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Research Article

# Some Biochemical Responses in Cigarette Addicts who Receive Royal Jelly Supplement

**Ali Muhittin Tasdogan,[1] Zarife Pancar[2]**

[1]Department of Anesthesiology and Reanimation, Hasan Kalyoncu University Faculty of Health Sciences, Gaziantep, Turkey
[2]Department of Physical Education and Sport, Gaziantep University, School of Physical Education and Sports, Gaziantep, Turkey

## Abstract

**Objectives:** The aim of this study was to investigate the changes in the levels of alanine aminotransferase, aspartate aminotransferase, urea and creatine kinase in cigarette addicts of Royal Jelly supplementatio.

**Methods:** Cigarette addict control group (n=10) and cigarette addict supplement group (n=10) were divided into two groups. The supplementation group was given liquid royal jelly (n=10/1000 mg/day), which was at the same time every morning for three weeks. In order to determine AST, ALT, urea and creatine kinase levels in both groups, blood samples were analyzed. SPSS 22.0 package program was used for statistical analysis. Paired Sample t-Test was used for the comparison of the pre and post tests of the groups and Independent t-test was used for the comparison of the two groups.

**Results:** In the analysis of AST, ALT and urea levels between the pre-test and post-test of the experimental group receiving royal jelly supplementation and the control group, no statistical significance was found ($p>0.05$); creatine kinase level was found statistically significant in favor of posttest in experimental group ($p<0.05$).

**Conclusion:** As a result of this study, royal jelly supplementation at a dose of 1000 mg/day for three weeks did not affect AST, ALT and urea levels in cigarette addicts; creatine kinase level positively.

**Keywords:** Enzymes, nicotine, royal jelly

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Smoking is one of the preventable causes of death. Smoking is a preventable predisposing factor against many clinical conditions. There are many chemically reactive types of molecules in cigarette smoke, including reactive oxygen species, cell and radicals that are toxic to various cellular processes.[1] Although overdose loading is rare; while continuing use, it is addictive, and the physical and hormonal changes that occur during deprivation affect one's vital activities and activities. It is emphasized that the addictive nicotine is a tertiary amine consisting of pyridine and pyrrolidine rings. Nicotine interacts with acetylcholine receptors, and calcium and sodium flow into the cell. With the introduction of calcium, voltage-dependent calcium channels become active.[2]

The nicotine substance in the cigarette activates the prefrontal cortex, thalamus, cortico basal ganglia thalamic system and initiates the stimulation and activation of the centers of happiness or reward in the dopaminergic pathways in the ventral tegmental area.[2, 3]

Cigarette smoke enhances the synthesis of various enzymes, especially cytochromes and other enzymes involved in liver metabolism in the liver; and thus cause different degrees of hepatotoxicity.[4, 5] It is also associated with increased risk of cardiovascular and metabolic diseases such as changes in

**Address for correspondence:** Zarife Pancar, MD. Gaziantep Universitesi, Beden Egitimi ve Spor Yuksekokulu, Beden Egitimi ve Spor Bolumu, Gaziantep,, Turkey
**Phone:** +90 505 248 37 72 **E-mail:** mtasdogan@yahoo.com

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plasma lipoprotein levels and lipid accumulation in the liver.[6] The liver has an important role in the metabolism of many drugs, including anesthetic agents; it has also been said to change the metabolism of anesthetic agents.[7] The liver is the organ that responds to all these metabolic events from activities such as protection from toxic substances, viral and bacterial infections and poisoning. Nicotine, an important component of cigarette smoke, is mainly metabolized in the liver and induces steatosis and lesions characterized by focal or confluent necrosis and varying degrees of fibrosis.[8] Tobacco smoking changes lipid metabolism with increased lipolysis, insulin resistance and tissue toxicity, leading to increased plasma lipoprotein levels.[9] The liver is the largest and most important metabolic organ in our body consisting of various functional and anatomical structures. Liver; It is defined as an organ that harms the drugs and many toxic substances taken into the body due to its role in physiological and biochemical processes. In terms of anesthesia applications; it is emphasized that liver diseases carry a greater risk than cardiac diseases.[7] Carbon tetrachloride (CCl4) is one of the more than 600 substances that cause many pathological histories that damage the liver.[10, 11] Cigarette smoke increases lipid peroxidation in the respiratory epithelium;[12, 13] increased free radicals due to smoking, decreased lung volume and capacity in the long term;[14, 15] respiratory and circulatory system diseases,[16–18] and more importantly, it is emphasized that it may cause lung cancer.[19, 20] In the light of this information, it was aimed to investigate the changes in royal jelly supplementation given to cigarette addicts in alanine aminotransferase (ALT), aspartate aminotransferase (AST), urea and creatine kinase (CK) levels.

## Method

### Subjects

The study principle was approved by the Ethics Committee of the University of Gaziantep and was conducted in accordance with the issues specified in the Helsinki Declaration. The study procedure was explained to the participants prior to the study and voluntary consent was obtained from the participants. A total of 20 sedentary smokers, aged 20-25 years, participated voluntarily.

### Experimental Design

This research is an experimental study. A total of 20 men were randomly divided into two groups. For this purpose, Fagerström Nicotine Dependence Scale was applied to smokers. Dependency scores (6-7 points) were determined. A total of 20 adult male cigarette addicts were included in the study (n=10) and as a cigarette addict supplementation group (n=10) receiving royal jelly supplementation.

**Table 1.** Supplement group pre-test and post-test values analysis

| | Mean | SD | t | p |
|---|---|---|---|---|
| AST IU/L | | | | |
| Pre-Test | 24.83 | 9.907 | -0.929 | 0.396 |
| Post test | 40.50 | 41.34 | | |
| ALT U/L | | | | |
| Pre-Test | 28.83 | 17.12 | -0.352 | 0.739 |
| Post test | 32.16 | 21.90 | | |
| CK IU/L | | | | |
| Pre-Test | 366.8 | 221.7 | -2.652 | **0.045** |
| Post test | 190.03 | 156.8 | | |
| Urea mg/dL | | | | |
| Pre-Test | 22.50 | 4.505 | -1.444 | 0.208 |
| Post test | 26.16 | 4.020 | | |

SD: Standard deviation; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; CK: Creatine kinase.

Criteria such as smoking and dependence of the individuals included in the study, not having any disease, and no allergies to honey-derived foods were determined. During the supplementation period, they were told not to eat different foods in their diet and not to go out of daily diet lists. The supplementation group was given liquid royal jelly (n=10/1000 mg/day) supplemented in the vials in the refrigerator at the same time daily for three weeks. The control group was not given any supplementation.

### Blood Test Procedure

Before and after the reinforcement of the individuals who participated in the study, in the biochemistry laboratory of Gaziantep University Faculty of Medicine; in the morning, 5 ml of venous blood samples were taken from the right arm to the yellow capped tube. Blood samples were centrifuged in Nüve-NF800 apparatus at 4000 rpm for a total of 7 minutes. Alanine aminotransferase (ALT), aspartate aminotransferase (AST), urea and creatine kinase (CK) levels were analyzed by spectrophotometric method.

### Statistical Analysis

SPSS 22.0 package program was used for statistical analysis of measured data of supplementation and control group. Paired Sample t-Test was used for the comparison of the pre and post tests of the groups and Independent t-Test was used for the comparison of the two groups. Statistical results were evaluated at $p<0.05$ significance level.

## Results

Statistical analysis of royal jelly supplement given to cigarette addicts is presented in tables as mean and standard deviation (Table 1). Reinforcement group pre-test and post-test values analysis

**Table 2.** Control group pre-test and post-test values analysis

| | Mean | SD | t | p |
|---|---|---|---|---|
| AST IU/L | | | | |
| Pre-Test | 23.16 | 7.305 | -1.040 | 0.346 |
| Post test | 28.50 | 15.79 | | |
| ALT U/L | | | | |
| Pre-Test | 27.33 | 16.39 | -0.428 | 0.686 |
| Post test | 28.50 | 22.44 | | |
| CK IU/L | | | | |
| Pre-Test | 179.6 | 64.29 | -1.115 | 0.327 |
| Post test | 407.6 | 482.7 | | |
| Urea mg/dL | | | | |
| Pre-Test | 28.16 | 4.956 | 0.001 | 1.00 |
| Post test | 28.16 | 5.706 | | |

SD: Standard deviation; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; CK: Creatine kinase.

**Table 3.** Pre-test and post-test analysis between supplement and control groups

| | Mean | SD | t | p |
|---|---|---|---|---|
| AST IU/L | | | | |
| Control | 5.333 | 12.56 | -0.586 | 0.580 |
| Supplement | 15.66 | 41.32 | | |
| ALT U/L | | | | |
| Control | 1.166 | 6.675 | -0.220 | 0.830 |
| Supplement | 3.333 | 23.19 | | |
| CK IU/L | | | | |
| Control | 217.0 | 410.0 | 0.225 | 0.827 |
| Supplement | 176.5 | 163.0 | | |
| Urea mg/dL | | | | |
| Control | -18.50 | 35.10 | 0.288 | 0.779 |
| Supplement | -23.66 | 26.38 | | |

SD: Standard deviation; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; CK: Creatine kinase.

As a result of royal jelly supplement given to nicotine addicts (Table 2); alanine aminotransferase, aspartate aminotransferase and urea levels were not statistically significant ($p>0.05$). The creatine kinase levels of the supplement group were statistically significant in favor of the posttest ($p<0.05$).

There was no statistically significant difference in the levels of (Table 3) alanine aminotransferase, aspartate aminotransferase, urea and creatine kinase in the control group who were non-dependent and not supplemented ($p>0.05$).

There was no statistically significant difference between pre-test and post-test values of supplemented cigarette addict group and control group in alanine aminotransferase, aspartate aminotransferase, urea and creatine kinase levels ($p>0.05$).

## Discussion

Some biochemical responses of systems exposed to the harmful effects of smoking with royal jelly with high nutritional value have been wondered. The effects of royal jelly supplement at 1000 mg/day for three weeks on alanine aminotransferase (ALT), aspartate aminotransferase (AST), urea and creatine kinase (CK) levels were examined and it was determined that royal jelly supplementation significantly changed creatine kinase level.

It has been emphasized that cigarette smoke increases liver enzyme values as a result of changes in the permeability of the liver membranes, and alanine aminotransferase and aspartate aminotransferase may also be common markers of hepatocellular injuries.[21] Liver functions are often impaired by the effects of chemicals, medicines, alcohol and cigarettes that the body is exposed to many times, or by infections. In addition, the liver is constantly responding to the ability to remove harmful molecules taken from the body and to reorganize and repair tissue damage caused by them.[22, 23] It is said that the treatments applied in cell damage are not possible because the liver is the organ where all the foodstuffs and chemicals taken are changed. In this respect, it is seen that natural nutrients have come to the forefront in the treatment of liver organ or tissue, which is deteriorated due to alcohol, excessive nutrition due to nutrition, exposure to chemicals and their damages, poisoning, viral infections, bacterial infectious diseases.[24] In particular, it prevents liver and kidney damage and protects the functions of these organisms in patients receiving intensive antibiotics, receiving radiotherapy and chemotherapy. It is emphasized that royal jelly can be prevented from fatty liver, because it contains plenty of acetyl choline. Bee milk is used in the treatment of chronic hepatopathy, hepatic cirrhosis, gastroduodenal ulcer, chronic constipation, chronic bronchitis of the elderly and atrophic rhinitis, renews the skin tissue, balances keratinization, nutritional, biological stimulating, revitalizing effect has been supported by the studies. It was also emphasized that it provides support for rapid and high-quality recovery after anesthesia during the healing process.[25, 26]

In our study, it was found that while individuals who were given royal jelly supplementation did not affect liver enzyme levels and urea levels, it affected creatine kinase levels. Creatine kinase is a brain-derived enzyme in the heart and skeletal muscle. ATP stores the energy for muscle contraction by catalyzing the passage of a phosphate to creatine.[27] It is said that muscle damage occurs more frequently in individuals who do not do sports with low form, when heavy loads are performed in athletes, when different training programs start to be applied, and with different exercises and exer-

cises with weight exercises.[28–30] It was thought that creatine kinase levels were high in the test results obtained before the supplementation, this level decreased with the addition of supplementary bee and this decrease was caused by the mechanism of action of royal jelly. It is emphasized that royal jelly is an effective natural nutrient source for human metabolism and systems with valuable substances used in the healing process of many diseases and in the removal of tissue damage. Royal jelly produced and collected in the hypopharyngeal and mandibular glands of worker bees for feeding the queen bees; water, protein, sugar (10-16%), fatty acids (3-6%), free amino acids, minerals, (iron and calcium) and vitamins (thiamine, niacin, riboflavin) is a rich source of nutrients.[31, 32] At the same time, when the effects of human studies are examined, royal jelly supplement is mostly used in the treatment of diseases such as bronchial asthma, arteriosclerosis, stomach and intestinal diseases, rheumatismIn addition, it has been reported to have high blood pressure prevention and kidney and urinary tract disorders. Royal jelly as well as mental and physical fatigue, as well as the aging of the skin, the skin is reported to be used effectively against deterioration.[33] In the treatment of many diseases, the use of royal jelly in the daily diet that supports the medical treatment process is reported to increase day by day. It is emphasized that royal jelly is recommended to reduce harmful effects of liver and kidneys and protect these organs from harmful chemicals taken in individuals receiving intensive antibiotics, cancer patients, radiotherapy and chemotherapy. Due to this rich feature, it is stated that the important role of royal jelly in terms of human life and health is increasing gradually.[34]

In the results of working; royal jelly supplementation given to cigarette addicts does not alter alanine aminotransferase (ALT), aspartate aminotransferase (AST) and urea levels, and it positively affects creatine kinase (CK) levels.

**Disclosures**

**Ethics Committee Approval:** The study protocol was approved by Gaziantep University Ethics Committee with 26/04/2017 dated and 311 numbered decision.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

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