The Effects of Hydroalcoholic Stem Extract of *Equisetum Arvense* on Male Rat RBC Membrane Stability

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Abstract— Horsetail extract has been used as traditional medicinal plants in many cultures. The aim of this study was to determine the effects of hydroalcoholic stem extract of *Equisetum Arvense* on male rat RBC membrane stability. In this laboratory experimental study, male Wistar rats blood samples were divided to control group and groups exposed to 6, 8 and 10 mg/kg/body weight of hydroalcoholic horsetail extract. In each group 5 blood samples of 5 rats were examined. Membrane stabilizing activity of each blood sample was calculated and the data were analyzed using ANOVA. Our findings indicated that male rats RBCs membrane stability significantly decreased following to extract exposure compared to control group (p<0.0001). Horsetail extract can reduce RBC membrane stability; according to which, the inflammatory effects of horsetail can be partly attributed to the effects of extract on RBCs membrane stability. On the other hand, a word of caution should be stated in the use of this plant as medicinal plant.

Keywords— *Equisetum Arvense*, Membrane Stability, RBC, Rat.

I. INTRODUCTION

Red blood cells, or erythrocytes, are the most common type of blood cell and the vertebrate organism’s principal means of delivering oxygen (O$_2$) to the body tissues via the blood flow through the circulatory system[1]. The membrane of the red blood cell plays many roles that aid in regulating their surface deformability, flexibility, adhesion to other cells and immune recognition. The lipid composition of membrane is important as it defines many physical properties such as membrane permeability and fluidity. Additionally, the activity of many membrane proteins is regulated by interactions with lipids[2]. On the other hand, the unsaturated fatty acids content of the membrane is very sensitive to different oxidants such as free radicals[3]. In fact, free radicals are among the most important factors which can change RBC membrane stability; so protective measures seem to be critical for RBC stability. In this regard, antioxidants are able to prevent free radicals from changing RBC membrane properties. Many herbal medicines have high levels of antioxidants and consumption of these medicines can play a major role in RBC membrane protection and reduce oxidative damage[4].

*Equisetum arvense*, commonly known as the field horsetail, is a bushy perennial herb[5] and a lower vascular plant considered as a storehouse of minerals and vitamins and also[6] showing aerial stems, branched with regular verticilies 2–23 mm in diameter, terminal strobile in the branches and in the main stem 10 mm long and 4 mm in diameter[7]. The plant is originally native to northern hemisphere. *Equisetum* species is widely distributed throughout Canada, USA except the southeast, Europe and Asia south to Turkey, Iran, the Himalayas, across China (except the southeastern part), Korea and Japan[8]. The plant contains abundant minerals such as silicon and calcium2, as well as small amounts of pharmacologically active compounds[9], studies analysis revealed the presence of large amounts of alkaloids, phyto-steroids, hydrocarbons[6], flavonoids, sterols, tannins, saponins[10] and triterpenoids[11]. *Equisetum arvense* L. has been used as a traditional medicine to stop bleeding, heal ulcers and wounds and treat tuberculosis and kidney diseases; In particular, it is expected to have antihypertensive[12], hypoglycemic and diuretic effect[13]. The aerial parts of *Equisetum arvense* L. have been used for the treatment of urethritis, jaundice, and hepatitis in oriental traditional medicine[7]. additional pharmaceutical applications of E. arvense have revealed antioxidant, anti-inflammatory, antibacterrial, antifungal, anticonvulsant and anticancer effects among others[11],[14].

About the effects of herbal medicines on RBC membrane stability, studies showed that some herbal extracts such as the methanolic extract of the *Rusellia equisetiformis* exhibited strong anti-inflammatory and antioxidant activity so it could be beneficial to stabilizing the membrane[15] And *Gongeronema latifolium* has been reported to show direct membrane stabilizing effect[16]. In accordance with these data, reports indicated that horsetail possesses strong antimicrobial and antioxidant activity[17],[18] and base on this hypothesis, this plant may be effective in membrane stabilizing.

II. MATERIAL AND METHODS

In this laboratory experimental study, male Wistar rats blood samples were divided to control group and groups exposed to 6, 8 and 10 mg/kg/body weight of hydroalcoholic horsetail extract. In each group 5 blood samples of 5 rats were examined.
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III. RESULTS

Membrane stabilizing activity of the *Equisetum arvense* L. extract was significantly reduced in groups exposed to 6, 8 and 10 mg/kg/body weight of hydroalcoholic horsetail extract compared to control group (P<0.001); however, there was no significant difference between membrane stabilizing activity of the groups exposed to 6, 8 and 10 mg/kg/body extract (Fig. I).

IV. DISCUSSION

Our results indicated that membrane stability was significantly decreased in groups exposed to 6, 8 and 10 mg/kg/body weight of hydroalcoholic horsetail extract compared to control group. In accordance with our data, several studies showed that some herbal extracts, display membrane destabilization. A study indicated that high concentration (800 mg/dL) of *A. occidentale* exhibited no membrane protective effect and decreased erythrocyte membrane stability[19]. The results of a study showed that *Momordica caharantia* leaf extract did not show membrane stabilizing effect, as it failed to offer significant protection of the erythrocyte against lysis induced by hypotonic solution[20]. The reports also indicated that treatment with *Equisetum arvense* L. in graded doses (30,50 and 100 mg/Kg) for 14 days did not produce important changes in the morphology and hepatic function in rats. The little hepatic morphology changes found in the *Equisetum arvense* L. groups are considered benign form and should not be attributed to use of the extract of *Equisetum arvense* L. Thus, the hepatic effects produced by *Equisetum arvense* L. in rats seems be related to the dose of extract[21]. On the other hand, another study showed that the aqueous extract from sterile stems of *E. arvense* has shown dose dependent cytotoxic effects on some human cancer cell lines[22].

In contrast to our findings, chronic administration of the hydroalcoholic extract from stems of *E. arvense* improves the cognitive deficits in aged rats, and this effect can be due, at least in part, to its antioxidant action. This extract also presented anticonvulsant and sedative effects[23], [24]. On the other hand, essential oil of *Equisetum arvense* L. was shown to possess a broad spectrum of a very strong antimicrobial activity against some strains[25].

hydroalcoholic extract of *E. arvense* presents a clear anti-inflammatory and analgesic effect and it can be related to flavonoids, sterols and others compounds like saponins and tannins[26].

V. CONCLUSION

We have shown that 6, 8 and 10 mg/kg/body weight of hydroalcoholic horsetail extract has anti-stabilizing activity on RBC membrane stability in male rats; according to which, may have inflammatory effects in the male.

ACKNOWLEDGMENT

This research has been done with the support of Islamic Azad University, Hamedan Branch, Hamedan, Iran. We appreciate all who helped us to exert the present study.

REFERENCES


http://dx.doi.org/10.15242/IICBE.C0114586