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# *Escherichia fergusonii* strains isolated from clinical specimens in Albania

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***Abstract*- The material includes four strains of *E.fergusonii.* Two of them were recovered from liver and spleen of diseased animals, a calf and a chicken respectively. The two other strains belong to a 31-year-old woman, admitted in the Hospital, for "Pseudoarthrosis cruris". Six days after surgical treatment, signs of an evident wound infection were present, and from two pus specimens, taken with a four days interval, *E.fergusonii* was isolated.**

**The four isolated strains were identified by a series of more than forty biochemical conventional tests, demonstrated the morphological, cultural and biochemical characteristics of the family *Enterobacteriaceae,* the genus *Escherichia.* They are distinguished from *E.coli* by their ability to ferment adonitol and cellobiose and failure to ferment sorbitol. The three over mentioned characteristics, combined with positive test for ornithine decarboxylase and negative tests for lactose, sucrose, rafinose and melibiose fermentation, are the most important features for the identification of isolated strains as *E.fergusonii.***

***Keywords— E.fergusonii, human animal's specimens, biochemical characteristics***

## I. INTRODUCTION

In addition to *E. coli,* the genus *Escherichia includes E. fergusonii, E. hermanii, E. vulneris and E. blattae* [1], [2]. Except for *E.blattae,* the other new *Escherichia* species, especially *E.fergusonii,* have been recovered from human clinical specimens [1], [2], [6], [9], [14]. Furthermore, it has been isolated from the intestinal contents of warm-blooded animals [12] and from beef during routine screening procedures [10]. *E. fergusonii* is reported also as a pulmonary pathogen in cattle by Guillermo M. Rimoldi and Robert B.Moeller [13].

E.fergusonii is very uncommon and although some data suggest possible clinical significance, a more systematic study is required to prove its role as a human and animal pathogen [3].

### MATERIAL AND METHOD

The material includes four strains of *E. fergusonii,* isolated for the first time in Albania. Two of them belong to a 31-year-old woman, admitted in the Trauma Department of the Central Military Hospital, for "*Pseudoarthrosis cruris".* Six days after surgical treatment, signs of an evident wound infection were present, and from two pus specimens, taken with a four days interval, *E. fergusonii* was isolated. The two other strains appertain to non-human sources. They were recovered from liver and spleen of diseased animals, a calf and a chicken respectively. The calf suffers a diarrheal disease and is suspected to be infected with pathogenic strains of *E. coli.* The chicken it is mortem without clinical sing.

The specimens were cultured onto sheep blood and Mac-Conkey agar plates. Subcultures on Kligler Iron Agar were used for biochemical studies and antibiotic susceptibility testing. The biochemical tests were performed as described by Edwards and Ewing [4]. Antibiotic susceptibility was determined on Mueller-Hinton agar by the disk diffusion method [5].

## II. RESULTS AND DISCUSSION

The four isolated strains demonstrated the morphological, cultural and biochemical characteristics of the family *Enterobacteriaceae:* they were gram-negative straight motile rods, facultative anaerobic, oxidase negative, fermented glucose and reduced nitrate to nitrite. They also manifested biochemical features of the genus *Escherichia.* Like *E.coli,* they produced indol, fermented glucose with gas, decarboxylated lysine, utilized acetate, gave positive reactions for manit, maltose, L-arabinose, D-xylose, trehalose and methyl-red, and negative for Voges-Proskauer, $H_2S$, urease, phenylalanine deaminase and growth in the medium with KCN [2]. Nevertheless, they are distinguished from *E.coli* by their ability to ferment adonitol and cellobiose and failure to ferment sorbitol. The three over mentioned characteristics, combined with positive test for ornithine decarboxylase and negative tests for lactose, sucrose, rafinose and melibiose fermentation, are the most important features for the identification of isolated strains as *E. fergusonii* [1], [3]. The lysine decarboxylation, adonitol fermentation and lack of both yellow pigment and growth in the medium with KCN, are the most useful tests for the differentiation of these strains from *E.hermanii* [1], [2]. They are also distinguished from *E.vulneris* by their ability to produce indol, decarboxylate ornithine, ferment adonitol but not rafinose and melibiose [1], [2].

More details on biochemical reactions and other properties are given in Table 1. It might be stressed that both strains of human origin manifested the same biochemical profile and also the same antibiotic susceptibility pattern being resistant to penicillin,

streptomycin, tetracycline, chloramphenicol and trimethoprim-sulfamethoxazole, and susceptible to gentamicin, amikacine, nalidixic acid, cephalothin and ceftazidime. The two strains of animal origin manifested a few differences in biochemical profile (arginine dihydrolase forth day, lactose fermentation sixth day) as well as in antibiotic susceptibility pattern (being resistant to ampicillin, gentamicin, ciprofloxacin, penicillin, streptomycin, and susceptible to amoxicillin, ceftazidime, nitrofurantoin and tetracycline).

According to Kelly et al. [7], *Escherichia* new species are uncommon and they account for less than 1% of *Escherichia* clinical isolates. In this regard, it might be mentioned that a much known author in Albania, after a detailed biochemical study of 279 strains of the genus *Escherichia*, isolated from clinical specimens, found that all of them belonged to *E.coli* [8].

Little is known about clinical significance of *E.fergusonii.* Some very rare isolation in patients with sepsis, urinary tract infections or diarrhea suggests its pathogenic potential [3], [14]. The data given in this study clearly indicate the role played by *E.fergusonii* as etiologic agent in a surgical wound infection. Farmer et al. [3] also describe some isolations of *E.fergusonii* from various animal sources, including cow and turkey, but they do not specify the sort of specimens. Our two isolates of *E.fergusonii* (in pure culture) from internal organs of diseased animals (calf and chicken) suggest also its possible pathogenic potential for animals.

TABLE I. BIOCHEMICAL AND OTHER CHARACTERISTICS OF FOUR *E.FERGUSONII* STRAINS

| Test | Strains 576 and 609 (wound infection) | Strain 130 (chicken) | Strain 254 (calf) |
|---|---|---|---|
| Indole production | + | + | + |
| Methyl-red | + | + | + |
| Voges-Proskauer (Barrit) | - | - | - |
| Citrate Simmons | - | - | - |
| Hydrogen sulphide (Kligler) | - | - | - |
| Urea hydrolysis | - | - | - |
| Phenylalanine deaminase | - | - | - |
| Arginine dihydrolase | - | - | $+^{4}$ |
| Lysine decarboxylase | + | + | + |
| Ornithine decarboxylase | + | + | + |
| Gelatine hydrolysis ($22^{o}$C) | - | - | - |
| Malonate utilization | - | - | - |
| Motility ($36^{o}$C) | + | + | + |
| D-glucose, acid production | + | + | + |
| D-glucose, gas production | + | + | + |
| Adonitol | + | + | + |
| L-Arabinose | + | + | + |
| Cellobiose | + | + | + |
| Dulcitol | - | + | + |
| Erythritol | - | - | - |
| D-Galactose | + | + | + |
| Glycerol | - | $+^{6}$ | $+^{6}$ |
| myo-Inositol | - | - | - |
| Lactose | - | $+^{6}$ | - |
| Maltose | + | + | + |
| D-Mannitol | + | + | + |
| D-Mannose | + | + | + |
| Melibiose | - | - | - |
| Rafinose | - | - | - |
| L-Rhamnose | + | + | + |
| Salicin | $+^{2}$ | + | + |
| D-Sorbitol | - | - | - |
| Sucrose | - | - | - |
| Trehalose | + | + | + |
| D-Xylose | + | + | + |
| Esculine hydrolysis | + | + | + |
| Acetate utilization | + | $+^{2}$ | + |
| Nitrate reduction | + | + | + |
| Oxidase | - | - | - |
| Catalase | + | + | + |
| Dnase ($25^{o}$C) | - | - | - |
| Growth in KCN medium | - | - | - |

*Symbols: + positive at 24 h or time of tests*

*- Negative at end of appropriate incubation (7 days for fermentation tests*

*Superscript numbers indicate the day the reaction became positive*

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