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**Kalakotla Vishwas**
Scientist, Edara Research Institute, Sanathnagar, Hyderabad, Telangana, India

**Kanakuntla Sandhyarani**
Contract Teaching Faculty, Department of Veterinary Pathology, C.V.Sc, P.V.N.R.T.V.U, Korutla, Telangana, India

**Doppalapudi Madhuri**
Professor, Department of Veterinary Pathology, C.V.Sc, P.V.N.R.T.V.U, Korutla, Telangana, India

**Mylaram Jeevanalatha**
Assistant Professor, Department of Veterinary Pathology, C.V.Sc, P.V.N.R.T.V.U, Mamnoor, Warangal, Telangana, India

**Kancharlapalli Dhanalakshmi**
Associate Professor (RETD), Department of Veterinary Microbiology, C.V. Sc, P.V.N.R.T.V.U, Hyderabad, Telangana, India

**Corresponding Author:**
**Kalakotla Vishwas**
Scientist, Edara Research Institute, Sanathnagar, Hyderabad, Telangana, India

# Incidence and mortality due to respiratory diseases in rabbits

**Kalakotla Vishwas, Kanakuntla Sandhyarani, Doppalapudi Madhuri, Mylaram Jeevanalatha and Kancharlapalli Dhanalakshmi**

**Abstract**
In the present study, the materials consisted of tissue samples from rabbit carcasses collected from organized farms located in and around Hyderabad apart from the animals necropsied in the Department of Veterinary Pathology, PVNRTVU, College of Veterinary Science, Rajendranagar, Hyderabad. A total of 150 rabbit carcasses of either sex and of different age groups died during January to July 2018 were subjected to detailed postmortem examination for pathological and bacteriological study. System wise causes of mortality was summerized in which highest mortality is due to involvement of respiratory system (43.33%). In respiratory system higher incidences of mortality due to pneumonia (73.84%), followed by tracheitis (6.15%), emphysema (6.2%), lung abscess (4.6%), pulmonary oedema (3.08%) and congestion (3.08%) were recorded. A total of 45 samples from lungs were examined for bacterial isolation and the major pathogen isolated from lungs was *Staphylococcus* (33.33%) followed by *E.coli* (24.43%), s*treptococcus* (13.33%), *Pasteurella* (8.9%). ABST revealed that most of the bacterial strains were sensitive to ceftriaxone and gentamycin.

**Keywords:** mortality, respiratory diseases, rabbits, bacteriological studies and ABST

## Introduction
The rabbit farming is an important emerging enterprise for skin, meat, fur and wool production besides as pet animal. Due to lack of awareness and less economic viability of rabbit farming to that of other livestock farming systems, the rabbits have not yet been accepted by most farmers and animal breeders. Since rabbits are generally maintained in confinement, good care and management are required. Heavy mortality in rabbits could be due to various disease with different etiological agents may invade throughout the flock. A review of most frequently diagnosed rabbit disease indicated that the prevalence of digestive and respiratory diseases are very common comparative to other systemic infections [6]. The study was considered with the objective to study gross and histopathological changes in lungs and trachea along with isolation and identification of organisms in respiratory diseases of rabbits.

## Materials and Methods
### Source
The materials for the present study consisted of tissue samples from rabbit carcasses collected from organized farms located in and around Hyderabad apart from the animals necropsied in the Department of Veterinary Pathology, PVNRTVU, College of Veterinary Science, Rajendranagar, Hyderabad. A total of 150 rabbit carcasses of either sex and of different age groups were necropsied, and respective samples were collected for histopathological and bacterialogical study.

### Postmortem examination and pathological studies
At necropsy, a detailed examination was carried out on rabbit carcasses for the presence of gross lesions if any. Tissue slices from representative portions of trachea, lungs that showed definite gross lesions were collected and fixed in 10% neutral buffered formalin (NBF) for histopathological examination.

### Histopathology
The pieces of trachea, lung showing gross lesions were collected in 10% NBF for fixation and processed for histopathological studies, by routine paraffin embedding technique [10].

**Bacteriological examination**
For bacteriological studies tissue samples and swabs were collected aseptically in sterile container.

**Bacterial isolation**
The swabs were collected in sterile test tubes and inoculated in nutrient broth/Brain Heart Infusion (BHI) broth and incubated at 37 $^0$C for 24 hours. Then the broth culture material was streaked on nutrient agar and BHI agar plates prepared in microbiology laboratory as per manufacturer's instructions. A provisional identification of bacterial growth was done based on the colony morphology and Gram's staining. Isolation and characterization of bacteria was done as mentioned in Bergey's Manual of Determanative Bacteriology [9]. The selective media for different bacterial species *viz.* Mac Conkey agar for gram negative bacteria, Eosin Methylene blue (EMB) agar for *E.coli*, Mannitol salt agar for *Staphylococcus spp* and sheep blood agar media for *Pasteurella spp* were used. The biochemical tests were employed as per the methods described in the Cowan and Steels Manual for the identification of Medical Bacteria [3].

**Antibiogram Materials**
Mueller-Hinton agar was used to study the antibiotic sensitivity pattern of the isolates.

**Results and Discussion**
A total of 150 rabbit carcasses of different age groups presented to the Department of Veterinary Pathology for postmortem examination during the period of January to July, 2018 were studied. Of these 150 carcasses the pathological conditions related to respiratory system (43.33%) were most prevalent. On the basis of systemic necropsy and pathomorphological examination various pathological conditions were identified and among systemic conditions major cause of mortality was pneumonia. These results were in agreement with other workers [20]. The most commonly encountered pulmonary lesions during postmortem examination in the present study were pneumonia (73.84%), congestion (3.08%), pulmonary edema (3.08%), emphysema (6.2%), tracheitis (6.15%) and lung abscesses (4.6%). Perusal of the literature revealed a higher incidence (33.9%) in earlier studies [21]. Grossly, tracheal lumen revealed frothy or blood mixed exudates and had an edematous mucosa with moderate to severe diffused congestion and haemorrhages. Similar gross changes were observed by earlier workers [1, 15]. Microscopically, scattered infiltration with heterophils was evident throughout the mucosa (Fig. 1).

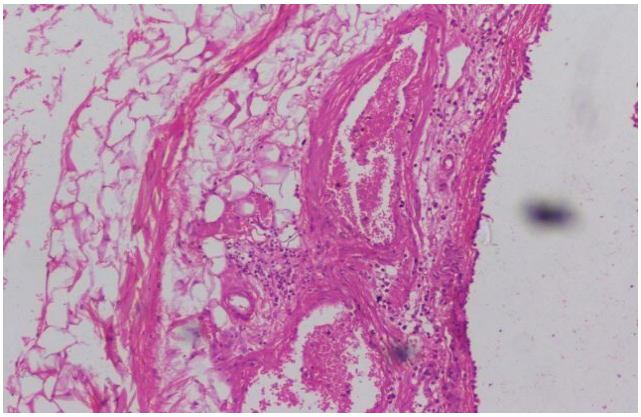

**Fig 1:** Photomicrograph of trachea showing scattered infiltration with heterophils throughout the mucosa and congestion. H&E X 100.

In the present study, circulatory disturbances were observed in 4 (2.66%) cases that included pulmonary congestion and haemorrhages (3.08%) and pulmonary edema (3.08%). Lesions of pulmonary congestion and hemorrhages comprised of red patchy areas and petechial to echymotic haemorrhages, and showed dilated blood vessles and RBC's (Red Blood cells) in the lumen of the alveoli microscopically (Fig. 2). The lesions observed were in accordance with the observation of recent works (22).

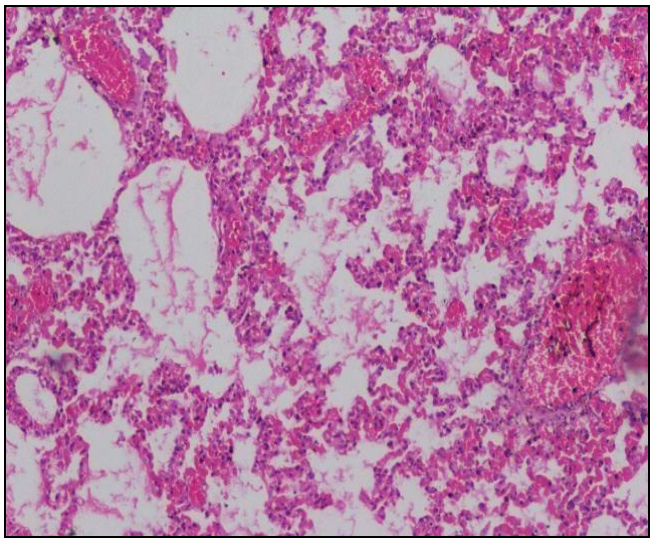

**Fig 2:** Photomicrograph of rabbit lung showing dilated alveolar capillaries with red blood cells. H&E X 100.

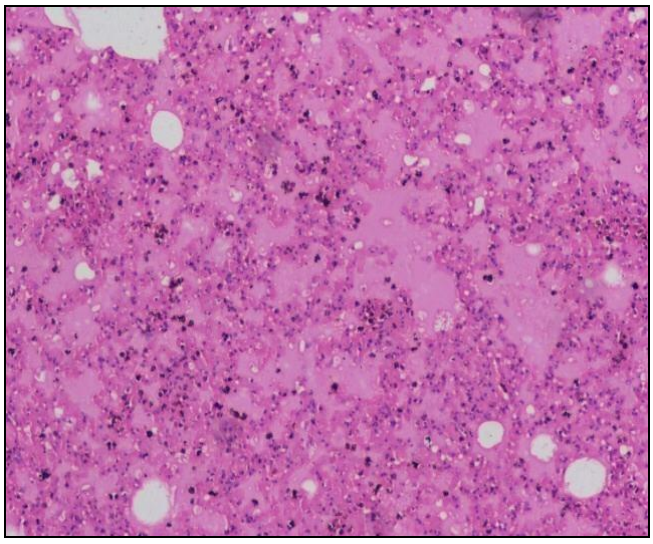

**Fig 3:** Photomicrograph showing pink coloured homogenous fluid in the alveoli. H&E X100.

The incidence of pulmonary edema (3.08%) observed was similar to the earlier reports [2, 22]. Grossly, lungs are pale and heavy, and microscopically homogenous pinkish fluid in the alveoli was observed (Fig. 3). Edema might be due to damage in the endothelium and because of exposure to bacterial toxins pneumocytes or it may also etc, [12]. The occurrence (6.2%) of pulmonary emphysema was low but the gross and histopathological lesions of pulmonary emphysema were in concurrence with earlier study [4]. Grossly, lungs were enlarged, pale in color. Microscopically, abnormal enlargement of air spaces with destruction of alveolar wall leading to formation of giant alveoli was observed (Fig. 4).

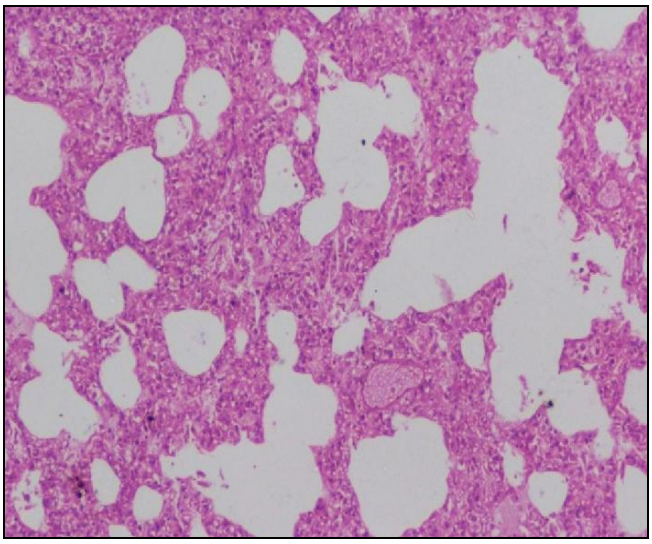

**Fig 4:** Photomicrograph of rabbit lung showing giant alveoli. H&EX400.

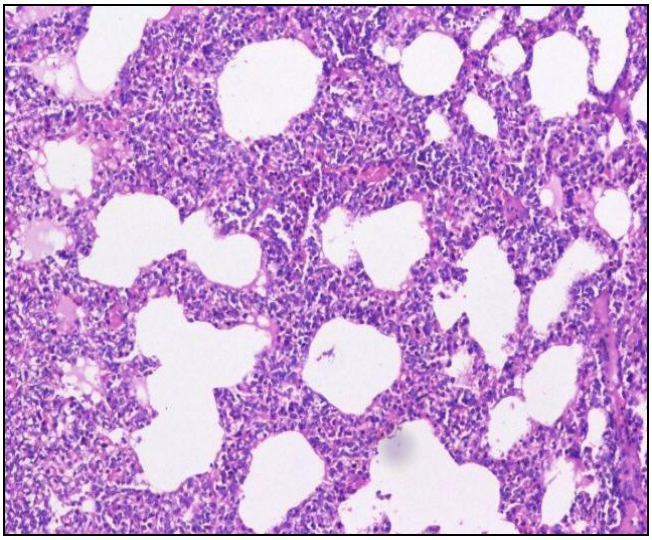

**Fig 5:** Photomicrograph of lung showing thickening of alveolar septa and infiltration of leukocytes. H&E X 100

The incidence of pneumonia observed was the highest among the lung lesions in the present study accounting for 73.84 per cent. The present study revealed that the most frequently encountered pneumonia was interstitial pneumonia (54.17%) which was in agreement with the findings of earlier studies [21]. Gross findings of interstitial pneumonia revealed pale, distended and heavy lungs. Petechiae to diffuse sub-pleural haemorrhages were evident. Histopathologically, the interstitium showed hyperemia, haemorrhages and thickening of inter-alveolar septae due to MNC infiltration. MNC aggregations was also observed around the bronchioles and blood vessels (Fig. 5). The over all incidence of bronchopneumonia in the present study was 18.8% and it was in agreement with the reports of recent studies [21, 22]. The bronchopneumonia was further subdivided into suppurative bronchopneumonia (22.9%) and fibrinous bronchopneumonia (4.2%) based on the type of exudates. Suppurative bronchopneumonia was characterised by diffused red hepatization of antero ventral lobes, plugging of airways with catarrhal exudate, while fibrinous bronchopneumonia revealed sub pleural haemorrhages and fibrinous exudate over the pleural surface of lungs. Histopathological observations in suppurative bronchopneumonia revealed bronchiolitis, alveolar lumen filled with exudate rich in polymorphonuclear (PMN) leucocytes and erythrocytes (Fig. 6). Bronchiolar epithelial cells had varying degree of degenerative changes along with leucocytic infiltration. The cases of fibrinous bronchopneumonia revealed fibrin mixed PMN cells and MNC in alveoli, bronchioles and interstitium (Fig. 7). The gross and microscopic findings observed in the present study were in agreement with the findings of earlier reports [21, 22]. Fibrin is chemotactic for neutrophils and hence neutrophils are evident in areas undergoing fibrinous inflammation [12].

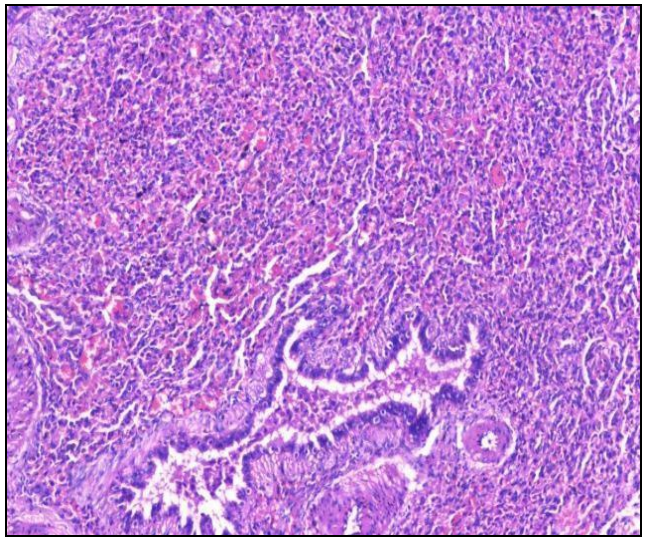

**Fig 6:** Photomicrograph rabbit lung showing heavy leucocytic infiltration and bronchiolitis. H&E X 100.

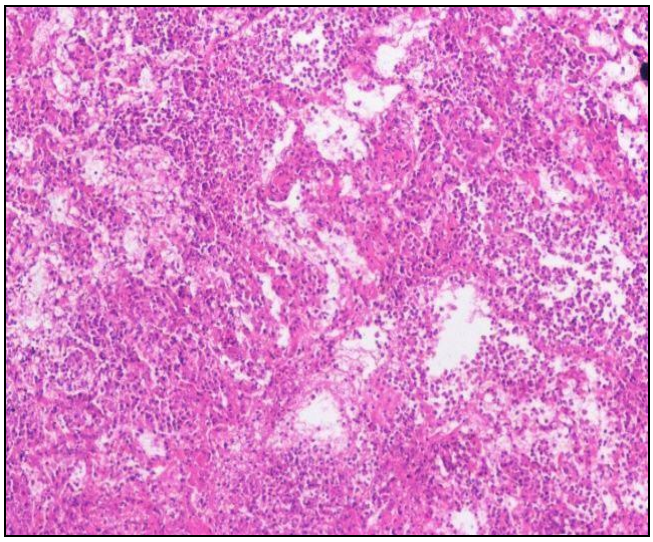

**Fig 7:** Photomicrograph of rabbit lung showing fibrinous pneumoniaH&E X100.

Lung abscess condition was seen in 4 cases (4.6%) and occurrence in the present study was low when compared to earlier studies [1, 14]. Grossly, multiple abscesses of walnut size were found on the surface of lung. Microscopically, a central caseo necrotic core surrounded by pyogenic membrane with infiltration of leukocytes was observed (Fig 8, 9). The presence of pyogenic membrane might be an attempt of the body to circumscribe the active infectious zone. Also the cytokines released by inflammatory cells might facilitate fibroplasia by paracrine action.

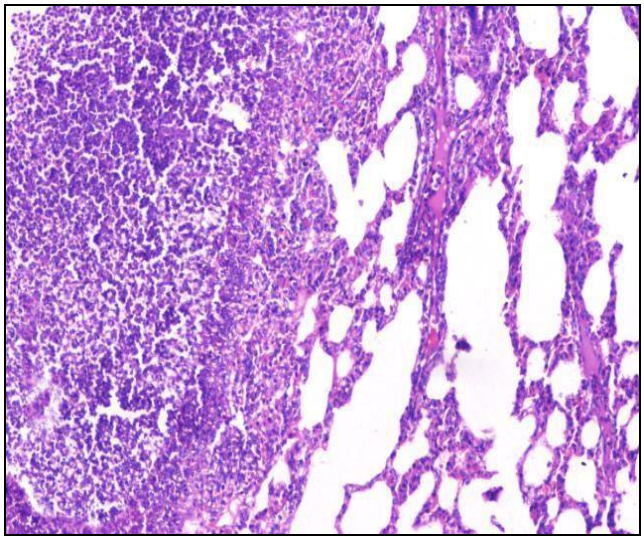

**Fig 8:** Photomicrograph of rabbit lung showing pyogenic membrane around the abscess. Adjoining alveoli showing emphysema H&E X 100.

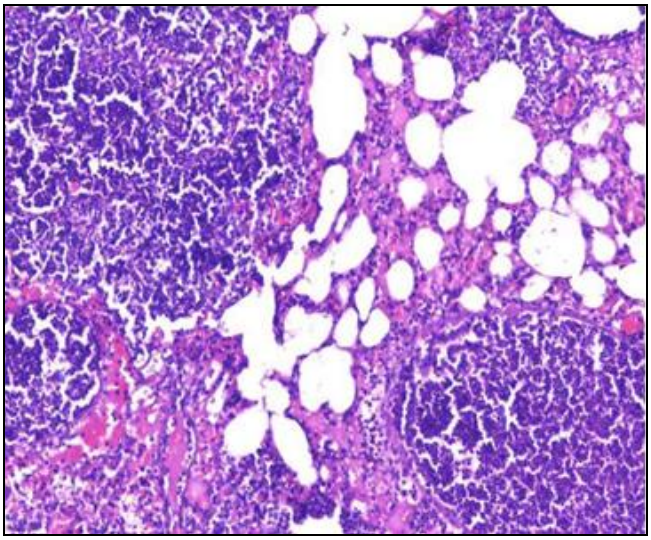

**Fig 9:** Photomicrograph of rabbit lung showing multiple abscess in the lung parenchyma. H&E X 100.

**Bacteriological Studies**

Microbiological samples collected from lung samples (45) revealed *Staphylococcus* spp. 15 (33.33%) (Fig. 10), *Streptococcus* spp. 6(13.33%), *E. coli* 11(24.43%) (Fig. 11), *Pasturella* spp.4 (8.9%) (Fig. 12) respectively. Some of research studies [2, 5, 7, 8, 11, 13, 17-19, 21-23] reported isolation of the similar bacterial species from lungs of rabbit carcasses. The result of

invitro drug sensitivity to different bacterial species isolated from lungs revealed that *Staphylococcus* spp. was sensitive to gentamicin, enrofloxacin, ceftrioxone and resistant to ampicilline and methicilline (Fig. 13). *Streptococcus* was sensitive to gentamycine, ampicilline, and amoxycilline and resistant to celfoperazone. *E.coli* sensitive to gentamycin, ceftrioxine, ampicilline and resistant to cloxacilline, celfoperazon (Fig. 14). *Pasteurella* was sensitive to enrofloxacine, ceftriaxone and resistant to cloxacilline. Almost similar results with respect to antimicrobial susceptibility resistance patterns have been reported previously [1, 16, 24].

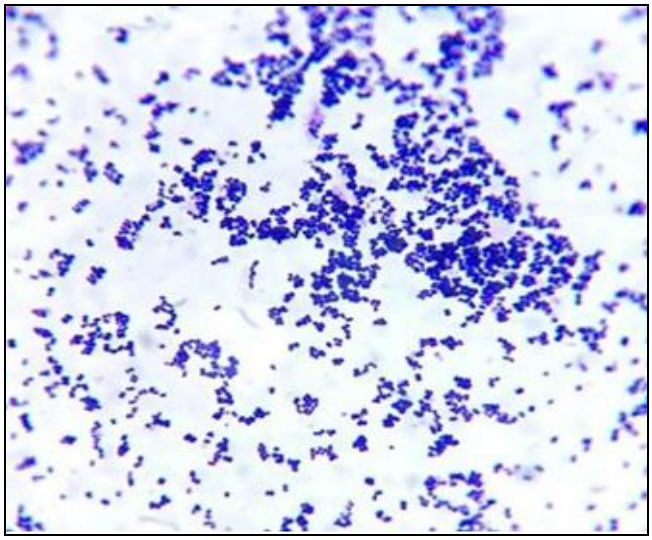

**Fig 10:** Photomicrograph showing Gram positive cocci in grape like clusters (*Staphyococcus*).

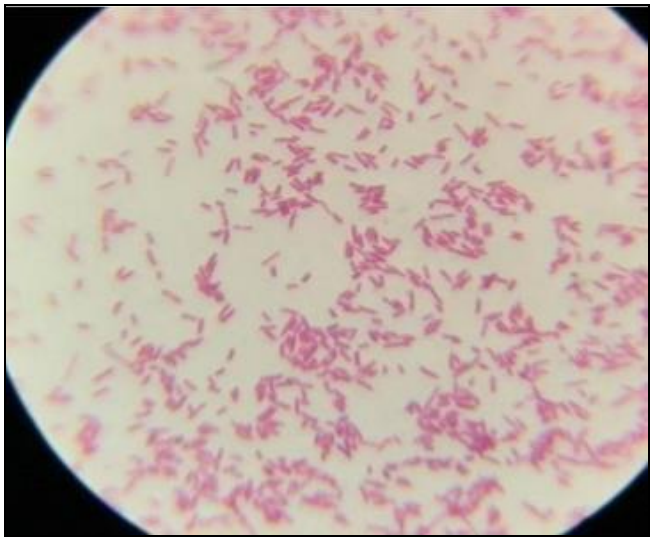

**Fig 11:** Photomicrograph showing Gram negative bacilli (*E. coli*).

**Fig 12:** Photograph showing Medium size Mucoid colonies of *Pasturella* on Blood agar.

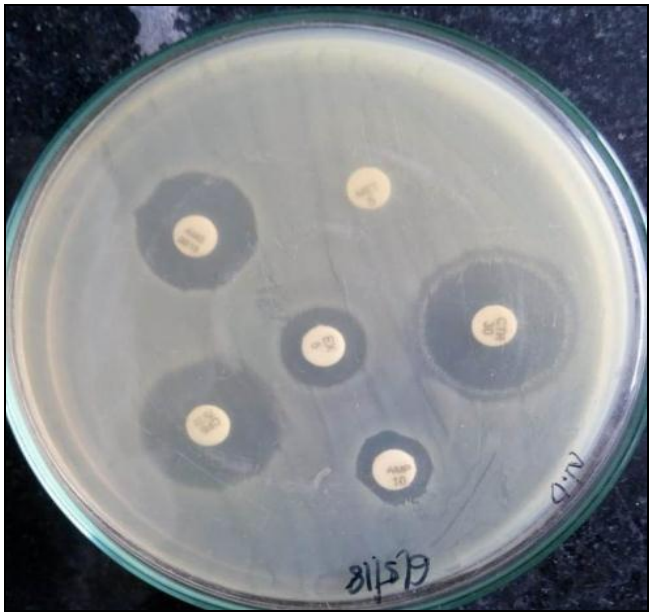

**Fig 13:** Photograph showing ABST pattern of *staphylococcus.*

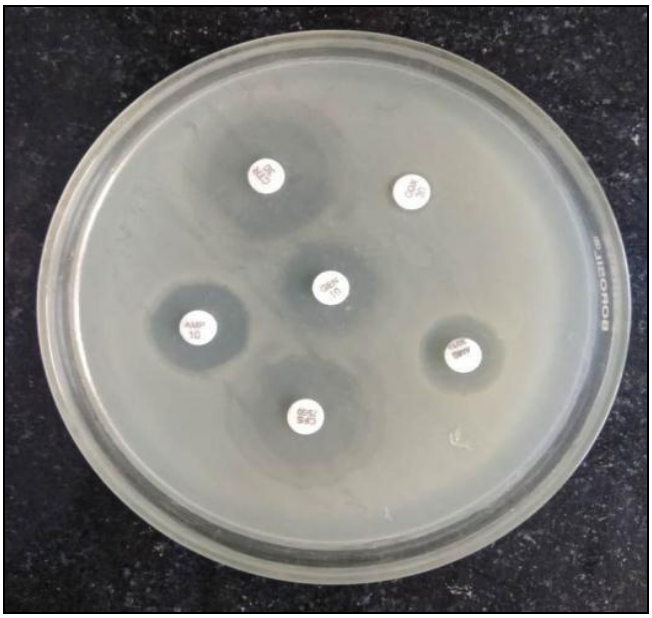

**Fig 14:** Photograph showing ABST pattern of *E. coli*.

## Conclusion

In conclusion, the incidence of respiratory affections was found to be highest in which the mortality due to haemorrhagic trachietis is 6.15%, pulmonary oedema is 3.08%, congestion is 3.08%, emphysema is 6.2%, pnuemonia is 73.84% and lung abscess is 4.6%.respectively. The bacteriolgical examination revealed the *staphylococci spp* was the major bacterial pathogen causing respiratory infections in rabbits along with *streptococcus, pasteurella* and *E. coli* as minor pathogens in the present study for which ceftriaxone and gentamicin were showed antibiotic activity effectively.

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