Assessing the Culture and Antibiogram Aerobic Microorganisms Isolated from Wounds and Abscesses in Adult Dairy Cattle

1Ali Rezaei, 2Ahmad Asghari and 3Saeed Ozmaie

1Department of Surgery, Tabriz Branch, Islamic Azad University, Tabriz, Iran.
2Department of Surgery, Science and Research Branch, Islamic Azad University, Tehran, Iran.
3Department of Clinical Science, Science and Research Branch, Islamic Azad University, Tehran, Iran.

Abstract: Superficial wounds and abscess are some of the most common reasons animals are brought to the veterinarian. This study was performed on 50 samples of abscesses and wounds in adult dairy cattle farms. Wound and abscess pus samples were sent to the laboratory for culture and antibiogram. Location cause abscesses and wounds were not considered in the study. In the laboratory, samples were cultured on conventional media for demonstrating gram-positive and gram-negative aerobic organisms, including blood agar and mac-conkey agar. After determining the type of organisms on Mueller Hinton agar medium was performed antibiogram by using disk diffusion method. The most common organism isolated from abscesses and wound infections was Staphylococcus aureus (%28). Then gram negative, including Escherichia coli (22%), Klebsiella (18%) and other bacteria were located. The highest resistance to tetracycline in E. coli was 81% and the highest resistance to penicillin in Staphylococcus aureus was 92%. In this study, due to the high bacterial resistance to common antibiotics, factors such as early treatment as prevention, failure to properly diagnose the disease, applying the non-effective dose of antibiotics and unnecessary use of antibiotics should be prevented.

Key words: wound, abscess, antibiogram, cattle.

INTRODUCTION

Superficial wounds and abscess are some of the most common reasons animals are brought to the veterinarian. Fortunately, most wounds and abscesses heal quickly when treated, but there are possible complications. Abscesses occur when the skin is punctured or compromised and bacteria or foreign material gets into the soft tissue below. Dirty environment or contaminated skin/drugs are the most common source. An inflammatory response is set off as the defense mechanisms of the body try to kill the bacteria or reject the material. The body then walls off a space at the site where germs multiply and pus develops. An abscess is a collection or pocket of pus in a cavity formed by disintegrating tissue and surrounded by inflamed tissue. Pus itself is a product of inflammation, accumulating where infection is present (Lingaraj, 1995). Abscesses can arise in any part of the body, but occur most often in the skin. Bacteria are frequently the source of the infection, but other microorganisms or an injury can also cause abscesses. Recurrent abscesses can be an indication of weakened immunity or toxicity in the system. Symptoms include swelling, heat, redness, and throbbing of the affected area. If the abscess becomes infected, most animals will exhibit an elevated temperature, disinterest in food, and lethargy. The abscess increases in size as it fills with pus, and decreases when the pus is drained. If untreated, the abscess can spread, resulting in the formation of other abscesses, or the tissue can become fibrous, leaving a lump. Surgical drainage is the treatment of choice for abscesses. Evacuation of the abscess cavity serves two major purposes: to obtain good bacteriological specimens for maximal antibiotic efficiency and to remove and thus prevent local spread of purulent material. (McGuckin et al., 2003; Podnos et al., 2002).

Although antimicrobial drugs may prevent suppuration if given early, or prevent spread of an existing abscess, they cannot be substituted for surgical drainage. The early administration of antibiotics can abort the development of an abscess. Once the suppuration has appeared; however, drugs generally become incapable of eradicating the infecting organisms. Several antibiotics can be partially inactivated by the pus, whereas others can maintain their potency. Another factor that decreases the activity of antibiotics that are active only against multiplying organisms is the failure of offending bacteria to multiply well in pus. Phagocytosis, which is essential to complete elimination of bacteria, is reduced in the abscess cavity. Because of the combination of these two factors, many abscesses are resistant to antimicrobial therapy. Gram’s stain of aspirated pus and appropriate aerobic and anaerobic techniques can help the veterinarian select proper therapy (Southwood and Baxter, 1996; Swaim, 1997). Unfortunately, over time, due to improper use of antibiotics in veterinary medicine and other sciences, they have lost their effect due to microbial resistance to antibiotics, the science has been forced to explore a new generation of antibiotics.

Corresponding Author: Ahmad Asghari, Department of Surgery, Science and Research Branch, Islamic Azad University, Tehran, Iran.
E-mail: Dr_Ahmadasghari@yahoo.com

738
The main objective of this research is the detection of antibiotic resistance patterns of microorganisms isolated from wounds and abscesses in the farms around Tehran - Iran which cause the financial and health damage.

**MATERIALS AND METHODS**

This study was performed on 50 samples of abscesses and wound in adult dairy cattle farms around Tehran in the years 2009-2011. Wound and abscess pus samples were sent to the laboratory for culture and antibiogram. The samples were transferred by syringe (or aspirated) or the swab to the laboratory. In total 200 samples were cultured from the abscesses and ulcers, and all samples were evaluated together. Location cause abscesses and wounds were not considered in the study.

In the laboratory, samples were cultured on conventional media for demonstrating gram-positive and gram-negative aerobic organisms, including blood agar and mac-conkey agar. Culture media were kept at 37 °C for one day. In order to diagnose staphylococci, coagulase and catalase tests, the mannitol medium and DNAase were used. The medium salt and Bile sculin were also used for growth of streptococci. Finally, diagnostic medium (IMVIC) for the Enterobacteriaceae, oxidase and OF to the non fermenter organism were used. After determining the type of organisms on Mueller Hinton agar medium was performed antibiogram by using disk diffusion method. According to the inhibition zone diameter around the antibiotic disks and the new tables NCCLS, organisms were classified as sensitive (S), resistant (R) and intermediate (I).

Since in this study the percentage of antibiotic resistance was considered, percentage of organisms resistant to antibiotics was determined. The statistical software SPSS and Chi-square test, were used in this study to determine significant results.

**Results:**

In general, 50 isolated samples from abscesses and ulcers were evaluated. The most common organism isolated from abscesses and wound infections was Staphylococcus aureus (%28). Then gram negative, including Escherichia coli (22%), Klebsiella (18%) and other bacteria were located.

Table 1: Resistance Percent common bacteria isolated from wounds and abscesses in cattle to different antibiotics.

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Penicillin</th>
<th>Ampicillin</th>
<th>Oxacillin</th>
<th>Tetracyclines</th>
<th>Erythromycin</th>
<th>Cefazolin</th>
<th>Gentamicin</th>
<th>Amikacin</th>
<th>Co-trimoxazole</th>
<th>Ciprofloxacin</th>
<th>Clindamycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>11</td>
<td>79</td>
<td>-</td>
<td>81</td>
<td>5</td>
<td>52</td>
<td>47</td>
<td>9</td>
<td>69</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Klebsiella</td>
<td>-</td>
<td>92</td>
<td>-</td>
<td>79</td>
<td>-</td>
<td>75</td>
<td>62</td>
<td>17</td>
<td>68</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>-</td>
<td>-</td>
<td>92</td>
<td>72</td>
<td>-</td>
<td>51</td>
<td>48</td>
<td>2</td>
<td>68</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Proteus</td>
<td>3</td>
<td>60</td>
<td>68</td>
<td>79</td>
<td>-</td>
<td>51</td>
<td>21</td>
<td>2</td>
<td>56</td>
<td>18</td>
<td>54</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>58</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>57</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2: Percent bacteria resistant to all antibiotics and sensitive only to one antibiotic.

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Total</th>
<th>Percent of bacteria resistant to all antibiotics</th>
<th>Percent of bacteria sensitive only to one antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus</td>
<td>14</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>11</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Klebsiella</td>
<td>9</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Proteus</td>
<td>3</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>5</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>4</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

**Discussions:**

The most common agent causing abscesses and wound infections were Staphylococcus aureus and the gram negative bacteria. Abscesses develop when bacteria gain entrance to the body. Puncture wounds caused by animal bites, especially in cats, are the most common cause. Puncture wounds are also caused by small foreign bodies such as wood which carry bacteria through the surface of the skin.

A careful attempt should be made to identify the causative microorganisms, including anaerobes, and as many of the isolated aerobic and anaerobic bacteria produce β-lactamase and are resistant to penicillins, antimicrobial agents effective against these organisms should be used (Finegold, 1999; Afnan and Hedjari, 1978). Antimicrobial agents effective against these organisms should be used. Appropriate management of
mixed aerobic and anaerobic infections requires the administration of antimicrobials that are effective against both aerobic and anaerobic components of the infection in addition to surgical correction and drainage of pus. When such therapy is not given, the infection may persist, and more serious complications may occur (Brook, 1999). To diagnose infection, microbiologic results must be evaluated in conjunction with local clinical findings, such as an increase in erythema, edema, pain, purulence, and lymphadenitis, or systemic factors, such as fever, leukocytosis (Hutchinson and McGuckin, 1990; Eaglstein, 1984; Altemeir et al., 1984). A number of factors should be considered when choosing appropriate antimicrobial agents. They should be effective against all target organisms, induce little or no resistance, achieve sufficient levels in the infected site, have minimal toxicity and have maximal stability and longevity. Antimicrobials often fail to cure the infection. Some of the reasons they do not work are the development of bacterial resistance, achievement of insufficient tissue levels, incompatible drug interaction and the development of an abscess. The environment of an abscess is detrimental for many antimicrobials. The abscess fibrotic capsule interferes with the penetration of antimicrobial agents, and the low pH and the presence of binding proteins or inactivating enzymes (β-lactamases) may impair the activity of many antimicrobials. The low pH and the anaerobic environment within the abscess are especially deleterious toward the aminoglycosides and quinolones (Wright et al., 2002).

Based on the results, it seems that there are many reasons for increase of microbial resistance such as; given unnecessary antibiotics for animals that do not require, the use of antibiotics without antibiogram, not complete treatment and the use of antibiotics without a prescription veterinarian, Environmental hygiene, Sterilization not observed in clinics, the use of antibiotics in agriculture and animal husbandry to obtain more product.

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REFERENCES