges they faced in anthrax control was failure to convince community members against consuming infected meat.

Table 6. Attitude towards Anthrax among Pastoralists in Jawhar, Qalimow, and Adan Yabal

Districts	Self-Treating	Unaware	Wait and See	Treating
Jawhar	64 (46%)	95 (49%)	21 (72%)	26 (70%)
Qalimow	23 (17%)	34 (17%)	7 (24%)	9 (0.9%)
Adan Yabal	51 (37%)	67 (34%)	1 (4%)	11 (30%)
Total	138	196	29	37

Practice of Anthrax Disease

Table 7 shows the level of practice among the pastoralists in Jawhar (96.5%), Qalimow (90%), and Adan Yabal (35%). The level of practice of anthrax disease was relatively good. The pastoralists used cattle as payment. This practice enables families without cattle to eventually own some. However, there was no evidence in the case of death of the cattle. Therefore, the meat and skin of the animal were dried and taken to the owner as evidence for the dead cattle. In other words, if cattle died of anthrax, the disease was transferred to another area through the meat.

Table 7. Level of Practice among Pastoralists in Jawhar, Qalimow, and Adan Yabal

District/Level of Practice	Poor	Moderate	Good/Very Good
Jawhar	0 (0%)	5 (3.4%)	144 (96.6%)
Qalimow	72 (67.9%)	33 (31.2%)	1 (0.9%)
Adan Yabal	5 (3.4%)	88 (60.7%)	52 (35.9%)
Total	77	126	197

DISCUSSION

This study provided the basis of knowledge, attitude, and practice of anthrax among pastoralists, as well as predicted future occurrences of the disease and epidemiological differences (Kracalik et al., 2017). This also opens up future research contribution and control of the disease. This study found that pastoralists kept more than one species of animal. Infectious diseases including anthrax are not only geographically and biologically determined, but they are also socially constructed and maintained. However, most of the interventions used to control of anthrax have been largely derived from technical solutions with limited consideration of the social conditions existing in the affected communities (Majed et al., 2016).

Furthermore, according to this study, the pastoralists lacked awareness of the disease by not believing in professionals from private or state agriculture and veterinary departments. Therefore, the pastoralists usually treated their livestock on their own. In order to gain an in-depth understanding of the socioeconomic and cultural contexts, interviews were conducted. The results indicated that awareness of anthrax

among the pastoralists was low. In addition, attitude towards eating anthrax-infected meat and vaccination of cattle were very poor (Manzulli *et al.*, 2019). Human behavior plays a significant role in influencing anthrax transmission. Human behaviour is also influenced by the knowledge, attitude, and practice of the affected populations. This study revealed that anthrax was more well-known in Jawhar and Qalimow than in Aden Yabal. However, the high level of knowledge of anthrax still suggested that dangerous practice and exposure can lead to infection (Mullins, 2013).

The pastoralists showed ignorant attitude towards the disease in terms of mode of transmission and prevention. In addition, they did not fully understand the possible risk factors for animals, not only regarding anthrax, but also other diseases with same signs and symptoms (Palazzo *et al.*, 2012). These results indicated that throwing away anthrax-infected meat affected the soil and public health.

CONCLUSION

Pastoralists and other livestock owners should be educated about the anthrax disease with the respect to the etiology of the disease, modes of transmission, signs and symptoms, as well as prevention and diagnosis for the control and reduction of the risk of infection in both human animals. More studies should be conducted in the districts of Middle Shabelle and their surrounding areas on the knowledge, attitude, and practice of other diseases among pastoralists. Finally, the findings suggested that in the affected animals and possibly in other similar environments, the transmission of anthrax was influenced by the existing living conditions and other cultural practices. Therefore, it is suggested that health education should consider addressing these factors. However, the level of knowledge of the pastoralists was good, but both attitude and practice were very poor. It is important to note that collaboration with other disciplines and involvement of local communities are essential to improve their awareness and effectiveness of control measures.

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CONFLICT of INTEREST

The author declares no conflict of interest.

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ETHICAL APPROVAL

This study did not require ethical approval.

AUTHORS' CONTRIBUTIONS

All authors involved in: formal analysis, investigation, methodology, software, writing original draft, reviewing, and editing.

REFERENCES

- Abbas, N., and Hafez, A. M., 2021. Resistance To Insect Growth Regulators and Age-stage, Two-sex Life Table in *Musca domestica* from Different Dairy Facilities. *PLoS One*, 16(4), 1-19.
- Ahmed, F. S., Helmy, Y. S., and Helmy, W. S., 2022. Toxicity And Biochemical Impact of Methoxyfenozide/Spinetoram Mixture on Susceptible and Methoxyfenozide-selected Strains of *Spodoptera littoralis* (Lepidoptera: Noctuidae). *Scientific Reports*, 12(1), 1-10.
- Alam, M. E., Kamal, M. M., Rahman, M., Kabir, A., Islam, M. S., and Hassan, J., 2022. Review of Anthrax: A Disease of Farm Animals. *Journal of Advanced Veterinary and Animal Research*, 9(2), 323-334.
- Antwerpen, M., Beyer, W., Bassy, O., Ortega-García, M. V., Cabria-Ramos, J. C., Grass, G., and Wölfel, R., 2019. Phylogenetic Placement of Isolates Within the Trans-urasian Clade A. Br. 008/009 of *Bacillus anthracis*. *Microorganisms*, 7(12), 1-12.
- Baldacchino, F., Desquesnes, M., Mihok, S., Foil, L. D., Duvallet, G., and Jittapalapong, S., 2014. Tabanids: Neglected Subjects of Research, But Important Vectors of Disease Agents. *Infection, Genetics and Evolution*, 28, 596-615.
- Barro, A. S., Fegan, M., Moloney, B., Porter, K., Muller, J., Warner, S., and Blackburn, J. K., 2016. Redefining The Australian Anthrax Belt: Modeling The Ecological Niche and Predicting The Geographic Distribution of *Bacillus anthracis*. *PLoS Neglected Tropical Diseases*, 10(6), 1-16.
- Bengis, R. G., and Frean, J., 2014. Anthrax As An Example of The One Health Concept. *Revue Scientifique Et Technique*, 33(2), 593-604.
- Bezymennyi, M., Bagamian, K. H., Barro, A., Skrypnyk, A., Skrypnyk, V., and Blackburn, J. K., 2014. Spatio-temporal Patterns of Livestock Anthrax in Ukraine During The Past Century (1913-2012). *Applied Geography*, 54, 129-138.
- Bianco, A., Capozzi, L., Monno, M. R., Del Sambro, L., Manzulli, V., Pesole, G., and Parisi, A., 2021. Characterization of *Bacillus cereus* Group Isolates from Human Bacteremia by Whole-genome Sequencing. *Frontiers in Microbiology*, 11, 1-15.
- Kracalik, I. T., Kenu, E., Ayamdooh, E. N., Allegye-Cudjoe, E., Polkuu, P. N., Frimpong, J. A., and Blackburn, J. K., 2017. Modeling the Environmental Suitability of Anthrax in Ghana and Estimating Populations at Risk: Implications for Vaccination and Control. *PLoS Neglected Tropical Diseases*, 11(10), 1-17.

Majed, R., Faille, C., Kallassy, M., and Gohar, M., 2016. *Bacillus cereus* Biofilms-same, Only different. *Frontiers in Microbiology*, 7, 1-16.

Manzulli, V., Fasanella, A., Parisi, A., Serrecchia, L., Donatiello, A., Rondinone, V., and Galante, D., 2019. Evaluation of In Vitro Antimicrobial Susceptibility of *Bacillus anthracis* strains Isolated during Anthrax Outbreaks in Italy from 1984 to 2017. *Journal of Veterinary Science*, 20(1), 58-62.

Mullins, J., 2013. Combining Genetic Diversity and Spatio-temporal Data to Characterize The Spatial Ecology of Anthrax Across Multiple Scales. [Thesis]. University of Florida.

Palazzo, L., De Carlo, E., Santagada, G., Serrecchia, L., Aceti, A., Guarino, A., and Fasanella, A., 2012. Recent Epidemic-like Anthrax Outbreaks in Italy: What Are The Probable Causes?. *Open Journal of Veterinary Medicine*, 2, 74-76.