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ELIMINATION OF BIOFILM PRODUCED BY ESCHERICHIA COLI AFTER EXPOSURE TO STRONTIUM SR90 AND CESIUM CS137 RADIOACTIVE SOURCE IN DIFFERENT DOSES

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Abstract: Objective:. The purpose of this research in order to remove biofilm produced from E. coli with different radioactive sources.Study design: Case–control in analytical and cross-sectional in descriptive study design. Backgrounds: The bacterium E. coli which is pathogenic to the urinary tract, depends on a wide number of virulence determinants, as it is the most important bacterium responsible for urinary tract infections. Radiation is power in the appearance of undulations or spout of mote. There are several types of radiance overall concerning us. Alpha dissolution occurs while the mote throw of the nucleus that constitute of two no and two P+. Beta dissolution a no is convert a P+ and an e- is released of the nucleus. Gamma dissolution happen through residuum power in the nucleus next alpha or beta dissolution or subsequent no catch (a kind of atomic response) in a nuclear reactor. Methodology: Study populations and bacterial isolates with diagnosing E. coli from catheter and several diseases from patients in Baghdad hospitals in 2023/ 2024. Expose the bacteria to radiance released of Sr90 and CS137 radioactive sources in various doses with screening biofilm production before and after exposure to radiation. Results: The results show that there is a high killing rate of E. coli during exposure to Cesium-90 and Cesium-137 radioactive sources. As well as loss of biofilm production at different doses. Conclusion: Firstly, the impact of radiance of various radioactive sources occasion the homicide of E. coli. Secondly, the impact of radiance released of radioactive sources in various doses is analogous in homicide of E. coli.

Keywords: Radiation, Bacteria and Antibacterial

Introduction

The bacterium E. coli is pathogenic to human rely on a extensive numeral of virulence agents, as it is the utmost paramount bacterium cause UTI. It is a colonizer chosen of the microbiome that possesses various virulence factors that enable it to colonize and invade the urinary tract and cause infection [1]. In almost all cases, the microbial ascend to the bladder then causing kidney contagion [2].

E. coli bacteria cause contagion via possessing virulence factors which assist them adjust with remain in the host and others factors permit them to fleeing of the host's advocate like the circulation of blood. Osmosis alteration pH and produces cytokines [3, 4]. Hemolysin toxins are known as toxic extracellular proteins secreted by many K-negative and K-positive bacteria. Hemolysin is a general term that refers to the toxic proteins that break down red blood cells. Some

E. coli isolates produce hemolysin, especially those isolated from extra-ductal infections digestive system for humans, as 92% of these isolates were found to be productive for hemolysin [5].

Radiation is input in the appearance of undulation or spout of mote. There are several class of radiance overall round us. Push through and visional light are commonplace appearance of radiance, another kinds inclusive ultraviolet radiance, infrared radiance and mike and television indicative [6, 7].

Isotopes are not steady and release radiance an element which succumb automatic dissolution and release radiance as it blights. Through the dissolution operation, it turn into less radioactive above period, finally turn into steady [8, 9, 10].

Methods

Study design

Cross-Sectional for descriptive and case-control for analytical study design depending in this research.

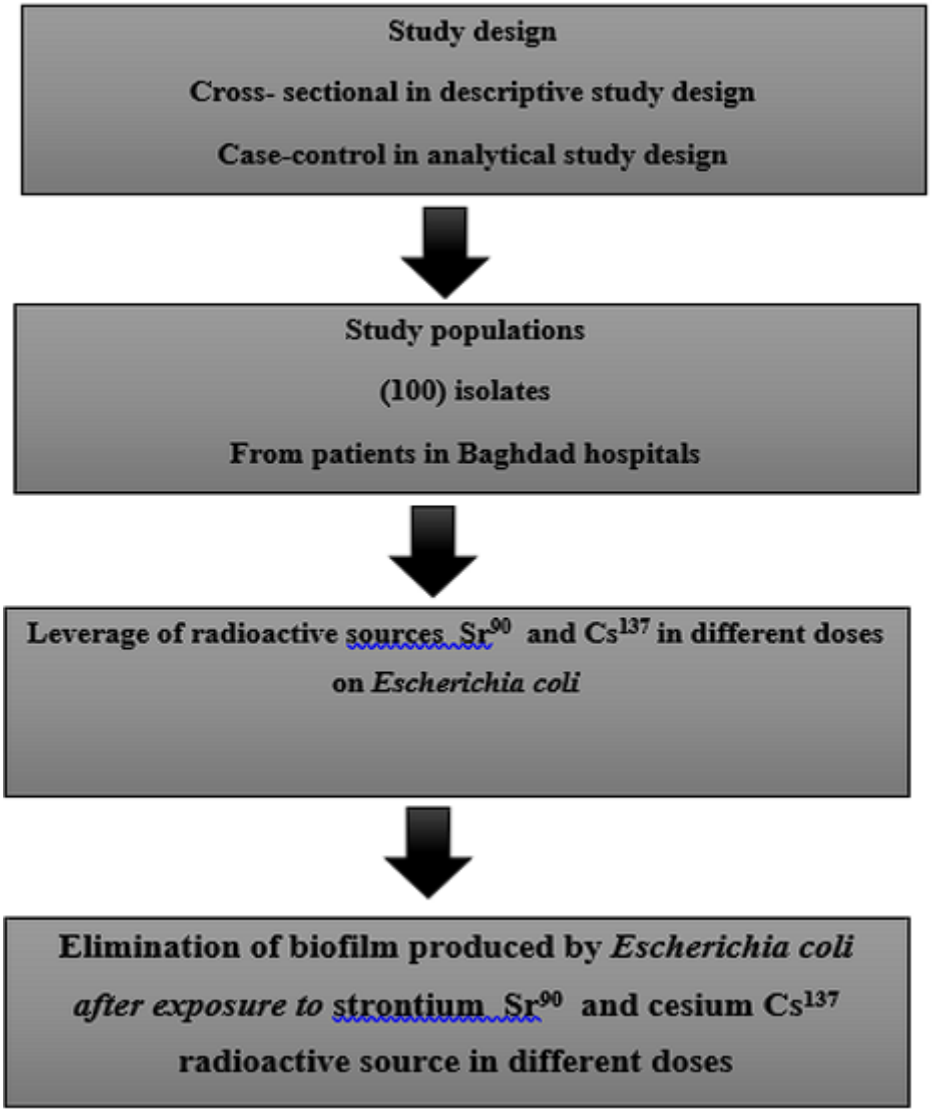

Figure (1): The clinical study design for this treatise.

Bacterial strains, media and growth conditions

A overall of collecting of specimen (200) E. coli of person in Baghdad hospital during 2023/2024 which diagnosis via classical and molecular method based to [11].

Validation of strontium and cesium on Escherichia coli

E. coli were cultured based on [12] in NB at 37° C for 24 hr., then (1) ml. of the bacteria suspension was prepared and its turbidity was compared with MacCfrland (0.5) exposed to radiation emitted from Co60 and Sr90 and cultured in Trypton soy agar under the same environmental conditions as the above planting .
The equation of killing rate:

$$\text{Proportion of killing \%} = \frac{\text{Control} - \text{process}}{\text{Control}} * 100$$

Elimination of biofilm produced by Escherichia coli after exposure to Sr90 and Cs137 radioactive source
The culture medium was prepared in the laboratory to detect biofilm production by adding 37 g/L of BHIB culture medium, 0.8 g/L of Congo red dye and of 1 agar (10 g/L). Then it was sterilized in an autoclave for 15 minutes at 121°C. Then it was left to cool at 45°C with the addition of 5 g/L of sucrose, subsequently it was left to solidify and then the bacteria were cultured and incubated at 37°C for 24-48 hr. [13].

Result and Discussion

The results in table (1) with figure (2), (3) and (4) show that there is a high killing rate of E. coli during exposure to radioactive sources and at different doses and loss of biofilm production.

Table (1): Kill rate and number of live cells of E. coli when exposition to Sr90 and Cs137 radioactive sources.

Nomber	Activity	Dosage through 1hr. mSV	Kill rate	Doses in 2hr. mSV	Kill rate	Doses in 3hr. mSV	Kill rate
Sr^{90} without Alminium	10 µci	3.284235	96%	6.568471	98%	9.852705	98%
Sr^{90} with Alminium	10 µci	5.2076*10-5	88 %	1.04153* 10^{-4}	92%	1.56228* 10^{-3}	95%
Cs^{137} without Alminium	10 µci	1.42776	96%	2.85552	98%	4.28328	100%
Cs^{137} with Alminium	10 µci	8.453*10-2	96%	16.906* 10^{-2}	98%	25.359* 10^{-2}	100%
Cs^{137} without Alminium	1 µci	4.79389	84 %	9.58772	90%	14.38167	92%
Cs^{137} with Alminium	1 µci	2.44586	96%	4.89172	97%	7.33758	100%
	Control = 250 colony						

E. coli exposed to Strontium wanting aluminium (10 µci) with percentage of homicides 96% in dosage 3.284235 (1hr.); 6.568471 (2hr.); 9.852705 (3hr.). As well as, Strontium to aluminium (10 µci) with percentage of homicides 88% in dosage 5.2076*10-5 (1hr.) and 1.04153*10-4 (2hr.); 1.56228*10-3 (3hr.) as shown in figure (2) and (3).

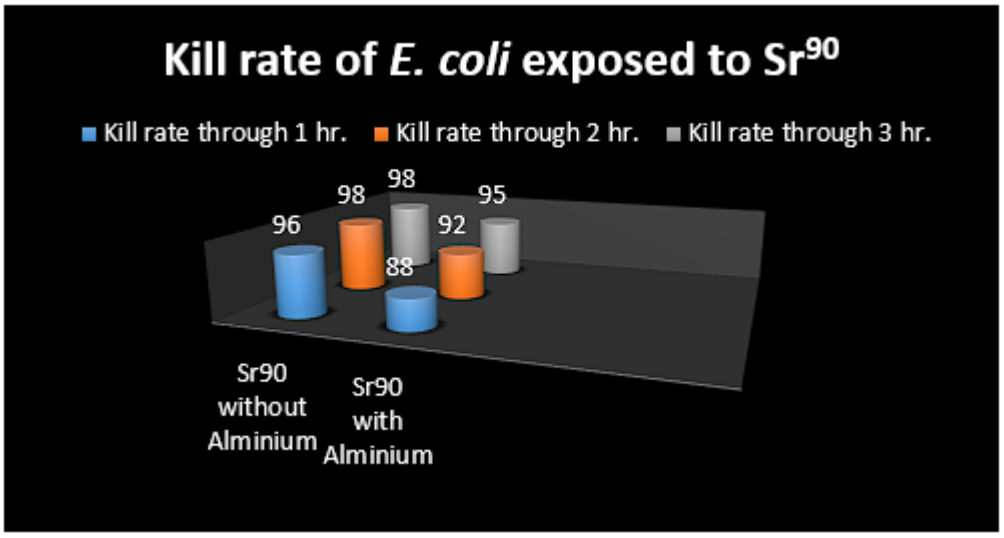

Figure (2): Kill rate of living cells E. coli exposed to Sr90 radioactive sources.

Figure (3): Biofilm production of E. coli before and after radiance exposure to Sr90 .

E. coli exposed to Cesium-137 wanting aluminium in (10 µci) with percentage of homicides 96%, dosage 1.42776 (1hr.); 2.85552 (2hr.); 4.28328 (3hr.). As well as, Cesium with aluminium in (10 µci) with percentage of homicides 96%, in dosage 8.453*10-2 (1hr.); 16.906*10-2 (2hr.) and 25.359*10-2 (3hr.).

E. coli exposed to Cesium-137 wanting aluminium in (1 µci) with percentage of homicides 96%, dosage 4.79389 (1hr.); 9.58772 (2hr.); 14.38167 (3hr.). As well as, Cesium-137 to aluminum in (1 µci) with percentage of homicides 96 %, dosage 2.44586 (1hr.); 4.89172 (2hr.) and 7.33758 (3hr.) as shown in figure (4) and (5).

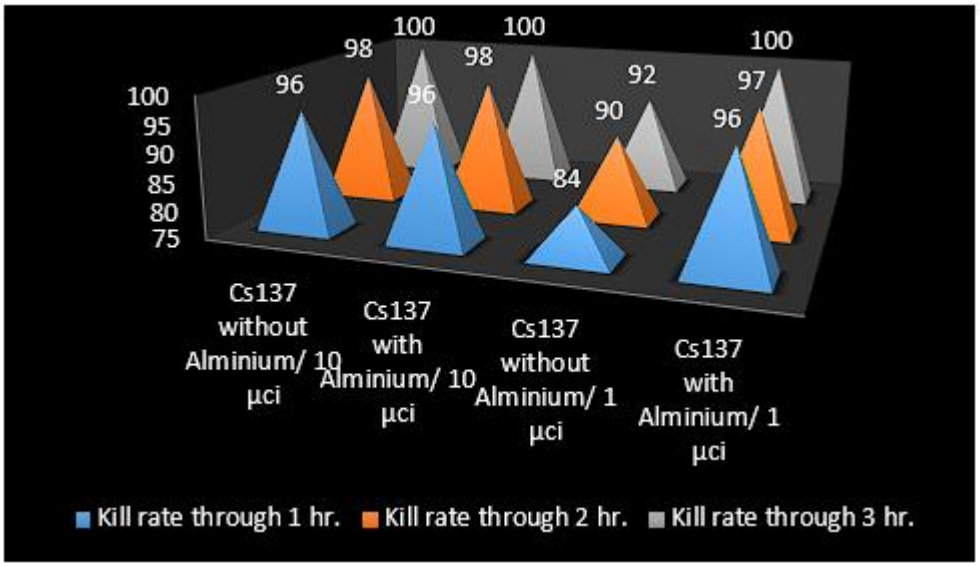

Figure (4): Kill rate of living cells E. coli exposed to Cs137 radioactive sources.

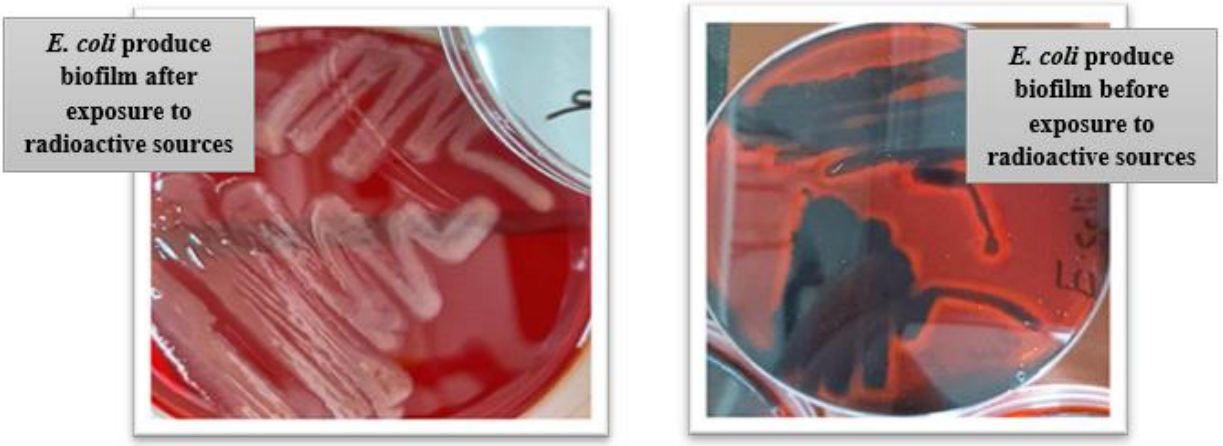

Figure (5): Biofilm production of E. coli before and after radiance exposure to Cs137.

A previous study by [14] it was found that the effect of gamma rays on the treatment of bacteria associated with biofilm production compared to non-producing bacteria.

A prior study by [15] it was U. V. light effectively blocked by the biofilm matrix produce from P. aeruginosa.

Conclusion

1- The impact of radiance of various radioactive sources occasion the homicide of E. coli.

2- The impact of radiance released of radioactive sources in various doses is analogous in homicide of E. coli

Ethical approval

All examination protocols were confirmed by the College of Ibn Sina University of Medical and Pharmaceuticals Sciences. All screening was achieved following the confirmed guidelines.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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