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Antimicrobial Action of Low Intensity Electric Current in a Case of Chronic Urinary Tract Infection

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ABSTRACT: Low intensity electric current has been used in biology and health for years. In this case report, it was used for the treatment of urinary tract infection, using a self-made appliance made by the author - patient, with medium voltage characteristics and a frequency of 600 hz; the application time was 30 minutes and pieces of aluminum foil were used as electrodes in the abdominal region. There was a rapid decrease in pain; one day after the second session, another routine urine test - EAS - was performed, which indicated the number of leukocytes within the normal limits - 3000.

KEYWORDS: Analgesia; bacteria; electricity; treatment

I. INTRODUCTION

Electricity has been used for years to restore health, prevent complications and analgesia. Current types, such as Russian, diadynamic, FES and TENS were and are used in physiotherapy for the purpose of rehabilitation. Different parameters, such as frequency, started to be isolated and used to enhance therapeutic efficacy.

In the present case report, the bacterium isolated from the urine culture was *Escherichia coli*. By using this, the team demonstrated that the ultra low voltage applied for 30 minutes created holes in the cell membrane that allowed small molecules, ions and proteins to leak into and out of the cell, killing the bacteria [1].

A team of researchers used a type of electronic dressing from conductive carbon, which serves to apply the electric current and the medication. After the electric current damages the bacteria through the hydrogen peroxide formed, a common antibiotic applied becomes more effective.

"The result was the destruction of all *Pseudomonas aeruginosa* bacteria, frequent in pneumonia and burns of patients in the ICU".

Bacteria that clump together in layers, called biofilm, are more difficult to kill because antibiotics partially penetrate feathers in this protective layer. Parts of these persistent colonies survive treatment by developing genes that make them resistant to the antibiotic. With this, they can grow and multiply, resulting in chronic infections [2].

Another study highlighted that microampere electrical currents ($\leq 100 \mu\text{A}$) on short timescales (for example, 30 minutes) caused significant damage to the membrane to allow bidirectional leaks of ions, small molecules and proteins across the bacterial membrane [3].

II. CASE REPORT

The experimental treatment was carried out by the researcher herself and by herself, in a situation of chronic urinary tract infection, previously diagnosed and difficult to treat.

Two large pieces of aluminum foil, used as electrodes, covered a large volume of the abdominal region in almost the entire area, with the exception of the pelvic and thoracic regions. The electrical treatment was carried out for 30 minutes. The electric current parameters were: frequency of 600 hz, pulsed current and voltage from 50 to 200 volts, with low amperage; the battery used was 9 volts common.

Two days later, the procedure was repeated, again for 30 minutes and there was no pain return. The following day a new routine urine test - EAS was performed.



III. RESULTS AND DISCUSSION

Analgesia occurred unexpectedly and instantly during the first treatment session. The result of the second EAS showed normal leukocyte values - 3,000. Days after the treatment, the feces had a normal appearance, but with a greenish color, which may suggest that normal bacteria in the intestinal flora, which cause the gray to brown color change in the feces, were also inactivated.

The treated patient is obese and had a large abdominal volume; despite this, she observed the internal effects of the electric current.

It can also be suggested that it is possible that this treatment could be effective in combating protozoa and viruses, such as SARS-CoV-2.

	Resultado	Valor Referencial	(-) Indicador (+)
Analito			
Volume.....	40 mL		
Cor.....	Amarelo claro	Amarelo citrino	
Aspecto.....	Turvo	Límpido	
Depósito.....	Presente	Ausente	
Densidade.....	1005	1.000 a 1.031	
pH.....	6,5	5,0 a 8,0	
Nitrito.....	Negativo	Negativo	
Proteínas.....	Negativo	Negativo	
Glicose.....	Negativo	Negativo	
Cetonas.....	Negativo	Negativo	
Urobilinogênio.....	Normal	Normal	
Bilirrubinas.....	Ausente	Ausente	
Hemoglobina.....	Presente +++	Negativo	
Sedimentoscopia			
Células Epiteliais.....	Numerosas	Raras	
Leucócitos.....	68.000 /mL	1.000 a 10.000/mL	
Hemácias.....	3.000 /mL	0 a 8.000 /mL	
Filamentos de Muco.....	Ausentes	Ausentes	
Flora bacteriana.....	Moderada	Normal	
Cristais.....	Ausentes	Ausentes	
Cilindros.....	Ausentes	Ausentes	

Figure 01. Routine urinalysis performed before treatment with low intensity electricity.

Source: own authorship



Resultado:		Valor de referencia Não houve desenvolvimento de micro-organismos na amostra analisada.	
Micro-organismo [1]: <i>Escherichia coli</i>		No de Colônias: >100000 UFC/mL	
ANTIBIOGRAMA			
[1]			
Antibiótico	SENS	MIC	
Ácido Nalidixico	R	>=32	
Amicacina	S	<=2	
Amoxicilina/Ácido clavulânico	R	>=32	
Ampicilina	R	>=32	
BLSE	-	Neg	
Cefalotina	R	32	
Cefepima	S	<=1	
Ceftriaxona	S	<=1	
Cefuroxima	I	16	
Cefuroxima Axetil	I	16	
Ciprofloxacina	R	>=4	
Ertapenem	S	<=0,5	
Gentamicina	S	<=1	
Meropenem	S	<=0,25	
Nitrofurantoina	S	<=16	
Norfloxacina	R	>=16	
Piperacilina/Tazobactam	S	16	
Trimetoprim/Sulfametoxazol	R	>=320	
Interpretação:(S) Sensível (R) Resistente (I) Intermediário (-) Não testado			

Figure 02. Routine urine culture examination performed before treatment with low intensity electricity.
Source: own authorship

Resultado	Valor Referencial	(-) Indicador (+)
Analito		
Volume.....: 40 mL		
Cor.....: Amarelo claro	Amarelo citrino	— * —
Aspecto.....: Turvo	Límpido	
Depósito.....: Presente	Ausente	
Densidade.....: 1005	1.000 a 1.031	
pH.....: 6,5	5,0 a 8,0	— * —
Nitrito.....: Negativo	Negativo	
Proteínas.....: Negativo	Negativo	
Glicose.....: Negativo	Negativo	
Cetonas.....: Negativo	Negativo	
Urobilinogênio.....: Normal	Normal	
Bilirrubinas.....: Ausente	Ausente	
Hemoglobina.....: Presente +++	Negativo	
Sedimentoscopia		
Células Epiteliais.....: Numerosas	Raras	
Leucócitos.....: 68.000 /mL	1.000 a 10.000/mL	
Hemácias.....: 3.000 /mL	0 a 8.000 /mL	
Filamentos de Muco.....: Ausentes	Ausentes	
Flora bacteriana.....: Moderada	Normal	
Cristais.....: Ausentes	Ausentes	
Cilindros.....: Ausentes	Ausentes	

Figure 03. Routine urinalysis performed after treatment with low intensity electricity.
Source: own authorship



IV. CONCLUSION

Através dos resultados de exames laboratoriais (EAS) conclui – se a eficácia do tratamento elétrico de alta tensão e baixa amperagem de infecções causadoras pela bactéria Escherichia coli no trato urinário humano. A coloração das fezes também foi um fator sugestivo de ação bactericida no trato intestinal.

São pode – se concluir também que os parâmetros de corrente elétrica são eficazes em pacientes obesos e/ou grande volume abdominal.

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