Clinical Treatment of UTI in Rats Induced by Pathogenic E. Coli

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Abstract

The present study objective was to evaluate the therapeutics effects of ciprofloxacin and gentamicin on UTI induced experimentally by *E. coli* in rats. Forty female rats were divided into two groups, infected (30 rats) and control (10 rats). The infected group were inoculated intraurethral by 10^8 suspension of E. coli. Then the infected group subdivided into 3 subgroups, G1 which serve as control positive, G2 which inoculated by *E. coli* and then treated by ciprofloxacin 50mg/kg, G3 were inoculated by E. coli then treated with gentamicin 40 mg/kg.Treatment with antibiotics started 24 hours after bacterial inoculation and finished 72 hours after the initial therapy. The length of antibiotic medication was chosen for both antibiotics as a short-term 3 days therapy.The animals were monitored for presence of signs. E. coli urine bacterial demonstration were done at 1 week before infection and 24hrs., 48hrs, 96hrs, 6 days, 12 days and 24 days after infection. There was significant increase ($P<0.05$) in *E. coli* viable count in all infectedgroups, in addition the result of optical density (OD) by using spectrophotometry record increased threshold of the OD of the urine culture of all infected groups after (24 hrs.) of infection compared with control group, The current results showed that UTI symptoms and bacterial isolation were decreased after treatment by both ciprofloxacin and gentamicin as compared with G1 group.

In conclusion, ciprofloxacin and gentamicin can alleviate the symptoms of UTI after single dose.

Key words: *E. coli, Ciprofloxacin, gentamicin, rat.*

Introduction

Escherichia coli has been implicated to causes disease in human [(1)] as well as animals [(2; 3, 4, 5, 6; 7; 8)]. In addition to gastrointestinal effects, it can cause UTI, meningitisin neonates and humanssepticemia [(9)].

The presence of a specific virulence factors, adaptations of the microbial, encouraging urinal tract achievement, distinguishes *E.coli* which is a source of UTI and another uropathogens from associated memberships of their genus and species [(10)]. *Escherichia coli* are the most common organism causing Lower (UTI). Although not all strains of *E. coli* are pathogenic to the urinary tract which suggested that the infective *E. coli* strains are a selected group with special properties enabling them to survive and multiply in the host tissue [(11)].

Regardless of their scope, pharmacokinetic qualities and overall strong resistance, fluoroquinolones are actually among the most used antimicrobials in the world. They are particularly helpful in the treatment of infections of the urinary tract (UTI) by enterobacteria. [(12)].It was shown that therapeutic effectiveness of intravenous ciprofloxacin in mice was comparable to that after oral administration when viable bacterial counts in the kidney were calculated 24 hours after inoculation[(13)].

Also, it has been showed that the potency of gentamicin ranged over a 24-hour cycle and the

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effectiveness at the moment when toxicity was lowest when UTI cases triggered by *E. coli* were treated.[14].

The goal of the current research was to determine the efficacy of UTI treatments induced by *E. coli*using gentamicin and ciprofloxacin.

Materials and Methods

Forty female rats were divided into two groups, infected (30 rats) and control (10 rats). The infected group were inoculated intraurethral by 10^8 suspension of *E. coli* according to [15]. Then the infected group subdivided into 3 subgroups, G1 which serve as control positive, G2 which inoculated by E. coli and then treated by ciprofloxacin 50mg/kg, G3 were inoculated by E. coli then treated with gentamicin 40 mg/kg.

Therapy started 24 hours after the bacteria were inoculated and finished 72 hours after the initial therapy. Period of antibiotic therapy was chosen for quick treatment with both antibiotics for three days.

The animals were monitored for presence of signs. *E. coli* urine bacterial demonstration were done at 1 week before infection and 24hrs., 48hrs, 96hrs, 6 days, 12 days and 24 days after infection.

All data were analyzed statistically as described by [16].

Results and Discussion

Bacterial count fromurine was done by using pour plate method.[17] Comparison among other urine counting processes for E. coli and finding that it was simpler and more practical to execute this process and spread plate system on MacConkey agar.

A Significant change ($P<0.05$)was found in *E. coli*countfor allinfected groups,these result in agreements with[18, 19]. Around the same time as the amount of bacteria in the contaminated groups was equivalent to the group A (-ve) only group A (-ve) displayed a substantial difference in the number of bacteria contaminated as contrasted with their number before the infection occurred.

These results are in agreement with [20,21]that demonstrated the effective colonization of *E. coli* by the inoculated rats with (2.6×10^6) CFU / ml within 24 hrs., by administering pathogenic *E. coli*, following urinary tract infection in rats via Intra-urethral way. The current results showed that UTI symptoms and bacterial isolation were decreased after treatment by both ciprofloxacin and gentamicin as compared with G1 group(table 1). Jakobsen et al. [22]reported that a higher antibiotic concentrations shows in the mouse urine after ciprofloxacin mediated to UTI mouse.

It has been showed that a good efficacy of norfloxacin againstpathogenic *E. coli*, and prevents the adherence of pathogenic *Escherichia coli* and dose-dependent they do so[23].

These anti-adhesive properties have an effect both on uropathic*E. coli* which can be antibiotically prone and antibiotic resistant. Antimicrobial infections are now commonly considered to stop bacteria clinging to the uroepithelium of the kidney, preventing capacity. Such findings align with a new analysis that, in terms of composition, norfloxacin is distinct from another antibiotics by the inclusion of the fluorine atom in position 6, a pipera-Zin ring in position 7 and a carbon atom replacement with a nitrogen atom in position 8.[24]. Such substitutes improve action against gram positive and gram negative bacterial infection[25].

Intravenous ciprofloxacin in all infection models tested has more than consequences following oral administration[13].

The interpretive parameters suggested for norfloxacin susceptibility measures, of example, are still preliminary and planned for usage in the clinical trials [26]. After the therapeutic feasibility papers based on this checklist, the ultimate decision may only be rendered[27].

One research [28] shows that aminoglycoside treatment is less likely to change bowel or vaginal flora, which could decrease the risk of bacterial resistive strains and Clostridium difficile colonization.

It must also be taken into consideration specific non-drug triggers of acute kidney injury (e.g. depletions of intravascular volume). Just 1.6 per cent reported temporary serum creatinine changes with no raises in serum creatinine in the clinical study of 24,107 patients obtain a single gentamicine dose with trials where all patients had age < 75 years[29].

In conclusion, ciprofloxacin and gentamicin can alleviate the symptoms of UTI after single dose.

Table 1. Different bacterial volumes before and after treatment of animals by ciprofloxacin and Gentamicin

Period	Control	G1	G2	G3
1 week before infection	1×101±0.01 Aa	2.0×102±0.02 Ba	2.3×102±0.03 Ca	2.3×102±0.001 Ca
24 hrs.	1×101±0.03 Ab	6.0×107±0.02 Aa	5.2×106±0.34 Ba	5.7×106±0.02 Ba
48 hrs.	1×102±0.03 Ab	7.3×108±0.5 Aa	4.0×106±0.4 Aa	4.3×106±0.05 Aa
96 hrs.	1.2×102±0.001 Ab	6.5 ×107±0.3 Aa	3.2 ×104±0.1 Aa	3.4×104±0.06 Aa
6 days	1.1×102±0.001 Ab	6.0×106±0.1 Aa	3.4×104±0.14 Aa	3.5×104±0.4 Aa
12 days	1.3×102±0.02 Ab	6.1×106±0.3 Aa	3.1×103±0.11 Aa	3.7×103±0.7 Aa

Capital letters denotes differences at P>0.05 between vertical lines

Small letters denote differences at P>0.05 between horizontal lines

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

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