Study the Variation in Biochemical Parameters of Post Colic Surgical Horses Which Treated With Chamomile Flowers

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Abstract: This study was conducted to determine the antioxidative effect of Matricaria chamomilla (Chamomile) flowers on the health status of post colic Surgical interference in adult horses. The experimental data were carried out eight clinically post colic surgical horses. All the horses were undergone colic surgery in different times. After eight weeks of the surgery, the horses were fed a ration supplemented with 15% Chamomile, in comparing with horses undergone colic surgery and spend eight weeks after surgery without adding any supplementation to their ration.

Total antioxidant reactivity (TAS), Malondialdehyde (MDA), Uric Acid (UA) levels, activities of muscle enzymes – Aspartate Aminotransferase (AST), Creatine Kinase (CK), and parameters of fatty acid metabolism such as Triacylglycerols (TAG) and Nonsteroidal Fatty Acids (NEFA) were determined. Average values of TAS after supplementation with Chamomile rose decreased gradually and were detected at significantly higher levels (P ≤ 0.05) in the eighth week in comparison with the control. The focus of malondialdehyde, decreased significantly (P ≤ 0.05) contrasted with the unprocessed control. The activities of AST and CK varied. However, no unsettling influence was shown in muscle homeostasis. The present outcomes indicate that the total antioxidat action of the post colic surgery horses fed a diet supplemented with Chamomile was higher, and it helped stabilize the porosity of the muscle cell membranes in the post-surgical horses.

Keywords: Biochemical Parameters; Post Colic; Surgical Horses; Chamomile Flowers

1. Introduction

During and after surgical procedures, here is a well-defined physiological exertion reaction that includes activation of inflammatory, endocrine, metabolic, and immunological mediators [1]. In major surgical procedures, increases in oxidative stress occur acutely; it can lead to tissue injury and is seen in colic surgery. Given that surgery can cause significant physiological stress in the body (2). In racing horses, this is particularly relevant where production of ROS (Reactive oxygen species) is increased and antioxidant defenses are reduced [3]. Unfortunately, there are few investigations of the effect of oxidative effort on post-operative outcomes. Although many studies sustain the idea of causation wherein increases of ROS concentration construct cellular dysfunction or organ damage, other studies failed to prove this hypothesis [4].

Oxidative stress is known as the condition in which the concentricity of reactive oxygen species (ROS) exceeds that of antioxidants, although ROS are removed from the body by antioxidants, complete removal is not possible in circumstances of extreme ROS formation [5]. Oxidative stress has been conveyed to happen through surgical treatment [6]. In horses, many factors, such as extensive invasion, bleeding, and time-consuming surgeries has been notified to reason intraoperative oxidative stress [7]. Oxidative stress has been reported in horses cause discouragement of the immune system, protracted wound healing, and other organ (such as the kidney and liver) damage; hence, it is important to diminish oxidative stress related to surgery to progress the postoperative prognosis [8]. However, no information concerning oxidative stress correlated to surgery in horses.

Oxidative stress, which is defined to be a condition where the construction of reactive oxygen/nitrogen type transcends the mechanisms needed to detoxify them, is thought to be a coordinated portion of the surgical stress reaction [9]. Surgical stress increases tissue demand for oxygen and cell respiration, resulting in the production of free radicals and reactive oxygen species [10]. Oxidative stress can have a negative impact in all forms of major surgery including colic surgery overproduction of oxidants exceeding the cellular antioxidant capacity outcomes in oxidative stress [11]. Chamomile is a potent antioxidant and in many studies has been appeared to be more efficacious...
than some "classical" antioxidants (e.g., vitamins E and C) in protecting against oxidative/nitrosative stress [12]. Horses do not have such a high concentration of non-enzymatic antioxidants in contrast with humans. Stallions specifically have a generally low convergence of systemic non-enzymatic antioxidants. Therefore, it is needful to complement the antioxidants per orally. The most common antioxidants added to horse faddors are vitamin E and C, instead of that a collection of both or vitamin E and some composes of selenium (13). The effect of *Matricaria chamomilla* (Chamomile) on oxidative stress includes the damper effect on lipid peroxidation and also its enhancement of the glutation - dependent antioxidative defense system (14).

Chamomile is a naturalistic provenance of blue oil (essential oil). The blossoms and bloom heads are the main organs of the formation of major oil. It is momentous that chamomile flower oil fundamentally comprises of sesquiterpene subsidiaries (75–90%) however just hints of monoterpenes. The oil includes up to 20% polyynes. The primary components of the crucial oil removed from the blooms are (E)-β-farnesene (4.9–8.1%), terpene alcohol (farnesol), chamazulene (2.3–10.9%), α-bisabolol (4.8–11.3%), α-bisabolol oxides A (25.5–28.7%) and α-bisabolol oxides B (12.2–30.9%) [15]. It has been revealed that supplementing Chamomile to the diet of the horses can raise the antioxidative ability (16). The diet supplementation with Chamomile in sport and racing horses is frequent. Supplementing the horse diet can raise the antioxidative capacity to decrease the oxidative stress throughout surgery. In conclusion, colic surgery appears to decrease antioxidant oxidative stress on prognosis.

## 2. Material and Methods

**Animals.** The experiment was performed on Thoroughbred horses at Al-Ghazaliya Equestrian Club in Baghdad Iraq (age 3–5 years, weight 470 ± 30 kg).

**Chamomile treatment.** The dosage was 15% Chamomile within typical ration corresponded with the requirements of National Research Council (18) for thoroughbred horses of a certain weight and maximal physical load. 4 horses fed 15% Chamomile diet for eight weeks post colic surgery and another four horses (Control group) fed a typical ration without any supplementation for eight weeks. The diet was based on oats, meadow hay, and extruded supplemental feed mixture for horses (Table 1). The horses had open arrival to water. Feeding doses were identified with the post-surgical condition.

**Blood sample collection.** The samples of blood were collected into polyethylene tubes (Vacutainer BD, Heidelberg, Germany) directly before colic surgical operation (day 0), and four, six, and eight weeks after the surgery, at 6.30 h. The samples were quickly handled in the laboratory and serum was stored at −70°C until analysis.

**Laboratory analysis.** Biochemical parameters were specified by commercial kits, TAS was determined with a commercial kit (Randox Lab-oratories Ltd., Crumlin, UK) on an automatic analyser XL-200 (Erba Lachema s.r.o.). malondialdehyde (MDA) were detected by an OxiSelectTM TBARS Assay kit (Cell Biolabs, Inc., San Diego, USA), based on the method principle presented by (19).

**Statistical analysis.** The data are first subjected to repeated measures, split-plot design analysis of variance using the SAS software package (Statistical Analysis System, Version 9.1, 2009), and the treatment alignments were conducted using the Least Squares significant difference method (Duncan Multiple Range Test). The standard of significance was 0.05 for all the statistical analyses.

<table>
<thead>
<tr>
<th>Table 1. Composition of feed ratio for experimental horses.</th>
<th>Meadow hay</th>
<th>Oats</th>
<th>Horse Opti</th>
<th>Horse Energy</th>
<th>Horse Müсли</th>
<th>Cham.</th>
<th>Σ Total</th>
<th>Cham.</th>
<th>Σ Total +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrients (kg)</td>
<td>7.00</td>
<td>4.00</td>
<td>0.50</td>
<td>0.80</td>
<td>1.00</td>
<td>0.15</td>
<td>13.45</td>
<td></td>
<td>13.45</td>
</tr>
<tr>
<td>Dry matter (g)</td>
<td>6 521.20</td>
<td>3 569.20</td>
<td>468.85</td>
<td>744.56</td>
<td>905.00</td>
<td>0.00</td>
<td>12 208.81</td>
<td>12 208.81</td>
<td></td>
</tr>
<tr>
<td>Crude protein (g)</td>
<td>398.30</td>
<td>472.00</td>
<td>75.00</td>
<td>64.00</td>
<td>100.00</td>
<td>0.00</td>
<td>1 109.30</td>
<td>1 109.30</td>
<td></td>
</tr>
<tr>
<td>DEh (MJ)</td>
<td>7.90</td>
<td>50.20</td>
<td>7.00</td>
<td>12.40</td>
<td>13.00</td>
<td>3.60</td>
<td>90.50</td>
<td></td>
<td>94.10</td>
</tr>
<tr>
<td>Ash (g)</td>
<td>364.00</td>
<td>128.00</td>
<td>40.65</td>
<td>10.80</td>
<td>59.20</td>
<td>0.00</td>
<td>602.65</td>
<td></td>
<td>602.65</td>
</tr>
</tbody>
</table>
3. Result

Results in Chamomile treated post colic surgical horses
To test the antioxidant effect of Chamomile, TAS was measured 0 day, four, six, and eight weeks after Chamomile treatment. The values of TAS revealed a significant (P ≤ 0.05) increase later six weeks of Chamomile supplementation, indicating that Chamomile treatment reached its saturation level at eight weeks of supplementation (Table 2). Next, we specified cell membrane lipoperoxidation by revelation of Malondialdehyde in serum by Malondialdehyde assay. We discovered that Chamomile supplementation gradually reduced the Malondialdehyde level within an interval of eight weeks of the supplementation, showing a significant (P ≤ 0.05) reduction of cell membrane lipid peroxidation (Table 2). To screen the metabolic action of the horses, the uric acid (UA) levels were slightly higher compared with the 0 day, whereas CK activity was not altered (Table 2). To examine the muscle homeostasis of Chamomile treated post colic surgical muscle enzymes AST and CK in the serum. There were no considerable divergences in AST activities after Chamomile supplementation, whereas CK levels were slightly higher compared with the 0 day, indicating that muscle homeostasis was not disturbed (Table 2).

Results in untreated post colic surgical horses

The analyzed data in (Table 3) observed the undesirable effect of post-surgical condition on the present study parameters; it was not significant changes in TAS and CK value along eight weeks after surgical operation, while the MDA, UA levels were gradual increasing (P ≤ 0.05) starting at six weeks to reach its maximum values at eight weeks in comparing with 0 days and decreasing the level of AST significantly.

4. Discussion
The aim of this study was to examine the antioxidant effect of Chamomile supplementation in the diet of race horses at full workload, and thus its ability to lower oxidative stress. Maximal workload is associated with an increment in the production of free radicals and interactive oxygen species, which can lead to imbalance between pro-oxidants and antioxidants and the forming of oxidative stress (20).

Antioxidant activity measuring by Malondialdehyde showed a statistically significant reduction in lipid peroxidation after eight weeks of Chamomile administration in monitored post colic surgical horses. These outcomes denoted that Chamomile as a very essential antioxidant effectively reduced the rate of oxidative stress generated in the horses after surgical interference (21). Moreover, the principal antioxidant components of the basical oil extracted from the Chamomile flowers are the terpenoids α-bisabolol and its oxide azulenes involving chamazulene and acetylène derivatives (22).

Table 2. Serum oxidant, antioxidant parameters and Serum activity enzymes in horses (n = 4) in Post colic surgery horses (day 0, week 8, 4,) the supplementation of 15% of Chamomile (Cham.)

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Sampling</th>
<th>day 0</th>
<th>4 weeks Cham.</th>
<th>6 weeks Cham.</th>
<th>8 weeks Cham.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAS (mmol/l)</td>
<td></td>
<td>0.89 ± 0.08B</td>
<td>0.79 ± 0.11B</td>
<td>1.25 ± 0.49A</td>
<td>1.16 ± 0.42A</td>
</tr>
<tr>
<td>MDA (µm)</td>
<td></td>
<td>92.94 ± 19.13A</td>
<td>74.45 ± 20.52B,C</td>
<td>69.65 ± 32.99B,C</td>
<td>42.9D ± 12.47D</td>
</tr>
<tr>
<td>UA (µmol/l)</td>
<td></td>
<td>12.90 ± 6.20A</td>
<td>10.70 ± 2.79A</td>
<td>10.50 ± 2.55A</td>
<td>11.00 ± 4.66A</td>
</tr>
<tr>
<td>AST (µkat/l)</td>
<td></td>
<td>5.83 ± 1.06A</td>
<td>6.33 ± 0.89A</td>
<td>5.96 ± 0.88A</td>
<td>6.51 ± 0.91A</td>
</tr>
<tr>
<td>CK (µkat/l)</td>
<td></td>
<td>3.49 ± 1.48A</td>
<td>4.25 ± 1.85A</td>
<td>4.88 ± 1.41B</td>
<td>4.9 ± 1.72B</td>
</tr>
</tbody>
</table>

(means ± SD)

A–D different superscripts within the lines indicate statistically significant differences (P ≤ 0.05)
TAS = total antioxidant activity, MDA = Malondialdehyde, UA = uric acid, AST = aspartate aminotransferase, CK = creatine kinase, Cham. = Chamomile

Cham. = Chamomile, DEh = digestible energy for horses

Ether extract (g) 114.10, 157.20, 33.50, 81.60, 49.20, 0.00, 435.60, 435.60
Fiber (g) 2 695.00, 389.20, 26.00, 14.56, 55.00, 0.00, 3 179.76, 3 179.76
Vitamin A (I.U.) 176.00, 7 610.00, 672.00, 47.4, 8 505.40, 8 505.40
Vitamin E (I.U.) 60.00, 80.00, 9.00, 0.00, 149.00, 149.00
Se (mg) 0.84, 0.04, 0.02, 0.00, 0.90, 0.90
Table 3. Serum oxidant, antioxidant parameters and Serum activity enzymes in horses (n = 4) in Post colic surgery horses (day 0, week 8, 4) without any supplementation (Control group)

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Sampling</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAS (mmol/l)</td>
<td>0.89 ± 0.12</td>
<td>0.75 ± 0.45</td>
<td>0.81 ± 0.4</td>
<td>0.75 ± 0.89</td>
<td></td>
</tr>
<tr>
<td>MDA (µm)</td>
<td>97.9 ± 12.1</td>
<td>94.4 ± 19.22</td>
<td>123.6 ± 25.19</td>
<td>152.2 ± 23.31</td>
<td></td>
</tr>
<tr>
<td>UA (µmol/l)</td>
<td>11.23 ± 4.10</td>
<td>13.70 ± 2.11</td>
<td>15.42 ± 3.85</td>
<td>16.02 ± 4.1</td>
<td></td>
</tr>
<tr>
<td>AST (µkat/l)</td>
<td>5.49 ± 1.46</td>
<td>5.3 ± 0.81</td>
<td>3.16 ± 0.44</td>
<td>3.76 ± 1.51</td>
<td></td>
</tr>
<tr>
<td>CK (µkat/l)</td>
<td>3.99 ± 1.08</td>
<td>3.21 ± 0.85</td>
<td>3.68 ± 1.21</td>
<td>3.89 ± 1.21</td>
<td></td>
</tr>
</tbody>
</table>

(means ± SD)
A–D different superscripts within the lines indicate statistically significant differences (P ≤ 0.05)

TAS = total antioxidant activity, MDA = Malondialdehyde, UA = uric acid, AST = aspartate aminotransferase, CK = creatine kinase, Cham. = Chamomile.

Chamomile inhibits lipid peroxidation which results in inflammation after surgery as long fibrosis reduction. Then, the amount of metabolites as MDA production would decrease (23). Significantly increased TAS in weeks six and eight of Chamomile saturation.

A positive engagement between products of lipid peroxidation and activities of blood enzymes AST and CK are well recognized (24). Despite the variance in the activities of AST and CK enzymes through the experiment, these estimates did not display a disturbance in muscle homeostasis (25).

AST and CK results were indicate significant anit-free radical action of Chamomile. Pre-incubation of blood plasma with Chamomile significantly diminished the extent of ONOO (-)-induced oxidative modifications such as protein carbonyl groups, SH groups, 3-nitrotyrosine, as well as the formation of lipid hydroperoxides (26). In summary, our study has shown that the in-take of the antioxidant Chamomile is beneficial and can compensate the oxidative stress generated after colic surgery, without significant disruption of musculoskeletal disorders of Chamomile treated horses.

References


