



Effect of royal jelly to deal with stress oxidative in preconception women: A literature review[☆]

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ABSTRACT

Introduction: Oxidative stress that occurs in preconception women can disrupt the reproductive system to cause infertility. The antioxidants contained in royal jelly can overcome oxidative stress due to low antioxidants in the body. The purpose of this study is to examine studies of the content of royal jelly, antioxidant activity, and the effectiveness of royal jelly in dealing with oxidative stress in preconception women.

Method: This research method is an electronic database search using keywords according to questions in research from the online library PubMed, content science, and Science Direct.

Result: a study review conducted in 6 research journals stated that the use of royal jelly as a supplement containing 10-hydroxy-2-decanoic (10-HDA) increases glutathione levels, as well as lipid peroxidation inhibitors.

Conclusion: The effectiveness of royal jelly to overcome oxidative stress in preconception women can be assessed from the content of royal jelly and antioxidant activity that can increase the glutathione levels and inhibit increased lipid peroxidation, which is a sign of oxidative stress.

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Introduction

Preconception becomes very important because, at this time, women will prepare themselves before conception occurs. Thus, the fulfillment of nutrition and the mother's psychological condition must be good for giving birth to healthy offspring.¹ Fulfillment of good nutrition during the preconception can reduce the risk of complications at the time of conception that will affect the health of the offspring.² Besides, the state of stress that occurs in women during this preconception also greatly affects the mother's health, which will cause menstrual disorders, PCOS (Polycystic Ovarian Syndrome), and infertility.³ Oxidative stress is a form of stress that occurs due to the body's lack of antioxidants and high free radicals that will cause damage to the cells.⁴

Management of oxidative stress that occurs in preconceived women can be done with non-pharmacological therapy, one of which is royal jelly. Royal jelly is another product of bees produced by thick white bees such as milk secreted from the hypopharyngeal gland and mandibular worker bees as food from the queen bee.⁵ Royal jelly is often referred to as a superfood because it

contains complex nutrients, namely fat, water, carbohydrates, protein, amino acids, sugar, iron, calcium, and vitamins. Additionally, royal jelly also contains flavonoids and phenolic acids, which are part of phenolic as an antioxidant.^{6,7} The complexity of the nutrition content of royal jelly provides pharmacological effects such as antibacterial, anti-tumor, anti-allergic, and anti-inflammatory.⁸

Several studies have been conducted in discussing the chemical structure, content, bioactivity, and antioxidant examination of royal jelly, which can be used as scientific information on the benefits of royal jelly. However, the explanation of the benefits of the information of the royal jelly as a non-pharmacological therapy in preconception women who experience stress is still very minimal. Thus, this literature review aims to provide information about the effect and benefit of royal jelly against oxidative stress in preconception women.

Method

In searching journals in this literature review, using online libraries to look for journals relevant to the content and benefits of royal jelly in overcoming the stress on preconception women in this literature, namely PubMed, ContentSciendo, and ScienceDirect. In the search for related articles based on keywords in questions in the study. Search keywords consist of; royal jelly, stress, oxidative stress, preconception.

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Table 1
Mineral and vitamin content of royal jelly.^{7,10}

Minerals and vitamins	(mg/100 g)
Potassium	200–1000
Magnesium	20–100
Iron	1–11
Zink	0.7–8
Copper	0.33–1.6
B1 (thiamin)	0.1–1.7
B2 (riboflavin)	0.5–2.5
B3 (niacin)	4.5–19
B5 (panthothenic acid)	3.6–23
B6 (pyridoxin)	0.2–5.5
H (BIOTIN)	0.15–0.55
Folic acid	0.01–0.06

Result

The search for articles that have been done by filtering according to research keywords in the last 5 years acquired 25 articles related to the content of royal jelly and oxidative activity. Then do the filtering of the articles again related to the questions in this study so that 6 articles are appropriate.

1. The main content of royal jelly

Based on Table 1, royal jelly contains 50–70% water, 7–18% carbohydrate, 9–18% protein, 3–8% lipids, 1.5% mineral salts, polyphenols, enzymes, hormones, and vitamins. Royal jelly contains bioactive components consisting of peptides, sterols, and fatty acids such as 10-hydroxy-2-decanoic, which effectively reduce ROS (reactive oxygen species) and hydroxyl radicals.⁹

2. Antioxidant in royal jelly

Flavonoid is a form of antioxidant in the royal jelly, divided into flavonoids, flavon, flavonol, and dan isoflavonoid.⁷ The royal jelly contains 23.3 ± 0.92 GAE $\mu\text{g}/\text{mg}$ total of phenolics and 1.28 ± 0.09 RE $\mu\text{g}/\text{mg}$ of total flavonoid.⁶ Pinobanksin and organic acids and their esters, for example, octanoic acid, 2-hexanoic acid, their esters, dodecanoic acid, and their esters, 1,2-benzene dicarboxylic acid, and benzoic acid are the main phenolic compounds contained in royal jelly.¹¹

3. Royal jelly in dealing with oxidative stress in preconception women

The antioxidant content of royal jelly can overcome oxidative stress due to high free radicals in preconception women. In some studies, royal jelly provides significant protection against the liver and kidneys by reducing lipid peroxidation and increasing glutathione (GSH) as an antioxidant.¹² Royal jelly also contains a bioactive component in the form of 10-hydroxy-2-decanoic (10-HDA), which is an anti-inflammatory and can reduce oxidative stress.¹³ Also, royal jelly can increase the growth and development of follicles that secrete estradiol to stimulate the uterus, increase LH (luteinizing hormone) and ovulation.^{14,15} Royal jelly contains MRJP 1, which gives a hypercholesterolemia effect that will affect the inhibition of corticosterone synthesis.¹⁶

Discussion

The six journal articles in Table 2 explained that giving royal jelly as a supplement can have a significant effect in increasing antioxidant levels to reduce oxidative stress that occurs during preconception.¹⁹ Antioxidants usually inhibit ROS production (reactive oxygen species) and bind to free radicals so that they become reactive.¹⁴ The antioxidant effect contained in the royal jelly can maintain the increase in glutathione in the blood, which is the primary antioxidant that functions as a detoxifier and regulates the immune system.²⁰ Glutathione is produced from cells

Table 2
The dose and effect of royal jelly.

Author	Purpose	The dose of royal jelly	The effect of royal jelly
Ghanbari et al. (2016) ¹⁴	To evaluate the effect of royal jelly as an antioxidant and antidiabetic on histopathological alterations of the testicular tissue in streptozotocin (STZ)-induced diabetic rats	100 mg/kg BW for 6 weeks orally	The effect of giving royal jelly can cure testicular disorders due to diabetes through the antioxidant content in royal jelly
Teixeira et al. (2017) ¹⁷	Evaluation of royal jelly in increasing antioxidants by maintaining the glutathione system and reducing corticosterone levels in the nerve tissue of stressed mice	200 mg/kg BW for 14 days	increase antioxidants by rebuilding the glutathione system, reducing lipid peroxidation, and decreasing corticosterone levels by increasing the antioxidant system in the brain
Altay and Alver (2017) ¹⁸	To increase antioxidants by rebuilding the glutathione system, reducing lipid peroxidation, and decreasing corticosterone levels by increasing the antioxidant system in the brain	100 mg/kg, for 30 days by oral	Royal jelly can increase protein carbonyl (PC) and 8-hydroxy-deoxyguanosine (8-OHdG), catalase (CAT), and glutathione (GSH)
Ghanbari et al. (2016) ¹⁹	To evaluate the effects of royal jelly on serum biochemical alterations and oxidative stress status in liver and pancreas of streptozotocin (STZ) rat	100 mg/kg bodyweight for 42 days by oral	Royal jelly can significantly reduce levels of FRAP and CAT as well as high levels of MDA in the liver and pancreas rat
Shidfar et al. (2015) ²⁰	know the effect of royal jelly in increasing antioxidant capacity	1000 mg, 3 times daily for 8 weeks	Royal jelly can increase antioxidant capacity in diabetic patients
Ghanbari et al. (2018) ¹²	The effects of royal jelly on a set of reproductive parameters in immature female rats	100, 200 and 400 mg/kg/body weight daily for 14 days	Royal jelly can increase serum levels of ferric reducing antioxidant power and decrease nitric oxide level

directly involved in neutralizing ROS free radicals and maintaining reduced vitamin C and E as exogenous antioxidants.¹⁸ In other studies, administering royal jelly with certain doses can increase antioxidants in the FRAP (ferric reducing antioxidant power) test and reduce nitric oxidase levels, which can reduce ROS increase by decreasing nitric oxidase levels.¹² Besides, an antioxidant activity that maintains elevated levels of glutathione in royal jelly can reduce the increase in lipid peroxidation, which is a sign of oxidative stress.¹⁷

Conclusion

Based on a journal search, using royal jelly as a supplement to increase antioxidants in the body in overcoming oxidative stress that occurs in preconception women is very effective. Several

laboratory tests have been done to state that royal jelly given to animals increases glutathione levels as the main antioxidant in the body and can suppress increased lipid peroxidation, reducing oxidative stress.

Conflicts of interest

The authors declare no conflict of interest.

References

1. World Health. Meeting to develop a global consensus on preconception care to reduce maternal and childhood mortality and morbidity. WHO Headquarters; 2012. p. 78. Geneva Meet report Geneva.
2. Bigman F. Preconceptions. *TLS – Times Lit Suppl.* 2013;5756:30.
3. Fink G. Stress: definition and history. *Encycl Neurosci.* 2017:549–55.
4. Cihan YB, Ozturk A, Gokalp SS. Protective role of royal jelly against radiation-induced oxidative stress in rats. *UHOD – Uluslararası Hematol Derg.* 2013;23:79–87.
5. Kocot J, Kielczykowska M, Luchowska-Kocot D, Kurzepa J, Musik I, et al. Antioxidant potential of propolis, bee pollen, and royal jelly: possible medical application. *Oxid Med Cell Longev.* 2018.
6. Pasupuleti VR, et al. Honey, propolis, and royal jelly: a comprehensive review of their biological actions and health benefits. *Oxid Med Cell Longev.* 2017. p. 2017.
7. Maghsoudlou A, et al. Royal jelly: chemistry, storage and bioactivities. *J Apic Sci.* 2019;63:17–40.
8. Morita H, et al. Effect of royal jelly ingestion for six months on healthy volunteers. *Nutr J.* 2012;11:1–7.
9. Bogdanov S. Royal jelly, bee brood: composition, health, medicine: a review. *Lipids.* 2011;3:8–19.
10. Abdelnour SA, et al. Useful impacts of royal jelly on reproductive sides, fertility rate and sperm traits of animals. *J Anim Physiol Anim Nutr (Berl).* 2020:1–11. November 2019.
11. Ahmad S, et al. New insights into the biological and pharmaceutical properties of royal jelly. *Int J Mol Sci.* 2020;21.
12. Ghanbari E, et al. Royal jelly promotes ovarian follicles growth and increases steroid hormones in immature rats. *Int J Fertil Steril.* 2018;11:263–9.
13. Pourmoradian S, et al. Effects of royal jelly supplementation on glycemic control and oxidative stress factors in type 2 diabetic female: a randomized clinical trial. *Chin J Integr Med.* 2014;20:347–52.
14. Ghanbari E, Nejati V, Khazaei M. Antioxidant and protective effects of royal jelly on histopathological changes in testis of diabetic rats. *Int J Reprod Biomed.* 2016;14:511–8.
15. Filipič B, et al. The influence of royal jelly and human interferon-alpha (HuIFN- α N3) on proliferation, glutathione level and lipid peroxidation in human colorectal adenocarcinoma cells in vitro. *Arh Hig Rada Toksikol.* 2015;66:269–74.
16. Kashima Y, et al. Identification of a novel hypocholesterolemic protein, major royal jelly protein 1, derived from royal jelly. *PLOS ONE.* 2014;9.
17. Teixeira RR, et al. Royal jelly decreases corticosterone levels and improves the brain antioxidant system in restraint and cold stressed rats. *Neurosci Lett.* 2017;655:179–85.
18. Altay DU, Alver A. The effects of royal jelly on the oxidant-antioxidant system in rats with N-methyl-N-nitrosourea-induced breast cancer. *Turkish J Biochem.* 2018;43.
19. Ghanbari E, Nejati V, Khazaei M. Improvement in serum biochemical alterations and oxidative stress of liver and pancreas following use of royal jelly in streptozotocin-induced diabetic rats. *Cell J.* 2016;18:362–70.
20. Shidfar F, et al. Does supplementation with royal jelly improve oxidative stress and insulin resistance in type 2 diabetic patients? *Iran J Public Health.* 2015;44:797–803.