Erythrocytes’ Detoxifying and Anti-oxidant capabilities in Human Fascioliasis: Effect of Egaten

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ABSTRACT

The present study was carried out on 21 fasciolia patients (6 with acute fascioliasis and 15 with chronic fascioliasis), and 10 age matched controls. Specific activities of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GR), glutathione S-transferase (GST), glucose 6-phosphate dehydrogenase (G6-PD) as well as glutathione content (GSH) were measured in red blood cells as it offers a number of advantage for studying the effects of oxidants. Egaten (the human form of the fasciolocidal drug Triclabendazole) was supplemented to all patients in a dose of 10 mg/kg body weight for 2 successive days. Before treatment specific activities of SOD, GPx, GR, G6-PD and GSH content were significantly reduced in the erythrocytes of all patients. The only exception was CAT enzyme that didn’t show any significant difference from controls and GST that showed significant elevation. Liver function tests were significantly elevated in plasma of fasciola patients. After treatment the level of all studied parameters except CAT were significantly elevated than that before treatment and became more or less round the figures of controls. Liver function tests became normal again, and anemia was recovered. Conclusively, Egaten has cured all cases of fascioliasis under study and it has abolished the effect of the parasite’s oxidants on the antioxidant capabilities of erythrocytes.

INTRODUCTION

Since more than two decades, fascioliasis has emerged as a human infection. That parasite affects the liver particularly during the acute stage, when the juvenile flukes migrate through the liver parenchyma, causing lysis of the liver tissue[1]. Severe immunological and inflammatory reactions were observed during that stage, as the excretory, secretory products of the worms were in direct contact with the tissues[2].

During the chronic stage, the worms were present in the bile ducts and gall bladder, the epithelium of the biliary system shows inflammation and hyperplasia ending in an obstructive phase[3]. Infection with that parasite leads to an intimate contact between the parasite and the host immune system. Neutrophils, eosinophils and macrophages play an important role in defense against the parasite[4,5]. The initial reaction of these cells is the generation of reactive oxygen species (ROS)[6]. ROS generation, through
normal cellular metabolism and by means of exogenous insult is a constant problem, for which cells have developed multiple protective mechanisms (6). Central to that defense are the anti-oxidant enzymes of the blood. These include SOD, GPx, CAT, the detoxifying enzyme GST, as well as the enzymes involved in recycling the oxidized GSH such as GR and G6-PD (7). Red blood cells could be regarded as circulating anti-oxidant carriers; they offer a number of advantages for studying the effects of oxidants (8).

TCBZ (6-chloro-5 [2, 3 dichlorophenoxy]-2- methylene-benzimidazole) has been extensively used in the treatment of animal fasciolasis (9), Egaten, a form of TCBZ, specially prepared for human use proved safe against fasciolasis. That drug has the advantage of treating both acute and chronic fasciolasis.

The aim of the present work was to study the effect of fasciola infection, acute and chronic, on the activities of some erythrocytes’ detoxifying and anti-oxidant enzymes. Besides, the effect of Egaten on these enzymes was assessed after three months from treatment.

MATERIALS & METHODS

The present study was carried on 21 patients 15-30 years old classified into the following groups:

**Group I:** Six patients with acute fasciolasis diagnosed clinically by fever, abdominal pain and enlarged liver, haematologically by eosinophilia and serologically by a positive indirect haemagglutination test (titre > 1/640).

**Group II:** Fifteen patients with chronic fasciolasis passing eggs in the stools and diagnosed by the kato katz technique (10). Control group of ten healthy persons; age matched were chosen.

None of the patients and controls had received blood transfusion, antibiotics or medication at least three months before the study. None gave a history of jaundice, diabetes mellitus or chronic diseases.

**Regimen of treatment**

Egaten (Novartis, Pharma AG, Bale, Switzerland) was given to all patients in a dose of 10 mg/kg body weight for two successive days after intake of a fatty meal (as recommended by the manufacturer) (11).

After the end of therapy, patients were followed up every fortnight for a period of 3 months to check the presence of eggs in stools; IHAT was repeated for patients with acute fasciolasis after 3 months.

**Blood sampling**

Ten mls. venous blood, were withdrawn from all patients before and 3 months after treatment, and from the control group. 200 µl were immediately used for assay of GSH. One ml was dispatched into a heparinized tube for studying the blood picture (12). The remaining blood sample was pipetted into tubes containing 10 mM (EDTA). Within 4 hours, the blood was centrifuged at 3000 rpm for 20 minutes in a cooling centrifuge to separate the plasma for assessment of liver function tests (ALT, AST (13), ALP (14), Bilirubin (15)). The Buffy coat was removed and the remaining erythrocytes were drawn and washed 3 times in cold sterile saline and used for assaying the activities of the different enzymes.

SOD (16), CAT (17), GSH (18), GPx (19), GR (20), GST (21), G6-PD (22), protein
Statistical analysis was done using SPSS8/ windows. Student “t” test, paired “t” test and ANOVA test were used to compare means of different variance. Difference was considered significant at p < 0.05.

RESULTS

I- Parasitological results
All cases of acute fascioliasis revealed a drop in eosinophilia and in the IHA titres after treatment confirming their cure. Chronic cases ceased to pass ova in the stools and the cure rate was 100%

II- Biochemical results
Results of the present study revealed that the specific activities of Cu/ Zn-SOD, GPx, GR, G6-PD as well as GSH content were significantly reduced when compared with controls in the erythrocytes of patients with acute and chronic fascioliasis before treatment, (P = 0.045, P = 0.001, P=0.032, P = 0.009, P = 0.043) for acute fascioliasis and (P = 0.000, P = 0.001, P = 0.001, P = 0.000, P = 0.019) for chronic fascioliasis respectively (Tables I-V).
The only exception of these was GST specific activity which showed significant increase in acute and chronic fascioliasis when compared with controls before treatment (P=0.001, P=0.000) respectively and regained its normal value (Table VI). Regarding catalase specific activity after 3 months of Egaten treatment showed significant elevation when compared with that before treatment (P=0.003, P=0.000) respectively and, also, with that of control (P=0.000, P=0.004) respectively (Table VII).

III- Haematological results
In comparison with control group, Hb content in acute and chronic fascioliasis was significantly lower (P = 0.000 and P = 0.000). After 3 months of Egaten treatment, Hb content was significantly elevated than that before treatment (P = 0.000, P = 0.000) and became within the normal range of control. Heamatocruit
values was significantly lower in the two studied groups when compared with controls ($P = 0.002$, $P = 0.000$) but after treatment with Egaten it regained its normal value. The same result was detected in red blood cells count which showed significant decrease in both patients with acute and chronic fascioliasis ($P = 0.000$, $P = 0.000$). After 3 months of Egaten treatment the count increased to show significant elevation than that of before treatment ($P = 0.000$, $P = 0.000$) respectively and to become within the normal range of control.

Before treatment eosiphilic % was significantly higher in patients with acute and chronic fascioliasis when compared with control ($P = 0.000$, $P = 0.000$) respectively. After Egaten treatment it was significantly decreased than before treatment ($P = 0.001$, $P = 0.000$) and regained its normal level only in patients with chronic fascioliasis ($P = 0.132$), but remained significantly higher than control in patients with acute fascioliasis ($P = 0.008$) (Table VIII).

IV- Liver function tests

Enzyme activity of both ALT and AST were significantly elevated in acute fascioliasis only but not in chronic fascioliasis when compared with controls. ($P = 0.001$, $P = 0.001$) for acute stage, but ($P = 0.726$, $P = 0.524$) for chronic stage.

After 3 months of Egaten treatment the activities of the two enzymes in acute fascioliasis were significantly decreased when compared with that before treatment ($P = 0.011$, $P = 0.020$, respectively) and regained the normal values. No significant change was noticed in case of chronic fascioliasis.

ALP specific activity was significantly elevated in both patients with acute and chronic fascioliasis when compared with control ($P = 0.001$, $P = 0.011$). After treatment the plasma level of the enzyme was statistically decreased in both groups ($P = 0.000$, $P = 0.000$) than that before treatment and returned to the normal values.

Bilirubin level in acute and chronic fascioliasis was significantly elevated when compared with control ($P = 0.006$, $P = 0.002$). After treatment the level decreased significantly when compared with that before treatment ($P = 0.001$, $P = 0.000$) and became within the normal range.
Table (I): Erythrocyte superoxide dismutase specific activity of controls and patients infected with *Fasciola* before and after treatment with Egaten.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Acute <em>Fasciola</em> patients</th>
<th>Chronic <em>Fasciola</em> patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td>n</td>
<td>(10) (6) (6) (15) (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± S.E.M</td>
<td>18.14 ± 1.66</td>
<td>12.78 ± 1.43</td>
<td>19.21 ± 0.56</td>
</tr>
</tbody>
</table>

The results are expressed in U/ gHb.

Table (II): Erythrocyte glutathione peroxidase specific activity of controls and patients infected with *Fasciola* before and after treatment with Egaten.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Acute <em>Fasciola</em> patients</th>
<th>Chronic <em>Fasciola</em> patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td>n</td>
<td>(10) (6) (6) (15) (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.82-2.65</td>
<td>0.35-0.82</td>
<td>1.04-1.87</td>
</tr>
<tr>
<td>Mean ± S.E.M</td>
<td>1.52 ± 0.16</td>
<td>0.57 ± 0.06</td>
<td>1.49 ± 0.12</td>
</tr>
</tbody>
</table>

The results are expressed in U/ gHb.
Table (III): Erythrocyte glutathione reductase specific activity of controls and patients infected with Fasciola before and after treatment with Egaten.

<table>
<thead>
<tr>
<th>Control group</th>
<th>Acute Fasciola patients</th>
<th>Chronic Fasciola patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
</tr>
<tr>
<td>n</td>
<td>(10)</td>
<td>(6)</td>
</tr>
<tr>
<td>Range</td>
<td>3.10-7.91</td>
<td>2.09-3.20</td>
</tr>
<tr>
<td>Mean ± S.E.M</td>
<td>4.29 ± 0.43</td>
<td>2.93±0.17</td>
</tr>
</tbody>
</table>

The results are expressed in U/g Hb.

Table (VI): Erythrocyte glucose 6-phosphate dehydrogenase specific activity of controls and patients infected with Fasciola before and after treatment with Egaten.

<table>
<thead>
<tr>
<th>Control group</th>
<th>Acute Fasciola patients</th>
<th>Chronic Fasciola patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
</tr>
<tr>
<td>n</td>
<td>(10)</td>
<td>(6)</td>
</tr>
<tr>
<td>Range</td>
<td>78.56-221.98</td>
<td>65.38-80.97</td>
</tr>
<tr>
<td>Mean ± S.E.M</td>
<td>138.75 ± 15.94</td>
<td>75.35±2.23</td>
</tr>
</tbody>
</table>

The results are expressed in U/g Hb.
Table (V): Erythrocyte glutathione contents of controls and patients infected with Fasciola before and after treatment with Egaten.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Acute Fasciola patients</th>
<th>Chronic Fasciola patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td>n</td>
<td>(10)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>Mean ± S.E.M</td>
<td>33.47 ± 2.41</td>
<td>26.40 ± 0.35</td>
<td>27.50 ± 0.14</td>
</tr>
</tbody>
</table>

\[ P=0.015 \] \[ P=0.000 \] \[ P=0.15 \] \[ P=0.45 \] \[ P=0.795 \]

The results are expressed in mg%.

Table (VI): Erythrocyte glutathione s-transferase specific activity of controls and patients infected with Fasciola before and after treatment with Egaten.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Acute Fasciola patients</th>
<th>Chronic Fasciola patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td>n</td>
<td>(10)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>Range</td>
<td>28.2-83.17</td>
<td>181.32-572.54</td>
<td>40.41-53.88</td>
</tr>
<tr>
<td>Mean ± S.E.M</td>
<td>63.61 ± 7.72</td>
<td>274.56±68.66</td>
<td>45.56±1.88</td>
</tr>
</tbody>
</table>

\[ P=0.022 \] \[ P=0.000 \]

The results are expressed in U/ g Hb.
Table (VII): Erythrocyte catalase specific activity of controls and patients infected with Fasciola before and after treatment with Egaten.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Acute Fasciola patients</th>
<th>Chronic Fasciola patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td><strong>n</strong></td>
<td>(10)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>2104.18-6704.42</td>
<td>3613.22-5480.37</td>
<td>4625.56-7692.65</td>
</tr>
<tr>
<td><strong>Mean ± S.E.M</strong></td>
<td>3434.62 ± 430.70</td>
<td>4466.12 ± 248.70</td>
<td>6655.73 ± 449.12</td>
</tr>
</tbody>
</table>

The results are expressed in U/ gHb.

P = 0.003
P = 0.105
P = 0.000
P = 0.300
P = 0.004
Table (VIII): Hemoglobin content, hematocrit values, red blood cell count and eosinophilic (%) in controls and patients with acute and chronic fascioliasis before and after treatment with Egaten.

<table>
<thead>
<tr>
<th></th>
<th>Control (10)</th>
<th>Acute fascioliasis</th>
<th>Chronic fascioliasis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment (6)</td>
<td>After treatment (6)</td>
<td>Before treatment (15)</td>
</tr>
<tr>
<td>Hemoglobin content (g/dl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td>13.44±0.26</td>
<td>10.99±0.27*</td>
<td>12.76±0.18**</td>
</tr>
<tr>
<td>Hematocrit values (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>34-45</td>
<td>33-36</td>
<td>38-40</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td>39.90±0.99</td>
<td>34.83±0.48*</td>
<td>39.0±0.37</td>
</tr>
<tr>
<td>RBCs count (M/mm³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>4.25-5.17</td>
<td>3.60-3.85</td>
<td>4.38-4.66</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td>4.69±0.10</td>
<td>3.72±0.03*</td>
<td>4.53±0.04**</td>
</tr>
<tr>
<td>Eosinophilic count (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0-5</td>
<td>17-33</td>
<td>4-10</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td>3.20±0.55</td>
<td>24±2.13*</td>
<td>6.17±0.87*</td>
</tr>
</tbody>
</table>

*Significant when compared with control. ** Significant when compared with that before treatment.
Table (IX): Liver function tests in controls and patients with acute and chronic fascioliasis before and after treatment with Egaten.

<table>
<thead>
<tr>
<th>N</th>
<th>Control (10)</th>
<th>Acute fascioliasis Before treatment (6)</th>
<th>Acute fascioliasis After treatment (6)</th>
<th>Chronic fascioliasis Before treatment (15)</th>
<th>Chronic fascioliasis After treatment (15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT (U/L)</td>
<td></td>
<td>10-32</td>
<td>14-133</td>
<td>10-29</td>
<td>7-49</td>
</tr>
<tr>
<td>Range</td>
<td>20.11±1.74</td>
<td>69.37±15.48*</td>
<td>18.0±2.56**</td>
<td>18.80±2.77</td>
<td>18.60±2.11</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td></td>
<td>22.88±2.36</td>
<td>45.50±9.33*</td>
<td>16.39±0.80**</td>
<td>24.83±1.91</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td></td>
<td>14-38</td>
<td>19-87</td>
<td>13.19</td>
<td>11-47</td>
</tr>
<tr>
<td>Range</td>
<td>22.88±2.36</td>
<td>45.50±9.33*</td>
<td>16.39±0.80**</td>
<td>24.83±1.91</td>
<td>21.10±2.04</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td></td>
<td>22.88±2.36</td>
<td>45.50±9.33*</td>
<td>16.39±0.80**</td>
<td>24.83±1.91</td>
</tr>
<tr>
<td>ALP (U/L)</td>
<td></td>
<td>112-303</td>
<td>153-405</td>
<td>72-186</td>
<td>94-437</td>
</tr>
<tr>
<td>Range</td>
<td>159.60±18.06</td>
<td>296.33±33.44*</td>
<td>129.17±14.72**</td>
<td>244.20±21.77*</td>
<td>160.13±14.18**</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td></td>
<td>159.60±18.06</td>
<td>296.33±33.44*</td>
<td>129.17±14.72**</td>
<td>244.20±21.77*</td>
</tr>
<tr>
<td>Billirubin (mg/dl)</td>
<td></td>
<td>0.4-0.7</td>
<td>0.6-0.8</td>
<td>0.5-0.6</td>
<td>0.5-1.2</td>
</tr>
<tr>
<td>Range</td>
<td>0.57±0.03</td>
<td>0.73±0.03*</td>
<td>0.53±0.02**</td>
<td>0.78±0.04*</td>
<td>0.59±0.02**</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td></td>
<td>0.57±0.03</td>
<td>0.73±0.03*</td>
<td>0.53±0.02**</td>
<td>0.78±0.04*</td>
</tr>
</tbody>
</table>

*Significant when compared with control.
** Significant when compared with that before treatment.
DISCUSSION

The present study indicated that infection with fasciola was accompanied by changes in the oxidative abilities of erythrocytes, that was manifested by a significant decrease in the activities of the main anti-oxidant enzymes, SOD, GPx, GR and G6-PD and in the content of the non enzymatic anti oxidant GSH. The only exception from this pattern was increased activity of GST, and unchanged activity of CAT.

Previous studies on rats infected with F.hepatica showed that the antioxidant capabilities of liver enzymes (SOD, GPx, GR) were reduced, GSH content showed significant depletion as a result of infection (25).

Results of the present study support the study of Rehim (2003) (26), which revealed a significant depletion in the erythrocyte GSH content as well as GPx and SOD activities in patients with acute and chronic fascioliasis.

SOD is the main anti-oxidant enzyme of the cell, responsible for scavenging the super oxide radical. With infection, its level was decreased and the super oxide radicals are thus expected to be elevated. Superoxide anions could cause oxidation of critical SH groups in proteins and possibly induce peroxidation of lipids in the membrane of the RBCs, causing lysis of the red cell membrane. (27-29) Moreover, some of the hemoglobin become oxidized to methemoglobin that does not build or transport O2. Heme may also be released, it reacts with O2 and H2O2 to produce OH* and ROS. (30)

RBCs CAT is protected from pro-oxidant mediated inactivation by associated NADPH generation. G6-PD was significantly inhibited in patient groups. Accordingly a decrease in catalase activity is expected. Yet, in the present study, the level of CAT in the oxidatively stressed erythrocyte did not show significant difference when compared with the control level. That finding could be explained according to Cooper et al (1972) (31) who stated that G6-PD deficiency lead to depletion of NADPH but has a smaller effect on NADH, the latter might prevent inactivation of CAT in the erythrocytes. The unchanged activity of CAT might also be attributed two its low affinity to H2O2. (31)

GSH is believed to function as an important redox buffer. It protects cell membranes from oxidative damage and helps to maintain the SH group of many proteins in the reduced form. In fasciola patients, the erythrocyte level of GSH was found to be low compared to the level in controls. That finding reflects an increase in free radical production at a rate that might exceed the detoxifying ability of GSH. (33)

The decreased level of GSH may be connected with enhanced oxidation of glytathione disulphide (GSSG), catalyzed by free radicals. Moreover, aldehydes generated during lipid peroxidation may form a conjugate with GSH, leading to significant decrease in cellular GSH. (34,35)

GPx a selenium containing protein, reduces H2O2 and various hydro peroxides using GSH as a reducing agent. (36,37) That enzyme showed decreased activity in infected patients, a finding which might be explained by the low content of GSH.
that acts as a substrate and decreased co-factor of GPx. \(^{38}\) Enzyme inactivation may as well be explained according to Kinter and Robert (1996) by the fact that 4-hydroxy non-enal (4 NHE), the aldehyde generated during lipid peroxidation, reacts with selenium in the active site of GPx and inactivates the enzyme. \(^{39}\) Moreover, non specific oxidation of the susceptible cysteine SH group adjacent to the selenol group appears to cause irreversible inactivation of the enzyme. \(^{39}\)

GSTs play a central role in human detoxification process. They catalyze the conjugation of GSH to toxic products that may be easily excreted. GST activity was elevated in patients with fascioliasis. The elevation is of interest, since mature erythrocytes are incapable of protein synthesis, so, enzyme activation seems not to reside on protein expression but it could be caused by a favourable conformational change following the oxidant insult. \(^{40,41}\)

G6-PD is involved in the generation of NADPH which is indispensable for biosynthesis of GSH. \(^{42,43}\) A decrease of G6-PD was encountered in all patient groups and this was expected to participate in causation of chronic hemolysis of erythrocytes.

Three months after Egaten treatment, the level of cell antioxidants was restored and became near or within the limits of the normal range.

Elevated levels of ALT and AST in acute phase of fascioliasis could be considered secondary to extensive destruction of the liver parenchyma and to association with some degrees of hepatic necrosis in some areas caused by the penetrating fluke.\(^{25,44}\)

Elevated level of ALP activity in acute stage may be due to hepatic damage and or increased permeability of the cell due to irritation by toxic metabolites of the worms and eggs. In chronic infection the elevation could be attributed to the mechanical obstruction of the bile duct and toxic action of the parasites leading to hyperplasia of the biliary epithelium with failure to excrete the enzyme in the bile, accordingly it is raised in plasma. \(^{45}\) These results were confirmed by the elevated level of bilirubin in plasma of patients of both phases of infection.

In both animal and human infection with fascioliasis, anemia was reported as one of the most characteristic symptoms. Anemia could be a result of the fluke which is a blood feeder, hemorrhage that occurs from the erosion of the biliary epithelium due to infection, toxic substances released by the fluke that affect the pituitary gland leading to reduction in thyrotrophic and adrenocorticoid hormones which in turn leads to reduction in the rate of erythropoiesis, reticulocytes that are increased in the periportal blood and shortens the half life of red blood cells.\(^{46,47}\)

In addition, the decline in G6-PD activity noticed in the current study leads to lack of reduced GSH necessary to detoxify ROS. All these findings may explain the anemia detected in the present study that was diagnosed by reduction of Hb concentration, red blood cell count and hematocrit value. Also, cross linkages of sulfhydral groups occur
both in hemoglobin and membrane. Heinz bodies that contribute to the rigidity of the red cell membrane resulting in their early removal from the circulation. After 3 months of Egaten treatment, the Hb concentration, red blood cell count and hematocrit percent regained their normal level denoting that Egaten has beneficial value in restoring the Hb level and correcting the anemia induced by fascioliasis.

Increased eosinophilic percent is in consistent with previous study by Hishmat et al (1996), it was suggested to be due to the stimulant effect of the parasite antigens specially those of larvae to the Th2 lymphocytes that secrete IL-4 and IL-5, responsible for eosinophilia.

Eosinophilic percent reached normal values by the end of three months post treatment in chronic fascioliasis. In acute fascioliasis, although the eosinophilic percent was statistically decreased than before treatment but was yet higher than control level.

Conclusively, Egaten has cured all cases of fascioliasis whether in the acute or chronic stage; it has thus abolished the effect of the parasite on the different anti-oxidant enzymes. The drug itself was safe and did not induce any insult.

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مقدمة مزيلات السمية ومضادات الأكسدة في حالات الالتهاب الكبدية: تأثير عقار الإيجابيين

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إن إصابة الإنسان بالالتهاب الكبدية قد تم رصدها في العديد من البلدان كما تم رصدها أيضاً في مصر.

وقد تم إدراج المزيلاة السمية ومضادات الأكسدة منذ فترة طويلة تعود إلى زيادة إنتاج الشفاقة الحرة والمركبات الأوروكسينية النشطة التي تسبب آثاراً بالخلايا الحية ومكانتها، لذلك فالجسم له استراتيجيات لتقليل النتائج من التعرض لهذه الشفاقة الحرة ومن أهم أحماض أحماض إنتاج السمية والمضادات للأكسدة ومنها سوبر أوكسيد ديزموريز. الكاتاتيز . الجلوتاتيون بروكسيدز. والجلوتاتيون ريدتراتز. الجلوتاتيون إس ترانصرفيز. الجلوتاتيون.

ومع ذلك، تم إعداد عقار الإيجابيين (التيولايدنالز) لعلاج التهاب الحاد والمزمن للفيروز المزمنة.

الكيماوي، لقد استنفده هذا البحث دراسة تأثير عقار الإيجابيين على كل من:

1. نشاط الأنزيمات المصابة للأكسدة (سوبر أوكسيد ديزموريز. الكاتاتيز . الجلوتاتيون بروكسيدز. الجلوتاتيون ريدتراتز. الجلوتاتيون إس ترانصرفيز. الجلوتاتيون.

2. وظائف الكبد قبل وبعد العلاج.

3. قدر الدم الناتج عن الإصابة قبل وبعد العلاج.

قد أجريت هذه الدراسة على 21 مريضاً بالإضافة إلى 10 أشخاص أصحاء وقد تم جمع عينات الدم من المريض المصابين بالداء الكيماوي قبل وبعد العلاج بالإضافة إلى الأشخاص الأصحاء.

المجموعة الأولى: ستة مرضى بدئ المزمنة الكبدية في المرحلة الحادة.

المجموعة الثانية: خمسة عشرة مريضاً بدئ المزمنة الكبدية في المرحلة المزمنة.

تم إعطاء المريض بجرعة 10 مجم/كم من وزن الجسم لمدة يومين متتاليين. وقد أظهرت الدراسة النتائج الآتية: كل الحالات المصاب بالالتهاب الكبدية. قد شهدت تأثيراً سيدون بسيطاً من رد فعل الإصابة بزيادة بيوياً أثناء شهر المتابعة الثالثة. لقد أوضحت هذه الدراسة أن الإصابة بالمزمنة الكبدية كانت مصحوبة بزيادة في مستوى محتويات الأكسيد كرات الدم الحمراء. وهذا كان واضحًا من الإرتفاع في مستوى أحماض إنتاج السمية وبائية الأحماض الكيماوية مثل سوبر أوكسيد ديزموريز. والجلوتاتيون بروكسيديز والجلوتاتيون ريدتراتز. الجلوتاتيون.

1. فوسفات ديزموريز. والجلوتاتيون: حسنان.

2. فوسفات ديزموريز. والجلوتاتيون: أحمد إبراهيم محمد.

3. فوسفات ديزموريز. والجلوتاتيون: هبة عبد النبي جلال.

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النتائج الزائد لتفاقم الجراحة المصاحبة لعملية الإنشاء كرد فعل من العدوى بالفيتيليات. بالنسبة لنشاط إنزيم الكالياز في كرات الدم الحمراء في جميع المجموعات لم يغتر عمستويات في المجموعة الضابطة.

أما ارتفاع كنتيجة إنزيم الجلوتاتيون في كرات الدم الحمراء للمريض المصاب بالتموزة الكبدية فإنه يعكس زيادة في إنزاق الدفق الحركي عالي فوق قوة قوة الجلوتاتيون على إثر الأدوية.

بالنسبة لنشاط إنزيم الجلوتاتيون بروكسيد في انخفاض مستويه في مريض المصاب بالتموزة الكبدية يعزى انخفاض مستوى إنزيم الجلوتاتيون في المجموعة المصابة بالتموزة الكبدية قد يرجع إلى تغيرات شكلية في الإنزيم نفسه. انخفاض مستويات شئان إنزيم الجلوتازور -6- فوسفات دهوجزين في المريض المصاب بإنخفاض المصل في كرات الدم الحمراء مما يؤدي إلى تدبير جدار كرات الدم الحمراء وبالتالي توقف التكسير المدمج لهذا الحالة.

بعد ثلاثة أشهر من العلاج بعقار الإيجاتين في المريض المصاب بالتموزة الكبدية في المرحلة الحادة والمرحلة فإن معظم الإنزيمات المصابة للكبدة تحت الرشاقة عادة إلى مستوى الطبيعي أو أكثر قليلا من المستوى الطبيعي.

يرتفع مستوى شئان الإنزيمات الكبدية ALT وAST في مريض المتموزة الكبدية في المرحلة الحادة للإصابة أما بعد العلاج فكان هناك تحسن ملحوظ في نشاط هذه الإنزيمات. بالنسبة لمستويات شئان إنزيم الفوسفاتاز القاعدي فقد ارتفع مستوى انخفاضه ذهابا دو دالة إحساسية في مصل دم جميع المجموعات المرضية بالمقارنة بمثبط في المجموعة المصابة، بعد العلاج بالعقار استعاد الإنزيم مستوى الطبيعية في كل المجموعات.

بالنسبة لنتائج صورة الدم: أظهرت الرشاقة أن القيم المتوسطة لتركيز الديهيدروجين وتعداد كرات الدم الحمراء وقيمة الدهيجوزن كانت مستقرة انخفاضًا دو دالة إحساسية في كل المجموعات تحت الرشاقة عند متابعتها بالمجموعة الضابطة. بعد العلاج بعقار الإيجاتين تعادت كل القيم مرة أخرى وعادت مستواها الطبيعي.

أظهرت الرشاقة أن القيم المتوسطة لكرات الدم الحمراء للإيوسين في كل المجموعات تحت الرشاقة كانت مرتفعة انخفاضًا دو دالة إحساسية بنسبة مثالية للمناطق الضابطة. أما بعد العلاج فقد تراجعت الرشاقة بنسبة معينة لكرات الدم الحمراء للإيوسين إلى معدلاتها الطبيعية في الفنجر الحاد.

الاستنتاج:

1. أن الإصابات بداء المتموزة الكبدية قد أدى إلى انخفاض نشاط معظم الإنزيمات المصابة للكبدة تحت الرشاقة.

2. أن عقار الإيجاتين قد أثبت كفاءة عالية في علاج حالات الإصابة بداء المتموزة الكبدية بمثابة العلاج والمزمنة كما ظهر من متاهة تحليل البراز بعد ثلاثة أشهر وكذلك استعادة وظائف الكبد لمستواها الطبيعي.

извечностью антагонистами и Ахуроизами (двойными артериями) в крови.

Авторы статьи: Эбид и др.


Ebied et al.