SOME STUDIES ON ENTERITIS IN RABBITS

R.R. RAGHEB, A.E. SAAD, AND A.I. TANIOS

1 Animal Health Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.
2 Faculty of Veterinary Medicine, Mishtohor.

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Abstract

One hundred and fifty diseased and freshly dead rabbits were examined for mycotic and bacterial organisms. The examined rabbits showed diarrhoea and/or enteritis. The most recovered mycotic organisms were Aspergillus fumigatus, Aspergillus flavus, Aspergillus niger, Mucor racemosus and Candida albicans. The recovered bacteria were Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa and Proteus vulgaris. Serotyping of Escherichia coli isolates revealed 4 different serovars; O119, O128, 0157 and 0178. Salmonella was not isolated from rabbits. Groups of 5 New Zealand White weaned rabbits of 30 days old were used to test the pathogenicity of isolated Aspergillus fumigatus, Mucor racemosus, Geotrichum candidum, Candida albicans and different serovars of Escherichia coli. Mixed infection of Aspergillus fumigatus, Candida albicans and Escherichia coli was also studied. Clinical and pathological changes were recorded. The main pathological changes were congestion, haemorrhages and necrosis in most examined organs, in addition to presence of periodic acid Schiff (PAS) positive fungal spores in hepatic and intestinal tissues.

INTRODUCTION

During recent years, rabbits industry became well established in Egypt. The rabbit meat is used as a good source of animal protein, and some breeds are reared for fur production, as well as, for medical and biological purposes.

Enteritis remains one of the major problems facing rabbitries causing high mortalities which is of economic importance. This problem is of multiple etiology. The mycotic enteritis associated with diarrhoea was previously reported in different animals (El-Badri, 1992 and Jensen et al., 1994). Candida species and Aspergillus fumigatus were isolated from fatal gastrointestinal lesions in calves and proved lethal for rabbits, mice and guinea pigs (Barinov, 1968).

The disorders of the digestive tract of rabbits due to bacterial agent were recorded by many authors all over the world (Urosevic et al., 1986, Abdel Gwad,

This study was planned to investigate the mycotic, as well as bacterial infections associated with enteritis in rabbits to find out the possible role of the isolates in causing diseases in experimentally infected rabbits and to clear the pathological changes associated with this infection.

MATERIALS AND METHODS

1. Samples
   - Liver, small and large intestine of 150 diseased and freshly dead rabbits with diarrhoea and/or enteritis were subjected to mycotic and bacterial examinations. The samples were collected from Kalubia, Sharkia and Giza Provinces.

2. Mycotic examination
   - **Direct microscopic examination**
     Scrapings from liver, small and large intestine of diseased and freshly dead rabbits were examined directly with microscope using 20% potassium hydroxide, carbol fuchsin and Gram's stain.
   - **Cultural examination**
     Small fragments of the examined organs were immersed in 70% ethyl alcohol for 5 minutes, then, inoculated into Sabouraud's dextrose agar containing penicillin (20 IU/ml) and streptomycin (40 mg/ml), and incubated at 37°C for 10 days. Suspected yeast and mould growth were subcultured onto Sabouraud agar slants in order to obtain pure cultures and are kept for further identification. *Aspergillus* colonies were inoculated on Czapeck's agar (3%), *Penicillium* colonies were cultured on Czapeck and Malt extract agar and other colonies were cultured on Potato dextrose and Malt extract agar for mould species identification. Yeasts were identified by culturing on Rice agar, the presence of germ tubes in serum and biochemical reactions.

3. Bacteriological examinations
   - **Cultural examination**
     Loopfuls from liver, small and large intestine were inoculated aseptically in to
Selenite-F broth (Difco) for 8-10 hours at 37°C, then, plated on Salmonella Shigella (Oxoid) agar at 37°C for 24 hours. The plates were examined for the presence of Salmonella suspected colonies.

Another loopfuls from the same organs were identified morphologically and biochemically according to Cruickshank et al. (1975), Koneman et al. (1988) and Carter and Chegappa (1991).

SEROLOGICAL IDENTIFICATION

Serological identification of suspected Escherichia coli strains was pointed out according to Edwards and Ewing (1972). Serotyping of the isolates was performed with slide agglutination test using Escherichia coli polyvalent and monovalent "O" antisera obtained from DENKA SEIKEN Co. LTD., Tokyo, Japan.

4. EXPERIMENTAL INFECTION

Fifty apparently healthy New Zealand White weaned rabbits of 30 days old were divided into 10 groups consisting of 5 each. The groups were used to test the pathogenicity of isolated Aspergillus fumigatus, Mucor racemosus, Geotrichum candidum, Candida albicans and different serovars of Escherichia coli. Mixed infection of Aspergillus fumigatus, Candida albicans and Escherichia coli was also made. Before infection, random samples were subjected to mycological and bacteriological examination which proved to be negative for infection. The last group was kept as control. Each rabbit was inoculated orally with 5 ml of spores suspension containing $2.6 \times 10^9$ spore/ml for each fungal species (Chihaya et al., 1988). The rabbits received a suspension of $2 \times 10^5$ CFU of each Escherichia coli serovar (Peeters et al., 1984).

Animals of all groups were kept under observation for up to 21 days with record of the clinical signs and mortalities. At the end of the experiment, survived rabbits were sacrificed. Recently dead, as well as sacrificed rabbits were subjected to post-mortem, mycological and bacteriological examinations for resisolation of inoculated organisms.

5. PATHOLOGICAL EXAMINATION

A small specimen from different organs including liver, small and large intestine of freshly dead or sacrificed experimental rabbits were immediately fixed in 10% formal saline for histopathological examination. The samples were then washed with distilled water, and then, routinely stained with Hematoxyline and Eosin and Periodic Acid Schiff (P.A.S.) (Clayden, 1971).
RESULTS

Clinically diseased rabbits were depressed, diarrhoeic, off food and had ruffled fur.

Grossly, there was congestion of internal organs. Liver showed enlargement, and some cases showed necrotic foci and/or distended gall bladder. Intestine showed catarhal enteritis with fluid contents and gases. Some cases showed dark coecal contents with or without haemorrhages of cecal mucosa. Lung congestion was reported in few cases.

The incidence of mycotic affection in examined rabbits is showed in Table 1. It is clear that, Aspergillus fumigatus, Aspergillus flavus, Aspergillus niger, Mucor racemosus and Candida albicans were isolated from liver, small and large intestine.

The incidence of fungal infection in liver, small and large intestine was 4%, 14.67% and 14.67%.

Table 1. Incidence of mycotic affections in examined rabbits.

<table>
<thead>
<tr>
<th>Isolates</th>
<th>Liver</th>
<th>Small intestine</th>
<th>Large intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Aspergillus fumigatus</td>
<td>1</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>2</td>
<td>1.33</td>
<td>2</td>
</tr>
<tr>
<td>Aspergillus niger</td>
<td>1</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>1</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>Aspergillus chevalieri</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cladosporium cladosporiodes</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Mucor racemosus</td>
<td>1</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>Mucor species</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Penicillium citrinum</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Rhizopus species</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scopulariopsis brevicaulis</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tricoderma species</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>1</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>Candida parapsilosis</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Geotrichum candidum</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>4</td>
<td>22</td>
</tr>
</tbody>
</table>

Incidence of different bacteria isolated from examined cases appeared in Table 2. It is observed that, the incidence of total bacterial isolation in liver, small and large intestine was in percentage of 8.67%, 18% and 27.35%, respectively. The
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recovered bacteria were Escherichia coli (44), Klebsiella pneumoniae (18 isolates), Pseudomonas aeruginosa (11 isolates) and Proteus vulgaris (8 isolates).

The examined livers were positive for Escherichia coli and Klebsiella pneumoniae only in incidence of 7.33% and 1.33%, respectively, while, small and large intestine were positive for all recovered bacteria.

Serological identification of Escherichia coli isolates revealed that, out of 44 isolates, 21 (47.73%) were 0119, 14 (31.82%) were 0128, 6 (13.64%) were 0157 and 3 (6.81%) were 078.

Results of experimental infections of isolated fungi, Escherichia coli, serovars and mixed infection of both organisms were illustrated in Table 4. It is noted that the inoculated fungi were pathogenic and resulted in mortality of 20% except that Aspergillus fumigatus was 40%. Mortality rate of 60%, 40%, 20%, and 20% were reported in rabbits infected with Escherichia coli serovars 0119, 0128, 0157 and 078, respectively. Mixed infection of 0119, Aspergillus fumigatus and Candida albicans resulted in high mortality of 80%. The results of re-isolation of inoculated organisms from experimental rabbits were positive. The inoculated rabbits showed depression, dullness, off food and diarrhoea.

Postmortem examination of infected rabbits revealed liver congestion in case of Aspergillus fumigatus, Mucor racemosus, Candida albicans and Escherichia coli, with presence of small whitish foci in Aspergillus fumigatus and large pale areas with distention of gall bladder in Candida albicans. Congestion of mesentric vessels and haemorrhagic areas on hepatic surface were noticed in Geotrichium candidum infection. Catarhal enteritis was recorded in Mucor racemosus and Geotrichium candidum infected rabbits. Intestine showed congested blood vessels with oedematous wall in Aspergillus fumigatus infection. Inflammatory intestinal wall was noticed in Escherichia coli infection. Candida albicans and mixed infected cases showed pasty content and gasses in intestinal lumen.

Microscopic findings of liver showed hepatic congestion with focal degenerative changes of hepatocytes in Aspergillus fumigatus, Mucor racemosus and Candida albicans infections. Severe congestion with focal areas of haemorrhages was observed in Geotrichium candidum and Escherichia coli infections, associated with hemodendrosis in the mixed infection. Focal mononuclear inflammatory cellular aggregation mostly lymphocytes was noticed in Mucor racemosus infection. In case of Candida albicans infection, focal areas of necrosis surrounded by mononuclear inflammatory cells and fibrous connective tissue proliferation with fungal masses at
periphery of necrosis were demonstrated (Fig. 1). The fungal masses were positive with PAS stain.

Examination of intestine revealed congestion and submucosal inflammatory oedema (Fig. 2), focal proliferation of lining epithelium and hyperplasia of goblet cells with presence of PAS positive fungal masses in submucosa of Aspergillus fumigatus in infected rabbits. Congestion of intestinal submucosal capillaries with mononuclear cellular infiltration was seen in Mucor racemosus and Geotrichum candidum in infected cases. In addition, Mucor racemosus gave vacuolation of the glandular epithelium, while, focal hyperplasia of mucosal epithelium was noticed in Geotrichum cases. Candida albicans infection produced congestion of blood vessels with proliferation of mucosal epithelium (Fig. 3). Oedema of submucosa infiltrated with inflammatory cells mostly lymphocytes and macrophages was also noticed. In Escherichia coli infection, focal desquamation of mucosal epithelium, hyperplasia of goblet cells with inflammatory cellular infiltration of lamina propria and submucosa mainly lymphocytes were noticed (Fig. 4). In mixed infection, congestion of blood vessels, desquamation of goblet cells proliferation with presence of PAS positive fugal spores were observed (Fig. 5).

**DISCUSSION**

Enterities and diarrhoea among rabbits cause high morbidity and mortality rates. Little is known regarding the aetiologic role of fungi in this problem. In the present study, Aspergillus fumigatus, Aspergillus flavus, Aspergillus niger, Mucor racemosus and Candida albicans were isolated from intestine and liver of diseased and dead rabbits. Nearly similar results were recorded by Refai et al. (1974) and Refai et al. (1990) who succeeded in the isolation of Mucor, Aspergillus niger, Aspergillus fumigatus, and Aspergillus flavus from the lungs, liver and hearts of hens, turkeys, ducks and rabbits. Aspergillus glaucus was isolated from small and large intestine of diarrhoeic rabbits, while, Scopulariopsis brevicaulis and Trichoderma species were recovered from large intestine of diarrhoeic rabbits. Ainsworth and Austwick (1955) reported one outbreak of scour in steers which was thought to be due to the consumption of mouldy grass nuts which when examined were found to be covered with a heavy growth of Aspergillus glaucus, Trichoderma koningii and Scopulariopsis brevicaulis. It is of interest to record that these three fungi were also the most frequent isolates from faeces of affected animals. Also, Penicillium citrinum, Mucor spp., Rhizopus spp., Cladosporium cladosporioides, Candida parapsilosis and Geotrichum candidum were isolated from intestine of rabbits with enteritis. Nearly similar results were obtained by Abou-Gabal et al.
Table 2. Results of bacteriological examination of examined rabbits.

<table>
<thead>
<tr>
<th>Type of examined organs</th>
<th>No. of Examined organs</th>
<th>Total No. of Bacterial Isolates</th>
<th>%</th>
<th>Type of isolated bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Escherichia coli</td>
</tr>
<tr>
<td>Liver</td>
<td>150</td>
<td>13</td>
<td>8.67</td>
<td>11</td>
</tr>
<tr>
<td>Small intestine</td>
<td>150</td>
<td>27</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Large intestine</td>
<td>150</td>
<td>41</td>
<td>27.33</td>
<td>19</td>
</tr>
</tbody>
</table>
(1977), Ibrahim et al. (1983) and Shalaby and Helmy (1992) in diarrhoeic fowls and Watambe et al. (1976) in diarrhoeic cattle and pigs. Moreover, Kharole et al. (1976) found that Rhizopus and Candida species isolated from diarrhoeic Raphieh buffalo-calves were highly pathogenic to rabbit by IV inoculation, while (1990) recorded that Candida albicans and Mucor species isolated from diarrhoeic calves were pathogenic to rabbits and mice. On the other hand, Geotrichum candidum infected the mucous membranes of the alimentary tract of animals (Carter and Chengappa, 1991).

In the present study, Klebsiella pneumoniae, Pseudomonas aeruginosa and Proteus vulgaris were isolated from examined rabbits (Table 2). Our results are supported by Sadek and El-Agroudi (1963) who isolated Proteus organisms from 2 baby rabbits with severe diarrhoea. Proteus vulgaris was isolated from rectal swabs of apparently healthy rabbits (Milgy and Ghoneim, 1970). Ali (1983) revealed Proteus spp., Klebsiella spp. and Pseudomonas aeruginosa from rabbits with digestive diseases, and Abdel Gwad (1988) isolated Klebsiella pneumoniae from liver of 100 dead rabbits. Katoch et al. (1993) isolated Proteus spp. and Klebsiella spp. from rectal swabs of 35 rabbits with digestive disorders. Since no pathogenicity tests were done on these organisms reported in this work, their role as a pathogen in enteritis in rabbits cannot be stated. Further work is needed to prove their pathogenicity.

The examined livers were positive for Escherichia coli and Klebsiella pneumoniae, while, small and large intestine were positive for all recovered bacteria. This may be attributed to the presence or absence of bacteraemia, and /or differences between the capability of certain pathogens in attacking and effacing the intestinal epithelia.

Table 3. Serovars of Escherichia coli isolated from examined rabbits.

<table>
<thead>
<tr>
<th>Isolated serovar of Escherichia coli</th>
<th>Liver</th>
<th>Small intestine</th>
<th>Large intestine</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0119</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>0128</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>0157</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>078</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>14</td>
<td>19</td>
<td>44</td>
</tr>
</tbody>
</table>
Our isolation of 44 Escherichia coli serovars 0119, 0128, 0157 and 078 (Table 3) was in agreement with Loli\-ger et al. (1969), Varga and Pesti (1982), Abdel Gwad (1988), Jaki (1989) and Hegazy et al. (1992). On the other hand, Salmonella was not isolated from diseased or dead rabbits in this world. This result goes hand in hand with that mentioned by Chandra and Ghosh (1992) who examined 123 faecal samples from diarrhoeic and apparently healthy rabbits and failed to isolate Salmonella. Harwood (1989) reported high mortality in rabbits in a commercial rabbitary and isolated Salmonella typhi\-murium from the alimentary and systemic sites from these rabbits. This variation in isolation of Salmonella may be due to hygienic measurements and management of the examined flocks.

Table 4. Results of oral infection of 30-day-old rabbits with isolated fungi and Escherichia coli.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Inoculated organism</th>
<th>No. of inoculated rabbits</th>
<th>No. of deaths</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aspergillus fumigatus</td>
<td>5</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Mucor racemosus</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Candida albicans</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Geotrichium candidum</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Escherichia coli 0119</td>
<td>5</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>Escherichia coli 0157</td>
<td>5</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>Escherichia coli 0157</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>Escherichia coli 0119 + Aspergillus fumigatus + Candida albicans</td>
<td>5</td>
<td>1</td>
<td>80</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Regarding the experimental infections of isolated fungi, *Escherichia coli* serovars and mixed infection of both organisms (Table 4), it was clear that, *Aspergillus fumigatus* was the most pathogenic inoculated species with mortality percentage (40%). Pure culture of the organisms was recovered from liver and intestine of dead rabbits. Idris et al. (1981) diagnosed *Aspergillus fumigatus* infection as the cause of sudden death in four out of 87 cattle fed on *Aspergillus fumigatus* contaminated sunflower cakes. *Mucor racemosus* and *Candida albicans* gave the same mortality (20%). The pathogenicity of *Mucor* species and *Candida albicans* was previously reported by Carter and Chengappa (1991) and Chihaya et al. (1991). Barinov (1971) diagnosed fatal mycotic gastroenteritis in young calves under one month of age due to *Aspergillus, Mucor* and *Candida* infections. *Geotrichium candidum* produced diarrhoea and clinical symptoms without death. Migaki et al. (1982) reported watery diarrhoea attributed to *Geotrichium candidum* in six adults gorillas.

Under condition of this study, mortality rate ranged from 20-60% was reported in rabbits infected with *Escherichia coli* serovars 0119, 0128, 0157 and 078. These results are nearly similar to findings of Ali (1983), Hegazy et al. (1992) and Saad (1994). Differences in pathogenicity within and in between serovars may be attributed to the fact that different strains within a given serovar vary in pathogenicity. Mixed infection of *Escherichia coli* 0119 and *Aspergillus fumigatus* and *Candida albicans* resulted in higher mortality (80%). This indicated that the combined effect of fungi and *Escherichia coli* resulted in high deaths when compared to the effect of either fungi or *Escherichia coli* alone.

Regarding the pathological changes in infected rabbits, the degenerative changes of hepatic tissue and enteritis by *Aspergillus fumigatus* were also supported by Hassan and Salim (1984) who reported that *Aspergillus fumigatus* was highly pathogenic to rabbits. In *Mucor racemosus* infection, catarhal enteritis, congestion and inflammatory changes in liver agreed with Jensen et al. (1994) who reported acute necrohaemorrhagic lesions in *Mucor* gastrointestinal lesions. Focal hepatic haemorrhages with hepatocellular degeneration and vacuolation of mucosal epithelium and submucosal inflammatory edema were found in intestine of *Geotrichium* infected rabbits. This finding agrees with Sheeky et al. (1976) who recorded a case of *Geotrichium* septicaemia. Concerning the experimental *Candida albicans* infection, necrosis of hepatic cells with presence of PAS fungal spores were observed. Intestine showed congestion, proliferation of epithelium and goblet cells with inflammatory cellular infiltration. This results were in agreement with Chihaya et al. (1991).
Experimental *Escherichia coli* infection was associated with hepatic congestion, haemorrhages and catarhal enteritis. These findings were similar to those of Prescott (1987), Coussement et al. (1984), Urosevic et al. (1986), Percy et al. (1993) and Saad (1994) who showed congestion and enlargement of liver and catarhal enteritis with an increase in the fluid of bowel contents with or without gas in the intestine of rabbits inoculated with *Escherichia coli*.

**ACKNOWLEDGEMENT**

We gratefully acknowledge Dr. Tantawi, A.A., Lecturer of Pathology, Fac. Vet. Med., Moshtohor, for his help throughout this study.
Fig. 1. Liver of rabbit orally infected with Candida albicans showing large central area of necrosis with presence of fungal masses at periphery of necrosis surrounded by thick connective tissue proliferation. H & E stain X 200.

Fig. 2. Intestine of rabbit orally infected with Aspergillus fumigatus showing congested blood vessels and inflammatory oedema of submucosa. H & E stain X 200.
Fig. 3. Intestine of rabbit orally infected with *Candida albicans* showing proliferation of mucosal epithelium. H & E stain X 200.

Fig. 4. Intestine of rabbit orally infected with *Escherichia coli* showing focal activation of goblet cells with inflammatory cellular infiltration in lamina propria mostly lymphocytes. H & E stain X 200.
Fig. 5. Intestine of rabbit orally infected with *Aspergillus fumigatus* *Candida albicans* and *Escherichia coli* showing presence of PAS positive fungal spore, PAS stain X 100.
REFERENCES


دراسات على الإنتهاكات المعوية في الأرانب
روف رمسيس راغب; أحمد مصي سعد; إبراهيم طانيس

1 معمل بحوث حيوانات - مركز البحوث الزراعية - وزارة الزراعة - الجيزة.
2 كلية الطب البيطري - مستشفى.

تم فحص 100 أرنبًا مريضا وناقشًا حديثًا للفطرات والبكتيريا. الأرانب التي فحصت كانت تحتوي على إسهالات أو تهيجات معروفة. معظم الفطرات المعوية كانت الأسبانيوس فوبوميكانس، الأسبانيوس فلافيوس، الأسبانيوس هنكل، الأسبانيوس راشيموس، وكلاهما في البيكاس، بينما كانت البكتيريا المعوية هي الميكروب القولوني، الكليميلا، السوموزما، 어근조ما، والروتوس فايلاريوس. أنشئ الأنواع السيرولوجية المعوية للميكروب القولوني إلى 4 أنواع سيرولوجية مختلفة (0178 & 0119, 0128, 0157 & 0119).

كما لم يتم العزل ميكروب السالونين من الأرانب. تم إجراء تحليلات لجثثات الأرانب الثوريزاتيًا عبر 30 يومًا لتحديد مدى انتشار الأسبانيوس فيوميكانس، الأسبانيوس راشيموس، والروتوس فايلاريوس. الكليميلا، السوموزما، أفرجما، والروتوس فايلاريوس. وقد سببت الأعراض المكسيمية والبلاكسيمية. كانت معظم الفطرات المكسيمية في توزيع قوي وتركيز في معايير الأعضاء المتخصصة.

بالإضافة إلى وجود خصائص الفطرات في نسبة الكبد والأمعاء، بنضج (PAS).