E3 Journal of Medical Research Vol. 1(7). pp. 095-097, August, 2012
Available online @ http://www.e3journals.org
ISSN 2276-9900 © E3 Journals 2012

Full length research paper

A scientific justification of the use of the giant African land snail (*Archachatina marginata*) haemolymph as oral rehydrant in African traditional practice

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Accepted June 5, 2012

Haemolymph of the African Giant land snail (Archachatina marginata) is used as Oral Rehydration Therapy in some Southwestern parts of Nigeria. Biochemical analysis carried out in this study shows that the haemolymph contains low concentrations of glucose and sodium ions, moderate concentrations of bicarbonate, chloride ions and protein and high levels of potassium and magnesium ions, when compared with the normal human plasma. If used as Oral Rehydration Therapy, a supplement of glucose should be added to complement the low glucose content. The low glucose content should not stimulate a comparative excessive production of insulin. Its low sodium content should not increase blood pressure.

Keywords: Giant African land snail; haemolymph; *Archachatina marginata*; Oral Rehydration Therapy; diarrhea; gastroenteritis; human plasma

INTRODUCTION

Gastroenteritis is the inflammation of the stomach and intestine but diarrhea is an abnormal frequency and liquidity of faecal discharge. Either, sometimes ignorantly interchanged by the layman, is usually caused by infection with *Escherichia coli* in infants, Salmonella typhii in cases of typhoid fever, Vibrio cholerae in cholera, Bacillus cereus in bacillary dysentery and the rotavirus in infants (Prescott et al., 2002). The main dangers of gastroenteritis and diarrhea are dehydration and electrolyte imbalance (Baron DN 1963; Valman HB 1980). Fluid and electrolytes (sodium and potassium) can be replenished by a combination of constant diet of glucose/electrolytes replacement fluid and intermittent intravenous isotonic saline with potassium (Rose BD 1977; Edwards et al., 1986). Babalola and Akinsoyinu (2010) suggested biochemical studies on the composition on snail heamolymph.

In certain parts of the Southwest Nigeria, snail haemolymph is sometimes administered orally with a combination of herbs as treatment regimen in cases of diarrhea and vomiting. This study was designed to biochemically analyze the Giant African land snail

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Table 1: Biochemical composition of snail (*Archachatina marginata*) haemolymph compared with reference ranges needed for ORT at the University College Hospital (UCH), Ibadan, Nigeria

	References ranges (UCH)	Snail haemolymph (Mean ± SEM)
Na^+ (MEq/L)	120 – 140	52.48 ± 3.12
K^+ (MEq/L)	3.0 – 4.8	3.62 ± 0.16
HCO_3^- (MEq/L)	20 – 30	17.82 ± 0.32
Cl^- (MEq/L)	95 – 110	64.05 ± 2.18
Mg^{2+} (µg/ml)	9 – 19	384.4 ± 0.008
PO_4^{2-} (µg/ml)	2 – 4	6.6 ± 0.0005
Glucose (µg/ml)	450 – 900	30.8 ± 0.0076
Total protein (µg/ml)	58000 – 80000	36800 ± 1.8

(Archachatina marginata) haemolymph with the view of recommending as an oral rehydrant and to scientifically justify its relevance in traditional medicine.

MATERIALS AND METHODS

Sample Collection

Apparently healthy Giant African land snails (Archachatina marginata) (n = 20) were obtained from the New Market, Ile-Ife, Osun State, Nigeria. They were brought in polythene bags to the department of Microbiology, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. Their shells were thoroughly washed with mild soap to remove dirt and debris and later rinsed with distilled water. The shells were cracked at the tips and the haemolymph obtained in sterile containers by filtering through glass fiber filter papers (Whatman) to avoid flesh contamination. 100 ml of sample was used for analyses. They were kept at 4˚C prior to biochemical analysis.

Biochemical Analysis

The samples were analysed for Na+, K+, HCO3-, Cl-, Mg2+ and PO42- using atomic absorption spectrophotometry (Agrawal et al., 1986; Harris DC 1999; Soylak et al., 2001). The atomic absorption spectrophotometer used was semi-automated. Manual for settings and instructions for the apparatus was used. All data were reported as ppm metal per weight of sample. Samples were well mixed before weighing to make sure they are homogenous. 2g equivalent of sample was used. Extraction with 20 mL of 0.01 M ethylene diamine tetraacetic acid (EDTA) solution by shaking in plastic centrifuge tubes for 15-20 minutes was done. Centrifugation was at 4,000 rpm. There after the supernatant was obtained in a clean test tube. The samples were aspirated into the flame. A carbon-rod atomizer (CRA) fitted with a 'mini-Massmann' carbon rod used in routine determination was used in this investigation. Oxide/acetylene flame was used to evaporate the solvent and dissociate the sample. Samples that reported concentrations "OVER RANGE" were diluted appropriately and re-measured. A standard curve of samples with known concentrations measured by Atomic adsorption spectrophotometry was used in the experiments. An HPLC-Thermospray Flame AAS was used in the study.Glucose content was determined using the Glucose oxidase method (Miller GL 1959;Trinder P 1969). Protein content was determined using the Lowry et al. (1951) method.

RESULTS

The results show mean ± SEM (standard error of mean) values of Na+, K+, HCO3-, Cl-, Mg2+, PO42-, glucose and total protein detected in the haemolymph of the Giant African land snail (Archachatina marginata) and reference value ranges at the University College Hospital, Ibadan Nigeria needed for ORT (Table 1).

DISCUSSION

In comparison with the normal human plasma, glucose and sodium ion (Na+) concentrations observed in the haemolymph appear to be low. Bicarbonate (HCO3-), chloride (Cl-) and protein appear to be in moderate levels while potassium (K+) and magnesium (Mg2+) seem to be high (Baron DN 1963; Rose BD 1977). Archachatina marginata fluid contains low sodium and so therefore should not increase blood pressure (Graham AM 1983). To use the haemolymph as ORT, glucose supplement would need to be added because of its low glucose content. Comparatively, excessive stimulation of insulin by glucose can also be avoided during diet.

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