Hepatoprotective effect of a traditional drug, gurgum-7 on carbon-tetrachloride-induced liver damage

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INTRODUCTION

In recent years, one of the leading diseases in the Mongolian population is digestive system diseases among which increased incidence of liver disease in the population is becoming a most challenging situation as it is one of the leading causes of mortality. As of 2013, within 5 leading causes of morbidity in a population of 10,000, digestive system disease stands 2nd while liver cirrhosis is ranked 3rd in the leading causes of mortality. Therefore, the Mongolian traditional drug Gurgum-7 was selected to determine its impact on liver damage caused by carbon tetrachloride compared with the standard group which used Liv-52. The study thus shows that Gurgum-7 prescription showed hepatoprotective effect.

Key words: Gurgum-7, CCI4, hepatoprotective effect.

MATERIALS AND METHODS

The present study was carried out in the Pharmacology Laboratory of the Institute of Traditional Medicine and Technology with the support of the pathological histology department of the medical school of the University of Medical Science, Ulaanbaatar city, Mongolia. 70 Wistar albino rats (180-250 g) of either sex were used for the experiment. They were kept in standard animal cages and maintained at room temperature (20 ± 2°C) and relative humidity (55 ± 5%) under 12 h of light and dark cycle. The animals were allowed free access to commercial animal feeds (pelleted feed) and water. Experiments were carried out according to the rules of procedure with the use of experimental animals. The study protocol was approved by
Table 1: The model of hepatotoxicity for experimental animals

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Treatment</th>
</tr>
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<tbody>
<tr>
<td>Normal group</td>
<td>10</td>
<td>2.5 ml distilled water was given orally for each day.</td>
</tr>
<tr>
<td>Control group</td>
<td>20</td>
<td>50% CCl₄ (0.4ml/100gm) subcutaneously injection once per day, for 4 days.</td>
</tr>
<tr>
<td>Live-52</td>
<td>20</td>
<td>50% CCl₄ (0.4ml/100gm) subcutaneous injection once per day, for 4 days.</td>
</tr>
<tr>
<td>Gurgum 7</td>
<td>20</td>
<td>50% CCl₄ (0.4ml/100gm) subcutaneous injection once per day, for 4 days.</td>
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<tr>
<td></td>
<td></td>
<td>100 mg/kg Liv 52₄5 was given orally each day for 28 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>275 mg/kg Gurgum 7 was given orally each day for 28 days</td>
</tr>
</tbody>
</table>

Figure 1: Gurgum-7’s impact on experimental animal liver damage by serum level of ALT

the Ethics Committee of the Health Sciences University of Mongolia.

The acute toxicity study

The animals were divided into 3 groups (n=20). 50% carbon tetrachloride (CCl₄) was subcutaneously injected at 0.4 ml/100 gm dose for 4 days (Table 1) and the evaluation taken on days 3, 7, 14 and 28 (Figure 1) (Khishigjargal et al, 2006; Ambaga (1992). The study results were obtained by evaluating aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) in serum level and histomorphological examination. Results are presented as mean, standard deviation (SD) and standard error (m) at 95% confidence interval. Statistical analysis was performed using one-way analysis of variance (ANOVA). P value <0.05 was considered significant.

RESULTS

In the group treated with Gurgum-7 (study group), serum ALT level decreased by 22.3% in 3 days, 37% in 7 days, 61.2% in 14 days and 49.2% in 28 days (Figure 2) compared to the control group (p>0.01).

There were statistically significant differences in serum AST level between the healthy and control groups. Serum AST level was eliminated by 39.2% in 28 days compared to the control group (p>0.01).

According to Figure 3, serum ALP level in the study group was lowered by 44.5% in 7 days, 52.1% in 14 days and 39.3% in 28 days respectively, compared to the control group. (p>0.01)

Comparative histological analysis was carried out on the liver tissues of experimental animals. According to Figure 4A, in the control group CCl₄ induced liver tissue damage showed inflammatory cells around the hepatic cords and triads, large and small fatty changes around the central vein, hepatocytes necrosis and decomposition, dismissed pillar structure of hepatocytes and blood stasis in the sinusoids in 3 days. Meanwhile, in Figure 4B, liver tissue showed small fatty changes, mild protein changes in hepatocytes and micro vascular blood stasis but the liver pillar structure remained.

In Figure 5A, CCl₄ induced control group liver tissue showed diffused fatty droplets, blood stasis, liver pillar and lobular structure was lost in lobular center; HCC formation of protein fatty metamorphosis in 7 days.
Figure 2: Gurgum 7’s impact on experimental animal liver damage by serum level of AST

Figure 3: Gurgum 7’s impact on experimental animal liver damage by serum level of ALP

Figure 4: CCI4 induced liver damage histopathology in 3rd day. (A: control group H&E x100; B: Gurgum-7 H&E x100)

a. artery  b. vein  c. Liver Trinity  d. inflammatory cell infiltration e. fatty metamorphosis j. HCC regeneration, F. blood stasis i. HCC decomposition and necrosis
**DISCUSSION**

CCl₄ can damage HCC through oxidative mechanisms, changes in connective tissue structures which can further cause degradation of liver function. Besides hepatocellular regeneration and inflammatory infiltration, hepatocellular regeneration proliferation of hepatic stellate cells and deposition of connective tissue are major features of liver histopathology (Qi-pepnum et al., 2005).

According to this study, Gurgum-7 can decrease serum ALT level (which refers to cell decomposition) by 22.3-61.2%, AST by 8.6-39.6%, ALP by 9.1-52.1%, respectively, due to the pathohistology analysis liver pillar structure was maintained, sinusoids and capillary structure was normal and HCC regeneration and inflammatory cell infiltration degenerated.

One of the main ingredients in Gurgum-7's is *Carthamus tinctorius* L, which has hepatoprotective effect on CCl₄ induced liver damage and at the same time can reduce cirrhosis damage level. Zhang et al. (2011) proved that this
Amarzaya et al.          5

Figure 7: CCI4-induced liver damage histology in 28 days (A. Monitoring H & E kh200; B. Gurgum-7, C-28 days, H & E kh200)

effect can be explained by substances called Kartamin (Wu et al., 2013; Shijun et al., 2013). *Carthamus tinctorius* L is also known to reduce HCC compensation, decrease cholestasis, connect biliation and cholecyst during hepatitis (Bayarmaa et al., 2013).

**Conclusion**

The study proves that a traditional recipe (Gurgum-7) can decrease HCC decomposition and necrosis through lowering serum ALT, AST and ALP levels in experimental animals while simultaneously, its hepatoprotective effect was confirmed by pathohistology analysis.

**Conflict of Interests**

The authors declare that there is no conflict of interests regarding the publication of the paper.

**REFERENCES**


Wu SC, Yue, Ding H (2013) Carthamus red from Carthamus tinctorius L. exerts antioxidant and hepatoprotective effect against CCl4-induced liver damage in rats via the Nrf2 pathway. J. Ethnopharmacol. pp.148-158.