A total number of 50 apparently healthy, adult buffaloes of both the sexes were examined for different physical and biochemical parameters of synovial fluid from the tibio-tarsal joints. The physical and biochemical parameters which was studied during present investigation were as follows: clarity, colour, specific gravity, pH, viscosity, spontaneous clot formation and total volume (ml), ALT (IU/L), glucose (mg/dl), total protein(g/dl) and bilirubin (mg/dl). Out of the 50 samples, 30% of the samples were colorless clear whereas 70% of the samples found were slightly yellow in colour and 90% of the samples had clear transparency whereas 10% were showed slight turbidity. The material was collected from buffaloes brought in the Cantonment Board slaughter house, Mhow (M.P.).

Keywords: synovial fluid, tibio-tarsal joint, buffalo, ALT, bilirubin, buffalo, clarity, colour, glucose, pH, specific gravity, spontaneous clot formation, total protein, total volume, viscosity

Synovial fluid is found in the diarthroidal joints filling the joint cavity which lubricates the joints, nourishes the articular cartilage and is produced by synovial membrane. Normally synovial fluid is composed of hyaluronic acid, lubricin, proteinases and phagocytic cells. (Wikipedia, 2009)

Synovial fluid is a clear, transparent straw-colored fluid but during any disease condition of any etiological origin affecting joints may bring changes in the cellular, chemical content and physical characteristic. Synovial fluid can provide valuable information regarding various arthritic conditions which may be infectious, rheumatic, autoimmune, neoplastic etc. and can be a valuable diagnostic aid. Although, synovial fluid examination will not always provide a specific diagnosis, it does give an indication of the degree of synovitis and metabolic derangement within the joints. (Tyagi and Krishnamurthy, 1974; Jani et al., 1994; Pal et al., 1994; Barvalia et al., 1995).

As the literature on the quality and quantity of synovial fluid of buffalo is scanty, there is a need to undertake a study related to synovial fluid. Keeping this in view, the present study was conducted to analyze the physical properties, cytological contents and biochemical parameters of the synovial fluid of apparently healthy buffaloes and is being presented for publication through this
MATERIALS AND METHODS

Synovial fluid was collected from 50 apparently healthy adult animals, which showed no signs of any arthritic condition immediately before slaughter in Mhow Cantonment Board slaughter house for meat purposes from the lateral aspect of the tibio-tarsal joint by arthrocentesis using a sterile 20 ml syringe having an 18 gauge needle. The collected fluid was immediately transferred to a dry, sterile vial without any anticoagulant. The gross appearance, physical properties and total volume were recorded at the time of collection.

All the tests except for glucose were conducted within 12 h of collection of samples while the glucose estimation was done within one hour of collection.

The pH of synovial fluid and the specific gravity were estimated by using pH paper and a urinometer, respectively.

The viscosity was evaluated by the method employed by Baniadam and Razi (2005) in which string formation of 2.5-5 cm was considered to be an indication of good viscosity.

Total leucocyte count was carried out on uncentrifuged synovial fluid samples in an Improved Brightline Neubauer counting chamber with the help of WBC diluting fluid by the method similar to that used during hematology (Jain, 1986).

As to biochemical parameters, glucose was estimated by method based on GOD-POD, total protein was estimated by the biuret method, end point, bilirubin was estimated by the method of Jendrassik and Grof, and ALT was estimated by IFCC method. These parameters were estimated by using an Auto analyzer, Chem-5 V 2 plus with kits supplied by Merck.

RESULTS AND DISCUSSION

The synovial fluid of buffalo was clear colorless to slightly yellow. Out of the 50 samples, 30% of the samples were colorless clear whereas 70% of the samples were slightly yellow and 90% of the samples had clear transparency whereas 10% had slight turbidity. The average total volume, pH and specific gravity of synovial fluid was found to be 17.65±1.01 ml, 7.3 and 1.013, respectively, which was in accordance with the findings of Soliman et al. (1975). The total volume of synovial fluid collected depends on the size of the joint, because the volume collected from older animal having larger joints was greater than that from the younger animals having smaller joints. Exercise and inactivity also influence the amount of fluid (Jubb et al., 1985).

Viscosity in 100% of the samples was found to be good as evaluated by the length of the string produced. A significant decrease in relative viscosity was observed following induced arthritis in buffalo calves (Jani et al., 1994). Viscosity varies with species and joint, e.g., fluid from larger joints is usually less viscous and cellular than from that from smaller joints. Synovial fluid viscosity also varies inversely with temperature. Synovial fluid viscosity depends almost entirely on hyaluronic acid concentration, which decreases considerably if it is hydrolyzed enzymatically or if its polymerization is destroyed by enzymes or by physical processes. (Swenson, 2000)

Absence of clot formation in any of the samples indicates that normal fluid does not contain fibrinogen and other macromolecules of plasma, but these proteins may accumulate if a
joint is injured as it may increase the permeability of synovial membrane and they diffuse through it. However, in the present study no such finding was observed in any of the samples.

The total number of leucocytes counted on uncentrifuged samples ranged from 300-1250/cu.mm with an average of 425/cu.mm, which was in accordance with the findings of Soliman et al., 1975. The count may be considered as a normal count or a count during non-inflammatory condition. During pathological processes, cellular content is altered. The total leucocyte count will be helpful in distinguishing inflammatory from non-inflammatory conditions.

There was no significant difference in the measured physical parameters in respect of age, sex and side of the joints. The values of different physical and biochemical parameters of synovial fluid are presented in the Tables 1 and 2.

In the present study ALT, total protein and glucose were found to be 17.82±0.71 IU/L, 0.94±0.06 g/dl, 62.89±3.69 mg/dl, respectively. The finding of ALT is slightly higher as compared to the value reported by Baniadam and Razi, 2005 i.e.15.08±2.75. Total protein of the synovial fluid of buffaloes was reported 882.10-900.20 mg% and 0.96±0.08 g/dl, respectively (Soliman et al., 1975; Kumar et al., 2007). The low total protein in the synovial may be due to reduced filtration of protein molecules through synovial membrane because of its higher molecular size (Tulamo et al., 1989). Glucose was reported 59.25±3.39 mg/dl and 49.1±5.72 from the synovial fluid of buffaloes. (Baniadam and Razi, 2005; Kumar et al., 2007). There was no significant difference between groups according to age, sex and side of the joint for the measured biochemical parameters, except ALT and LDH according to sex (Baniadam and Razi Jalali, 2005).

Table 1. Physical characteristics of tibio-tarsal synovial fluid.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity</td>
<td>Clear</td>
</tr>
<tr>
<td>Colour</td>
<td>Colorless - slightly yellow</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.013 (range :1.010-1.015)</td>
</tr>
<tr>
<td>pH</td>
<td>7.3 (range:7.28-7.32)</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Good</td>
</tr>
<tr>
<td>Spontaneous clot formation</td>
<td>None</td>
</tr>
<tr>
<td>Total volume (ml)</td>
<td>17.65±1.01 ml</td>
</tr>
</tbody>
</table>

Table 2. Chemical characteristic of tibio-tarsal synovial fluid.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT (IU/L)</td>
<td>17.82±2.01</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>62.89±3.69</td>
</tr>
<tr>
<td>Total protein (g/dl)</td>
<td>0.94±0.06</td>
</tr>
<tr>
<td>Bilirubin (mg/dl)</td>
<td>0.11±0.02</td>
</tr>
</tbody>
</table>

± standard error
Bilirubin was also found in samples having slightly yellowish tinge and was not reported by any of the earlier workers. Bilirubin-0.11±0.02 mg/dl (range-0.00-0.41 mg/dl). The bilirubin along with ALT and AST might be useful in assessing the condition of the liver and bone health of the affected animals.

A general trend of increase in all the biochemical parameters had been observed as the colour of the synovial fluid progresses from colorless to slightly yellowish. Synovial fluid can be considered as a dialysate of blood plasma except for hyaluronic acid content, which is almost entirely responsible for its viscosity. In comparison to blood plasma of buffalo, total protein was significantly low in synovial fluid, which may be due to lesser permeability of synovial membrane and capillaries to protein, but it increases significantly following induced arthritis in buffalo calves. (Jani et al., 1994) The value of glucose is in and around blood plasma, ALT is a bit higher than blood plasma and bilirubin is absent in colorless samples and in samples where it is found either around blood plasma or lower.

REFERENCES


