Prevalence of *salmonella* organisms in dogs and the health implication in Aba, Abia State, Nigeria

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The study was carried out to evaluate the prevalence rate of *Salmonella* in dogs in Aba city and the risk it poses to dog handlers as well as those that consumes it as a delicacy. The study was carried out using 125 Dogs obtained from five different veterinary clinics located in Aba within five local government area that make up the city. Rectal swabs were used. Dogs of all ages and sex were sampled. They include 42 (33.6%) of puppies, 60(48%) adult and 23(18.4%) geriatric dogs. Dogs of different breeds (local, mixed, exotic) were also sampled. Of the total 125 dogs sampled, only 16(12.8%) were positive for *Salmonella*. The percentage of exotic dogs sampled was 50.4% and have the highest representation than the other two groups (Local and Mixed). Ciprofloxacin was the most sensitive against *Salmonella*, recording 100% susceptibility while cloxacillin was the least susceptible 2%. The prevalence rate of *Salmonella* from this study is significant (P > 0.05). It ranges from 4% to 16% and this is not acceptable hence, dog owners should cook the meat they feed their dogs adequately and scavenging should be discouraged.

**Key words**: *Salmonella*, dogs, antibiotics, clinics, Aba.

INRODUCTION

Members of *Salmonella* genus are Gram negative bacteria which can infect many animal species, including humans. *Salmonella* bacteria are distributed worldwide and they are responsible for large numbers of infections in both human and animals (Timoney et al., 1988). A number of animal species including ruminants, carnivores, birds and reptiles can play a major role as a carrier in the spread of *Salmonella* and transmit them to other healthy animals and humans (Sanchez et al., 2002). There have been several reports on transmission of *Salmonella* from dogs to humans (Sato et al., 2000). Sources of infection for dogs includes feeding of raw diet, certain dog traits such as pig ears and on rare occasions commercially prepared dry foods (Finley et al., 2007; Lefebre et al., 2008; Morley et al., 2006). For prevention, ensuring that food sources are free from infection and are stored correctly; hygiene measures and careful disposal of faces have to be put in place. Dogs may pose a risk to humans where close contact exists between dogs and their owners. Immune-suppressed individuals may be particularly at risk (Sato et al., 2000). Dogs generally seem to be resistant to *Salmonella* infections and most cases are latent and non-clinical (Kozak et al., 2003).

Clinical *Salmonellosis* are rare in dogs, but clinical signs include fever (40 - 41°C), anorexia, abdominal pain, diarrhea and possibly abortion (Marks and Kather, 2003). In Nigeria, particularly in South-East and South-South region, while some dog owners keep their dogs in kennels and feed them on prepared meals, others allow theirs to scavenge for food. Also, the people of this region eat dog as a delicacy hence this work was designed to evaluate the prevalence rate of *Salmonella* organisms in dog and the public health implication or the risk it poses to those people who handle and consume dogs knowing that the organism has zoonotic concern.

MATERIALS AND METHODS

The study area covered 5 Local Government Areas that make up the commercial city called Aba, in Abia State Nigeria. Five different private clinics each located in one local government area of the city were chosen as sample collection point. Rectal swabs were aseptically collected from 125 dogs of various ages (2 months to 12 years), sex and breeds. The swabs were carefully placed in
sterile polythene bag, embedded in icepack and transported to the veterinary laboratory of Michael Okpara University of Agriculture, Umudike within 4 h of collection for processing. The dogs from which samples were collected were dogs brought to the clinic for treatment and had clinical symptoms of Salmonella. They were made up of local breeds called Mongrel, Cross Shepherd and Doberman. The exotic breeds which comprises: Rottweiler, German Shepherd and Doberman.

**Isolation and bacteriological analysis**

The respective rectal swab sample were each inoculated in freshly prepared selenite F-broth and aerobically incubated at 37°C for 24 h. The inoculums was sub cultured into MacConkey agar and Salmonella shigella agar (Oxoid, Basing stoke, Hants, England). Further incubation was carried out at 37°C for 24 h. The presence of discreet colorless and non-fermenting colonies on Macconkey agar plates and translucent with black centre colonies of about 2 - 4mm on S. shigella agar plates were identified and the suspected colonies was Gram stained and subjected to biochemical analysis as described by Barrow and Felltham (1993). Salmonella isolates were confirmed by slide agglutination test according to the Kauffman – White Scheme Rowe and Hall (1998). The Salmonella anti-sera were obtained from (Laboratory Diagnostic products Ltd. Middlesex, Limited Kingdom).

**Antibiotic Susceptibility Testing**

This was done using the disk diffusion method (Bauer et al., 1966) with the following antibiotics: penicillin G (10 ug), gentamycin (10 ug), oxfloxacine (5 ug), amoxicillin (10 ug), streptomycin(10 ug), sulphamethoxazole (1.25 ug), ampicillin (25 ug), Chloramphenicol (5 ug), ciprofloxacine (25 ug), cephaloxine (30 ug), cloxacillin (10 ug), erythromycin (25 ug). All the antibiotics were obtained from (Oxoid United Kingdom). There was a control test using a standard sample. Isolates were categorized as susceptible and resistant based on the interpretative criteria developed by the Clinical and Laboratory Standards Institute (CLSI, 1999).

**Statistical analysis**

Statistical analysis of the data obtained from the study was analyzed using the one way analysis of variance (ANOVA).

**RESULTS**

The result obtained from Table 1 show that the dogs between the age of 1 year and 5 years visited the various clinics more than puppies and geriatric dogs.

It represents 48% compared to the other two groups of 35.6% and 18.4%. The results also show that the number of male dogs that came for treatment was higher than female dogs at 65 and 60 respectively. This is an indication that the dogs that falls within the ages of 1 year and 5 years were more frequent to the clinic and more likely to be carrier of Salmonella organisms. This statement may not be conclusive the number of samples that were positive for Salmonella organism was highest for Clinic D (24%) and Clinic A (16%) while the least was Clinic E (4%). Similarly, Clinic E and Clinic B recorded the highest negative sample of (96%) and (92%) respectively.

Most of the fecal samples were those obtain from exotic dogs which could be from German shepherd, Rottweiler or Doberman which are the exotic breeds that have fully adapted to our climatic environment. The percentage of negative samples represented (87.2%) from Table 2 while positive samples has (12.8%). The exotic dogs have 50.4% of the total dogs that were sampled, while the least was the mixed breed of dogs.

The antibiotic susceptibility test shows that 100% of isolates were susceptible to ciprofloxacine and 92% isolates for chloramphenicol, 72% isolates for gentamycin, 70% isolates for amoxicillin while isolates of Salmonella were 50% and 2% least susceptible or most resistant to erythromycin and cloxacillin.
Table 2. Number and percentage of samples that were positive and negative for Salmonella and the breeds of dogs.

<table>
<thead>
<tr>
<th>Clinics</th>
<th>No. of Samples</th>
<th>No. of Positive</th>
<th>No. Negative</th>
<th>Breeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic A</td>
<td>25</td>
<td>4(16%)</td>
<td>21(84%)</td>
<td>Local 5 8</td>
</tr>
<tr>
<td>Clinic B</td>
<td>25</td>
<td>2(8%)</td>
<td>23(92%)</td>
<td>Mixed 4 11</td>
</tr>
<tr>
<td>Clinic C</td>
<td>25</td>
<td>3(12%)</td>
<td>22(88%)</td>
<td>Exotic 4 13</td>
</tr>
<tr>
<td>Clinic D</td>
<td>25</td>
<td>6(24%)</td>
<td>19(76%)</td>
<td>6 16</td>
</tr>
<tr>
<td>Clinic E</td>
<td>25</td>
<td>1(4%)</td>
<td>24(96%)</td>
<td>3 15</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>16(12.8%)</td>
<td>109(87.2%)</td>
<td>22 63(50.4%)</td>
</tr>
</tbody>
</table>

Discussion

The study shows dogs within the aged bracket of 1 year to 5 years may likely be more susceptible to Salmonella than the other two age bracket (2 – 12 months) and (7 – 12 years). However, clinical Salmonellosis may occur in puppies due to the fact that their immune system is immature and they are more easily prone to septicemia (McGavin et al., 2001). In clinical cases of Salmonellosis in puppies, mortality could get up to 40% while morbidity could challenge 100% (McVey et al., 2002). Of the total 125 fecal specimen that was sampled, 16 (12.8%) was found to be positive. Similarly, exotic breeds of dogs recorded 63 (50.4%) of the total 125 fecal specimen sampled and may likely be more susceptible to Salmonella than local and mixed breed of dogs. The study shows that the presence of Salmonella in dogs makes them a potential source of infection to humans since they serve as companion animals and this was supported by Carter and Quinn (2000).

From the study, the prevalence of Salmonella ranges from 4% to 16% and this finding is in agreement with findings of (Greene, 2006). The prevalence rate of Salmonella in fecal samples from clinically healthy dogs range from 10% to 36% but may be declining due to recent commercialized feeding of processed foods. The recent prevalence figure in other countries shows a prevalence decline of <1% in military kenneled dogs (Schotte et al., 2007) and a prevalence of 2.1 % in household pets and 6.3% in dogs in Taiwan (Tsai et al., 2007).

The exotic breed of dogs represented the highest samples 63 (50.4%) of the total sampled. The possibility of having more Salmonella organism isolated from it is higher because dog owners that keep exotic breeds feed them on commercialized feed and raw chicken which could be a major source of Salmonella contamination. This is in agreement with the findings (Konemen et al., 1997).

In Nigeria, most local dogs are owned by individuals who allowed them to scavenge for themselves and by this process Salmonella organisms can easily be picked from rotten or spoiled food. The dogs use for this research came for treatment. From the information supplied by the dog owners, it can be concluded that some dogs are fed intensively on meat and per boiled chicken and others. Scavenging by these local dogs exposes them to infection by Salmonella as were the findings Finley (2004).

From Figure 1, it was observed that Ciprofloxacin, Chloramphenicol, Gentamycin and Amoxicillin were more susceptible to Salmonella organism under study as recorded by the degree of percentages of effectively: 100%, 92%, 72% and 70% in that order. Cotrimoxazole, erythromycin and cloxicillin were the most resistance presenting 24%, 5% and 2% respectively in that order. Ciprofloxacin is the most sensitive while Cloxicillin was the most resistance.

From this study, the prevalence of Salmonella in the five local government areas could be said to be significant hence effort should be directed at preventing or controlling the spread of this organism within the locality. This could be achieved by dog owners preventing their dogs from scavenging and by thoroughly cooking raw meat and making sure that their source of commercialized feed is not infected. Improving the hygiene level of dog bedding and housing could be useful such that Salmonella organism shed by infected dogs can be destroyed.

Conclusion

There is relatively high prevalence rate of Salmonella and high risk of contamination of the owners of dogs and invariably those that consume it. Ciprofloxacin is the most susceptible drug for Salmonella infection in dogs in the study.

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Figure 1. Antibiotic susceptibility test of Salmonella isolated from dogs.
Cip = Ciprofloxacin, Chl = Chloramphenicol, Gen = Gentamicin, Amox = Amoxicillin, Strep = Streptomycin, P = Penicillin G, Amp = Ampicillin, Cef = Cefuroxime, Oxf = Oxofoxacine, Sup = Sulphurmethoxazole, Ery = Erythromycin, Clox = Cloxacillin.

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REFERENCES