Comparison of the Effects of Oral Rehydration Solution and Maize “Ogi” Liquor in Albino Rats infected with Escherichia coli O157:H7

Adebolu T.T.*, Akerele C.A., Momoh A.O.

Department of Microbiology, Federal University of Technology, Akure, Ondo State, Nigeria

Article history:
Received: 12 February, 2017
Accepted: 14 February, 2017
Available online: 17 May, 2017

Keywords:
Maize ‘ogi’ liquor, Oral rehydration solution, bacterial diarrhoea, Escherichia coli O157:H7

Corresponding Author:
Adebolu T. T.*
Email: ttadebolu01 ( at ) yahoo ( dot ) com

Abstract
Diarrhoea is still a serious problem in many developing countries. To prevent complications such as dehydration associated with the illness, Oral Rehydration Solution (ORS) is normally administered to diarrhoeal patients especially children and the elderly. However since it is possible that the commercial sachet of the salts that is used for the preparation of ORS may not be available in most rural areas for first line treatment of diarrhoeal patients, the possibility of using maize “ogi” liquor (MOL) that is normally found in most homes in Southwest, Nigeria was evaluated as an alternative. In this investigation, Escherichia coli O157:H7, the aetiological agent of hemorrhagic diarrhoea was used in inducing diarrhoea in albino rats. The infected rats were then oroagastically administered either ORS or MOL at the onset of symptoms of infection. Appreciable increase in weight was observed in the infected rats administered MOL and they also recovered within 72h of therapy. On the other hand, progressive decrease in weight was observed in the ones administered ORS and no apparent sign of recovery throughout the duration of the investigation. From this study, therefore, MOL is being recommended as a novel alternative to ORS since in addition to having rehydrative effect in maintaining the weight of the rats infected with Escherichia coli O157:H7, it also leads to quick recovery of the infected rats.

Citation:

All Rights Reserved with Photon.
Photon Ignitor: ISJN53497294D858617052017

1. Introduction

Up till today, diarrhoea is still a serious problem especially in children and the elderly. Although the illness in most cases is self limiting, however in severe cases complications such as dehydration may lead to hypovolemic shock and in extreme cases death (Waldorman et al., 1998; Victora et al., 2000; Cheesbrough, 2006). In order therefore to prevent this complication, Oral Rehydration Solution (ORS) is normally administered to replenish the water, minerals and electrolytes that are lost during episodes of diarrhoea (Victora et al., 2000). ORS is made up of water, sodium salts and a carbohydrate (Hirschhorn et al., 1991) and it is prepared by dissolving ready-made sachet of oral rehydration salts in water (WHO, 2005). Access to this ready-made sachet however may be limited in rural areas, therefore there is the need to search for alternative therapy. In this study therefore, the liquor of fermented maize “ogi”, was investigated as an alternative to ORS by administering it to albino rats with induced diarrhoea caused by Escherichia coli O157:H7 to see whether it has rehydrating effect by monitoring the weight changes in the infected rats that are administered the liquor as compared with the ones administered ORS and the infected rats that were not administered the liquor or ORS.

2. Materials and Methods

2.1 Animals used:
Wistar albino rats, aged 4-6 weeks

2.2 Bacteria:
The Escherichia coli O157:H7 used was collected from the Nigerian Institute of Medical Research Laboratory, Yaba, Lagos.
2.3 Type of maize grains used for the production of “Ogi”:
The yellow variety of maize (Zea mays Linn) grains was used.

2.4 Production of “Ogi”:
This was produced according to the method of Adebolu et al. (2007).

2.5 Oral rehydration salt:
Hydrolyte Oral Rehydration Salt, NAFDAC REG. No. A4-2156; Archy Pharmaceutical Limited was used and prepared according to manufacturer’s instruction.

2.6 Infection of healthy rats with the Infectious dose of Escherichia coli O157:H7 used:
A total of 15 rats were orogastrically infected with the determined infectious dose (1.8 x 10⁶ cfu/ml) of Escherichia coli O157: H7 using the method of Cheesbrough (2006). Prior infection, the rats were observed for 14 days for any sign of illness before infecting them. During this period, the rats were kept on broiler’s starter and sterile distilled water. After infection, the rats were daily examined for signs of illness such as weakness, loss of appetite and watery stool. Their weight was also monitored.

2.7 Administration of ORS or maize “ogi” liquor to the infected rats and effect on their weight and recovery: At the onset of symptoms, the rats were divided into five groups (3 rats per group) and orogastrically administered ORS or maize “ogi” liquor as follows; Group 1 was administered ORS (1ml) per rat, 6 hourly, Group 2; the liquor of 24h fermented “ogi” (1ml) per rat, 6 hourly; Group 3; the liquor of 48h fermented maize “ogi” (1ml) per rat, 6 hourly; Group 4; liquor of 72h fermented “ogi” liquor (1ml) per rat, 6 hourly while Group 5 was left untreated. The rats were daily observed for signs of recovery and changes in weight.

3. Results

3.1 Effects of administration of ORS or maize “ogi” on the weight of rats infected with Escherichia coli O157:H7 and their recovery pattern
After the initial weight loss observed in most of the rats infected with E. coli O157: H7 24h after infection sets in, there was an appreciable increase in weight of the ones administered the liquor of 48h fermented maize “ogi” (group C; 0.70%) and the ones administered the liquor of 72h fermented maize “ogi” (group D; 1.46%) while the ones administered ORS (group A), the ones left untreated (group E) and the ones administered the liquor of 24h fermented maize “ogi” (group B) recorded progressive weight loss of 14.17% and 4.16% and 0.63% respectively (Table 1). In the therapeutic assay, all the infected rats that were administered the liquor of maize “ogi” irrespective of the fermented duration however recovered within 72h of administration while the ones administered ORS and the ones not treated did not recover throughout the 8 day duration of administration (Table 2).

<table>
<thead>
<tr>
<th>Days</th>
<th>Treatment</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>60.60 ± 6.22</td>
<td>63.83 ± 1.26</td>
<td>94.87±3.89</td>
<td>61.53±0.49</td>
<td>58.70±1.21</td>
<td>68.77±5.64</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>60.27 ± 6.77</td>
<td>63.77 ± 1.31</td>
<td>83.67±4.01</td>
<td>61.37±0.55</td>
<td>59.10±0.78</td>
<td>77.90±6.32</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>60.00 ± 1.00</td>
<td>61.53 ± 1.47</td>
<td>80.87±1.33</td>
<td>60.10±0.10</td>
<td>58.50±0.70</td>
<td>80.13±3.95</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>59.70 ± 1.54</td>
<td>61.33 ± 1.53</td>
<td>81.20±1.20</td>
<td>60.70±0.35</td>
<td>57.10±0.26</td>
<td>83.03±3.75</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>58.00 ± 1.00</td>
<td>61.43 ± 0.55</td>
<td>85.77±5.06</td>
<td>61.77±0.61</td>
<td>56.30±0.15</td>
<td>87.90±6.46</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>57.23 ± 1.68</td>
<td>62.23 ± 1.69</td>
<td>88.43±5.76</td>
<td>61.67±1.50</td>
<td>56.30±0.30</td>
<td>88.43±6.02</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>54.47 ± 1.29</td>
<td>63.37 ± 1.18</td>
<td>91.33±7.05</td>
<td>62.10±1.08</td>
<td>56.27±0.31</td>
<td>89.13±6.09</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>52.01 ± 0.90</td>
<td>63.43 ± 0.49</td>
<td>95.53±7.07</td>
<td>62.43±1.27</td>
<td>56.26±0.25</td>
<td>83.87+9.24</td>
</tr>
</tbody>
</table>

Key: A= Infected rats administered ORS; B= Infected rats administered liquor of 24h fermented yellow maize “ogi”; C=Infected rats administered liquor of 48h fermented yellow maize “ogi”; D= Infected rats administered liquor of 72h fermented maize “ogi”; E= Infected and not treated rats; F= Control rats; *= % weight loss or gain

Table 2: Effect of the administration of the liquor of fermented maize “ogi” or ORS on the recovery of albino rats infected with E. coli O157: H7 and the constituency of their stool.

<table>
<thead>
<tr>
<th>Rat group/Treatment</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORS</td>
<td>W, LA, US, DF</td>
</tr>
<tr>
<td>A</td>
<td>AC, RA, FS, SF</td>
</tr>
<tr>
<td>B</td>
<td>AC, RA, FS, SF</td>
</tr>
<tr>
<td>C</td>
<td>AC, RA, FS, SF</td>
</tr>
<tr>
<td>D</td>
<td>W, LA, US, DF</td>
</tr>
</tbody>
</table>
Key: A= Liquor of maize “ogi” fermented for 24h; B= Liquor of maize “ogi” fermented for 48h; C= Liquor of maize “ogi” fermented for 72h; D= Infected but not treated with ORS or the liquor; W= Weak; LA = Loss of appetite; US = Unformed stool; DF = Dull fur; AC = Active; RA = Restored appetite; FS= Formed stool; SF = Shining fur

4. Discussion

In this study, the potential of the liquor of fermented maize “ogi” in preventing dehydration in albino rats with induced diarrhoea with *Escherichia coli* O157: H7 was compared with that of ORS which is normally used as first line treatment of diarrhoeal patients especially children. The increase in weight observed in the infected rats administered the liquor of 48h fermented “ogi” and the group administered the 72h fermented liquor shows that they can be exploited to checkmate weight loss as a result of dehydration and loss of electrolytes and nutrients during episodes of diarrhoea. The recovery observed in the rats administered the liquor unlike the ones administered ORS shows that the liquor posses bioactive components which can be exploited to treat the diarrhoea caused by this organism. These bioactive components as reported by earlier researchers include lactic acid, bacteriocin, diacetyl, hydrogen peroxide (Olukoya et al., 1994; Ogunbanwo et al., 2003; Adebolu et al., 2012). The inability of ORS to mediate recovery of the infected rats lends credence to the fact that its usage in diarrhoeal cases is just to restore the electrolytes and fluids that are lost during episodes of diarrhoea (Victors et al., 2000), it does not have therapeutic potential.

Conclusion

Since the administration of the liquor of fermented maize “ogi” used caused an appreciable increase in weight of the rats infected with *E. coli* O157:H7 and also the recovery of the infected rats unlike the administered ORS, it is suggested that it could be exploited in treating diarrhoeal patients to prevent complications such as dehydration that is associated with severe diarrhoea.

Recommendation

It is recommended that maize “ogi” liquor be exploited as a better alternative in the management of diarrhoeal patients in order to prevent dehydration that is associated with severe diarrhoea and promote quick recovery from the scourge of the illness caused by the bacteria used in this investigation.

Limitation

The gender of the rats was not put into consideration.

Conflict of Interest

The authors declare that there is no conflict of interest

References


For publications/ Enquiries/ Copyrights: Email: photonjournal@yahoo.com