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Histological Description of the Pancreas and Blood Glucose Levels in DM Mice Exposure to Cigarette Smoke when Using a Herbal Biofilter

Agus Mulyono¹, Mokhamad Tirono²

^{1,2}Department of Physics, State Islamic University of Maulana Malik Ibrahim Malang,
Jl. Gajayana No. 50 Malang 65144

Correspondent Author: gusmul@fis.uin-malang.ac.id

ABSTRACT

Free radicals in cigarette smoke contain compound that are harmful to your health. Diabetics have high levels of oxidative stress due to excessive free radicals and lack of antioxidants, so they need antioxidants for free antioxidants in the body. We show that some herbal biofilters have the ability to scavenge free radicals in cigarette smoke. This is for the immediate effect of exposure. The sample for this study used seven treatment groups that had previously induced diabetes with streptozotocin. Exposure to cigarette smoke was carried out for 3 weeks and blood glucose was checked every week. The mice were then dissected and the histological picture of the pancreas was observed. Statistical results using OneWayAnova show that exposed to cigarette smoke using a biofilter made from herbs affects blood glucose levels and histology in diabetics.

Keywords: Free Radicals, Biofilter, Herbal, Diabetes mellitus, , Pancreatic histology

INTRODUCTION

Cigarettes square measure acquainted to most of the people. There square measure several professionals and cons that debate the matter of intense cigarettes. Cigarettes square measure thought of dangerous for the customers and square measure thought of to be the largest drawback as a result free radicals content which will damage the health of the frame.

Each puff of a cigarette contains large amounts of oxidants including aldehydes, epoxides, peroxides, and other free radicals (Legowo, 2016). In addition to containing oxidants, cigarette smoke can trigger the activity of anti-inflammatory cells to form free radicals indirectly in the body so that the amount of oxidants in the body can exceed the amount of available antioxidants (Rom et al., 2013).

A study states that smoking increases ROS and decreases antioxidants in semen so that a smoker is more susceptible to infertility due to increased production of free radicals in sperm, causing DNA damage and sperm cell apoptosis. Free radicals originating from cigarette gas particles also cause sperm agglutination, resulting in decreased sperm motility (Mohamed et al., 2013).

Smoking and nicotine exposure have an impact on body composition, insulin sensitivity, pancreatic and cell function, and are linked to increased risk of type 2 diabetes (Maddatu et al., 2017). One of the most important, modifiable risk factors for diabetes mellitus is smoking. (Pan et al., 2015). Exposure to cigarette smoke is linked to endothelial dysfunction, vascular injury, and activation of the blood coagulation cascade. (Cacciola et al., 2007), Therefore, it can be argued that smoking and blood glucose elevation accelerate vascular damage in diabetics. a smoker. It is generally accepted that people with type 2 diabetes who smoke are at a much higher risk of microvascular and macrovascular problems (Nelson et al., 2010).

Diabetes mellitus is a disease characterized by blood sugar levels that exceed normal (hyperglycemia) as a result of the body's lack of relative and absolute insulin (Unger & Cherrington, 2012). Lack of responsiveness of the body's cells to insulin or inadequate insulin synthesis by the Langerhans cells of the pancreas can both result in inadequate insulin function (Fujitani, 2017).

This disease is characterized by symptoms including: polyuria, polydipsia, polyphagia, blurred vision, impaired coordination of limb movements, tingling in the hands or feet, very disturbing itching (pruritus), and weight loss (*Diagnosis and Classification of Diabetes Mellitus*, 2013).

In diabetes mellitus it is easy to occur ROS (Reactive oxygen species). ROS are free radicals that are reactive and react with other compounds. In the body, ROS tend to react with tissues which can cause tissue damage. The imbalance in the number of ROS with antioxidants in the body causes oxidative stress. Oxidative stress contributes to impaired islet function and insulin resistance thereby worsening the condition of diabetes (Padgett et al., 2013).

So efforts to reduce free radicals in cigarette smoke need to be done by making biofilters made from herbal plants. Herbal plants as the basic ingredients of cigarette smoke biofilter are expected to reduce cigarettes contain free radicals and can reduce the risk in people with diabetes mellitus.

MATERIALS AND METHODS

Investigation of the impact of openness to tobacco smoke with a biofilter of home grown plant powder on glucose levels and pancreatic histology in mice with diabetes mellitus is a trial study with 7 medicines and 3 replications. The treatment utilized is (Group1) Diabetes Control Without Openness To Tobacco Smoke, (Group2) Diabetes Control Presented to Tobacco Smoke Without Biofilter, (Group3) Diabetes Presented to Tobacco Smoke With Espresso Biofilter, (Group4) Diabetes Presented to Tobacco Smoke With Tobacco Leaf Biofilter, (Group5) Diabetes Presented to Tobacco Smoke With Moringa Leaf Biofilter, (Group6) Diabetes Presented to Tobacco Smoke With Neem Leaf Biofilter, (Group7) Diabetes Presented to Tobacco Smoke With Bidara Leaf Biofilter.

Making a biofilter is finished by blending natural (espresso, tobacco leaf, moringa leaf, neem leaf, bidara leaf) powder with PEG, then mixing with a spatula until homogeneous. The composite was formed with a hose with a width of 0,7 mm and a level of 2 cm, and permitted to dry. In the wake of drying, the composite biofilter was eliminated from the shape and heated at 105 °C for 20 minutes.

In these 7 medicines, testing was completed for 21 days with a volume of smoke of 10 ml for every openness and the organization of tobacco smoke for 15 openings with a timespan minute for every organization of tobacco smoke. Mice were recently prompted by streptozotocin (STZ) at a portion of 30mg/kgBW to foster DM. The means in this examination are as per the following:

1. Experimental creatures are placed into confines.
2. The biofilter is appended to the foundation of the cigarette.
3. Installed a 10 ml hose and needle for tobacco smoke
4. Cigarettes were singed and tobacco smoke was presented to exploratory creatures for 15 times with an interval of 1minute.

Blood glucose level and the histology of the pancreas were evaluated for the sample of experimental animals as follows:

1. Blood glucose level were measured day 7, day 14 and day 21.
2. Neck dislocation was perform in experimental animals to avoid stressful conditions
3. Organ removal from the pancreas for histological observation

RESULTS AND DISCUSSION

Impact of Tobacco Smoke Openness with home grown Powdered Biofilter for Blood Glucose Level in *Mus musculus*.

Blood glucose levels of rats were measured from day 4 of streptozotocin (STZ) injection, after which they were treated with cigarette smoke for 21 days with or without a biofilter. Determine the immune system status of mice. To measure blood glucose levels, rub the rat's tail with a cotton swab soaked in alcohol, cut off a small part of the tip, and gently pull it off. Touch a drop of blood to the test strip attached to the blood glucose meter (Roche) to cover the test strips reagent surface and read the level of blood glucose within 0,43 minute.

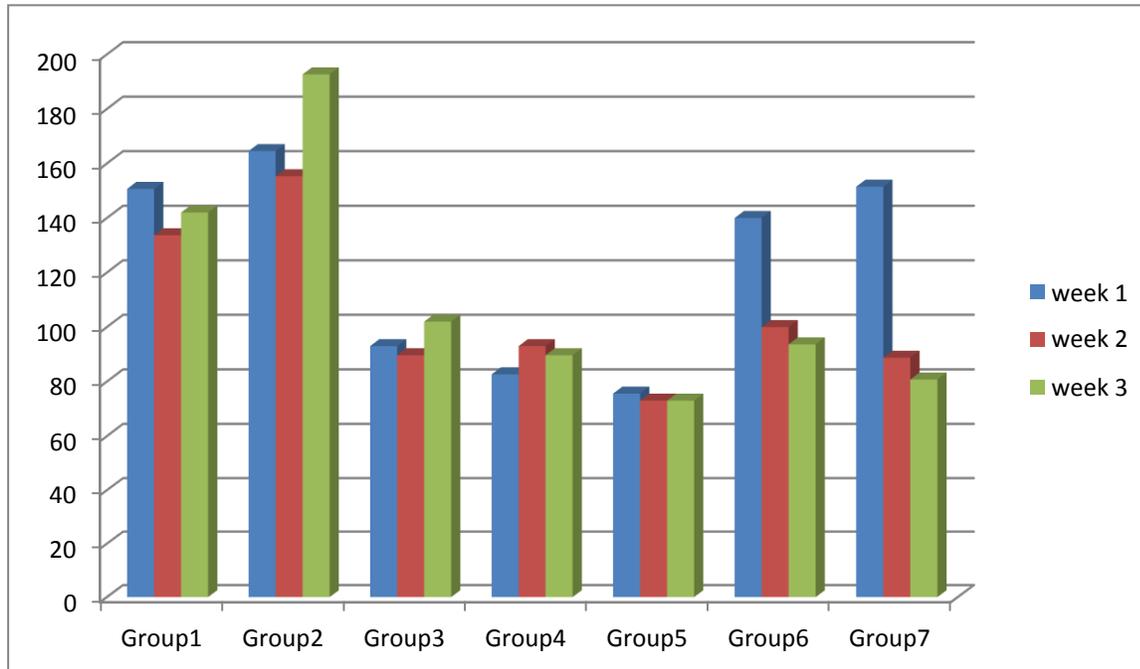


Fig. 1 Mice blood glucose information from 7 treatments

Group1: Diabetes Control sans Openness To Tobacco Smoke

Group2: Diabetes Control Presented to Tobacco Smoke sans Biofilter

Group3: Diabetes Presented to Tobacco Smoke With Coffee Biofilter

Group4: Diabetes Presented to Tobacco Smoke With Tobacco Leaf Biofilter

Group5: Diabetes Presented to Tobacco Smoke With Moringa Leaf Biofilter

Group6: Diabetes Presented to Tobacco Smoke With Neem Leaf Biofilter

Group7: Diabetes Presented to Tobacco Smoke With Bidara Leaf Biofilter

Figure 1 shows that there are differences in blood glucose levels in each treatment group from week 1 to week 3 after exposure to cigarette smoke. In the group treated with herbal plant biofilters (coffee, tobacco, Moringa, neem, bidara) the most prominent graphic decrease was in the Moringa biofilter group with an average value of 75.6 mg/dl in the first week, 73 mg/dl in the second week, and 73 mg/dl at week three.

The consequences of factual tests utilizing Anova showed that there was an impact of openness to tobacco smoke with a biofilter produced using home grown plants on the glucose level of mice (*Mus musculus*) diabetes mellitus with an importance worth of 0.00.

Table 1. One way Anova investigation of blood glucose level information

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	20052.844	6	3342.14	10.1	.000
Within Groups	4273.379	13	328.72	67	
Total	24326.23	19	1		

Clove smoke contains seven free radicals that can be detected by the Leybold Haracus ESR (Electron Spin Resonance): hydroperoxides, CO₂·, C, peroxy, O₂, CuGOx, and CuGeO₃ (Mulyono & Muthmainnah, 2016). Free radicals are produced by the incomplete combustion of kretek cigarette smoke. Free radicals are reactive (unstable) compounds due to the absence of electron pairs in the outer shell, attacking other compounds, including cells in the body, to stabilize free radicals.

Biofilters function freely by providing free external electrons, so free ones are non-reactive, and antioxidants are stable because they have a stable group, and they are stable in the body such as pancreatic cells. Keeps your cells and organs safe without damage from free radicals (Zhu et al., 2012).

Hyperglycemia conditions can induce the formation of free radicals such as superoxide, hydrogen peroxide, nitric oxide, and hydroxyl radicals. Free radicals can cause damage to the insulin-producing pancreatic beta cells. Insulin is a facilitator of glucose entry into cells and tissues, so that if insulin is disturbed, glucose cannot enter cells and tissues but accumulates in the blood, resulting in an increase in blood glucose levels or hyperglycemia (Soviana et al., 2014).

In cigarette smoke that has been given a biofilter, the free radicals contained in cigarette smoke will be filtered, captured and controlled when the smoke passes through the filter. Cigarettes that do not use a biofilter produce cigarette smoke that looks cloudy and blackish white, while cigarettes that have been filtered with a biofilter of cigarette smoke appear clear white with a distinctive aroma.

Effects of Cigarette Smoke Exposure with Herbal Leaf Powder Biofilter on Histological Pancreas of Mice (*Mus musculus*).

Histological testing of the pancreas was carried out by looking at the pancreatic organ preparations using a digital microscope with a magnification of 400X. To see the level of damage to the pancreas organ, it can be done by counting pancreatic cells in the islets of Langerhans and measuring the diameter of the islets of Langerhans by drawing horizontal and vertical lines at the ends of the islands, so that the average is obtained from the islets of Langerhans.

Histological observation of pancreatic tissue were performed on paraffin blocks using a hematoxylin-eosin staining procedure. Islets of Langerhans are a collection of endocrine glands scattered throughout the pancreas, shaped like islands and traversed by capillaries. On HE staining, islets of Langerhans are thinner than the surrounding acinar cells, making it easier to distinguish the islets of Langerhans. DM patients experience morphological change in both the number and size of the islets of Langerhans (Ridwan et al., 2012).

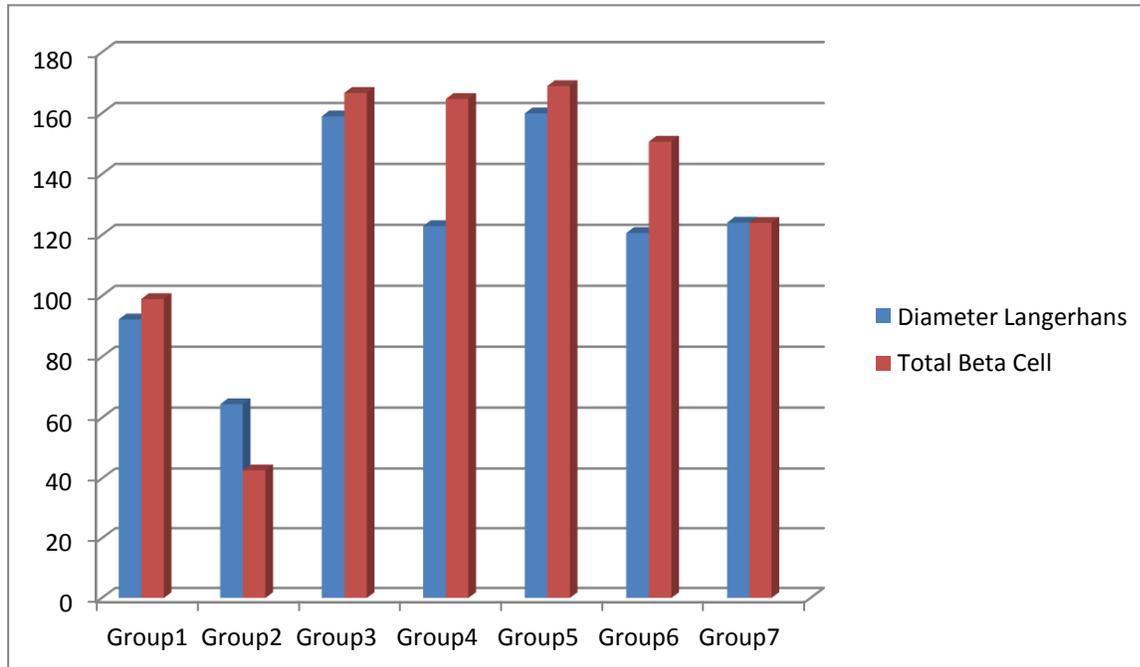


Fig. 2 Levels of Pancreatic Histology Damage from 7 treatments

Figure 2 shows that the treatment group with herbal plant biofilters had smaller pancreatic histology damage (larger Langerhans diameter and more beta cells) than the group without the use of biofilter.

Chronic hyperglycemia is the main catalyst for various microvascular complications in diabetes such as retinopathy, neuropathy and nephropathy. High blood sugar increases oxidative stress through enzymatic and nonenzymatic processes. In the enzymatic process there will be changes in protein function such as NADPH oxidase so that it disrupts and damages cell function and causes reactive oxygen intermediates that can oxidize LDL, while non-enzymatic processes will change gene expression (growth factors and cytokines) and disrupt antioxidant defenses (increase oxidative stress). which leads to damage to beta cell function (Safi et al., 2014).

Patients with diabetes mellitus will experience oxidative stress and the formation of peroxide free radicals. Peroxide free radicals will attack the essential substance of pancreatic beta cells and initiate pancreatic beta cell damage, resulting in a decrease in insulin secretion by pancreatic beta cells (Rochette et al., 2014). Research results of exposure to cigarette smoke with biofilters of herbal plant powders showed a relationship between increased blood glucose levels and pancreatic histological damage (see fig 3), several treatments showed that there was a relationship between glucose levels and the level of pancreatic damage. If glucose levels are high, degree of pancreatic damage is also high. Free radicals in cigarette smoke can damage cells in the pancreas. Damage DNA and also reduce mitochondrial oxygen levels, resulting in oxygen deficiency and impaired cappotential to provide insulin.

Free radicals in cigarette smoke will be neutralized by using a biofilter. The antioxidant component of the biofilter material can stabilizes free radicals by donating external electrons to them, so the free radicals no longer react and the antioxidant remains stable.

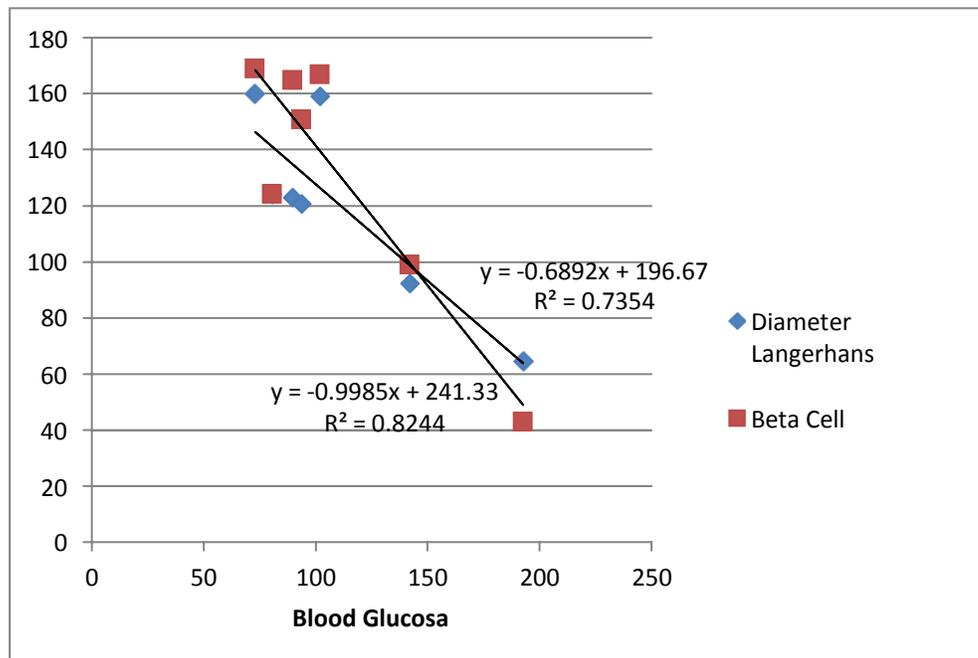


Fig 3. Relationship between blood glucose levels and pancreatic damage (Langerhans diameter)

CONCLUSION

From the consequences of the review, it was reasoned that the utilization of natural plant biofilters affected blood glucose level and pancreatic histology in diabetic mice. Blood glucose levels of diabetes mellitus mice diminished after openness to tobacco smoke with home grown/herbal plant biofilters and the quantity of beta cells and the width of the islets of Langerhans utilizing a biofilter were more noteworthy than those of Diabetes Mellitus mice without a biofilter.

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ETHICAL APPROVAL

This review and the exploratory techniques in involving creatures were all directed as per the creature care rules of the State Islamic University of Maulana Malik Ibrahim Malang, Indonesia.

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