

THE EFFECTIVENESS OF PLATELET-RICH PLASMA ON LIPID PROFILE CHANGES IN STREPTOZOTOCIN-INDUCED DIABETIC RATS

dr. Linda Chiuman, M.K.M (NIDN: 0120068803)

ABSTRACT

Diabetes mellitus is a metabolic disease caused by pancreas inability to produce insulin. Platelet Rich Plasma is widely used to treat various disease as it contains many growth factors (GFs) which are useful for triggering cell growth and regeneration. This study was conducted to determine the effectiveness of PRP at doses of 0.5, 1.0, and 1.5 ml/kg BW on lipid profiles improvement. The PRP went through two centrifugation processes before given to the subjects. The PRP was given to each group twice a week for three weeks. Shapiro-Wilk test was used for normally distributed data, followed by the Kruskal- Wallis and Mann-Whitney test. The tests results a significant value of $P < 0.05$, showing that there was an effect of PRP administration on lipid profiles improvement. Dose of 0.5 ml/kg BW of PRP is effective in increasing the lipid profile except the HDL levels, thus a higher dose of PRP is needed to significantly increase the HDL levels.

Keywords: Diabetes Mellitus, Platelet Rich Plasma, Lipid Profile.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder in the body characterized by hyperglycemia and insulin secretion abnormality. WHO predicts the prevalence of diabetes in Indonesia will increase from 8.4 million in 2000 to 21.3 million in 2030, while IDF estimates that the prevalence of diabetes will increase from 7.0 million in 2009 to 12 million in 2030. Platelet Rich-Plasma (PRP) is a product produced from fresh whole blood which contains components of red blood cells, white blood cells, platelets, and plasma. The plasma itself contains organic and inorganic molecules and ions.

METHODS

PRP PREPARATION

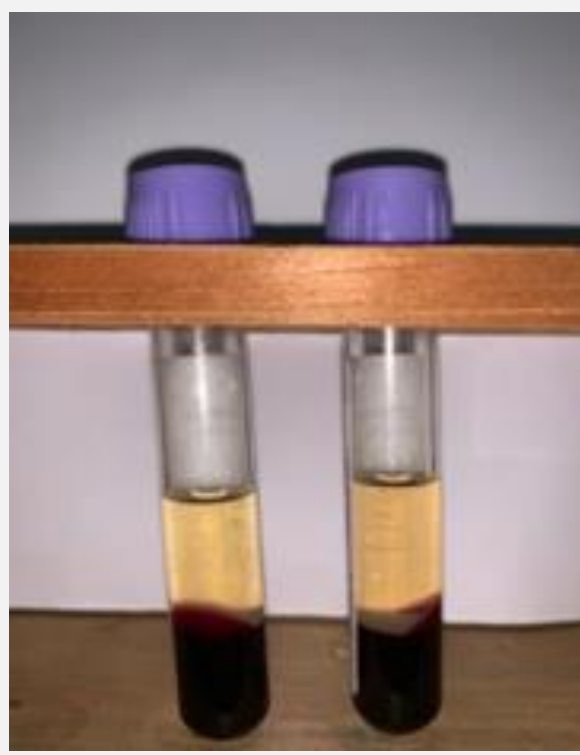
1. Sedate healthy rats with chloroform, collect the blood from the puncture on the heart.
2. Inject 3 ml of the blood into a tube with EDTA anticoagulant.
3. Perform the first centrifugation at 1600 rpm for 10 minutes, until it results in 3 compartments: erythrocytes, buffy coat layer, and plasma.
4. Take out the plasma from the tube without touching the buffycoat.
5. Perform another centrifugation at 2000 rpm for 10 minutes, until forming 2 compartments: PPP and PRP.
6. Take out the PRP, mix with CaCl_2 .
7. Discard the CaCl_2 precipitations.
8. Store the remaining PRP in the freezer for later use.

PRP ADMINISTRATION

1. Mix the PRP with Phosphate-Buffer Saline with a ratio of 1: 1 to activate the growth factors in the PRP.
2. Inject the activated PRP subcutaneously to the subjects.

SERUM MAKING

1. Sedate subjects with chloroform and collect subjects' blood using a syringe through a puncture in the heart.
2. Inject the blood to a tube without anticoagulant, centrifuge at speed of 1600 rpm for 10 minutes.
3. Take out the serum on the upper part of the tube, inject to the microtube.



RESULTS

DISCUSSION

The body uses fat as a source of energy. People with abnormal blood lipid levels are at risk for various diseases, such as cardiovascular disease, pancreatitis, diabetes, and other health problems. Based on the results of this study, it is proven that the administration of PRP at a dose of 1.5 ml / kg BW is more effective in decreasing lipid profiles levels because the components of the growth factors in PRP perform tissue regeneration in the pancreas, restoring its function. The results of this study are in line with research by El Tahawy et al., in 2017 using PRP against Streptozotocin induction. Subcutaneous injection of 0.5ml PRP twice a week for three weeks is proven to regenerate and stimulate ductal cells, acinar and exocrine glands in the pancreas.

CONCLUSION

PRP of dose 0.5 ml / kg BW dose had a significant effect on improving lipid profiles except HDL levels compared with the control group and did not show a significant difference when compared to other groups. However, a higher PRP dose was required to significantly increase HDL levels compared to the control group.

REFERENCES

1. El Tahawy, N. F. et al. (2017) 'Effect of Platelet Rich Plasma (PRP) Injection on the Endocrine Pancreas of the Experimentally Induced Diabetes in Male Albino Rats: A Histological and Immunohistochemical Study', *Journal of Diabetes & Metabolism*, 08(03). doi:10.4172/2155-6156.1000730.
2. Hidayati, D., Setyorini, D. and Afrian Nuari, N. (2018) 'Differences Complications During Perinatal in History of Women With Diabetes Mellitus and Obesity Gestational', 9(2), pp.148–160.
3. Islam, I. H. M. ., Rania, N. A. M. . and Marwa, M. A. M. . (2019) 'Effect of Platelet Rich Plasma on an Experimental Rat Model of Adriamycin Induced Chronic Kidney Disease', *The Medical Journal of Cairo University*, 87(June), pp. 2207–2217. doi:10.21608/mjcu.2019.54382.
4. Karina et al, 2019 (2019) 'Jurnal Riset Biologi dan Aplikasinya', 1(1), pp. 18–25.
5. World Health Organization (2016) 'Global Report on Diabetes', ISBN, 978, p. 88. doi:ISBN 978 92 4 156525 7.

Treatment Groups	Tryglyceride Level		Total Cholesterol		HDL		LDL	
	Median	Range	Median	Range	Mean	SD	Median	Range
Normal	76.00 ^c	44.00	138.00 ^c	31.00	69.60 ^c	9.76	51.00 ^c	26.00
Standard	88.00 ^c	57.00	129.00 ^c	13.00	70.60 ^c	1.67	42.00 ^c	51.00
Control	125.00 ^{ab}	19.00	198.00 ^{ab}	53.00	34.20 ^{ab}	2.59	129.00 ^{ab}	21.00
PRP 0.5 ml/kgBW	81.00 ^c	31.00	118.00 ^c	34.00	46.00 ^{ab}	7.48	60.00 ^c	27.00
PRP 1.0 ml/kgBW	83.00 ^c	44.00	135.00 ^c	35.00	67.40 ^c	19.51	65.00 ^c	36.00
PRP 1.5 ml/kgBW	82.00 ^c	58.00	130.00 ^c	15.00	67.00 ^c	17.00	63.00 ^c	43.00
P Value	0.027		0.013		< 0.05		0.009	

Note: ^a there is a significant difference with the normal group; ^b there is a significant difference with the standard group; ^c there is a significant difference with the control group.



REPUBLIK INDONESIA
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA

SURAT PENCATATAN CIPTAAN

Dalam rangka perlindungan ciptaan di bidang ilmu pengetahuan, seni dan sastra berdasarkan Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta, dengan ini menerangkan:

Nomor dan tanggal permohonan : EC00202120447, 19 April 2021

Pencipta

Nama : **dr. Linda Chiuman, M.KM**
Alamat : Jalan S.Parman No. 83 A, Medan, SUMATERA UTARA, 20111
Kewarganegaraan : Indonesia

Pemegang Hak Cipta

Nama : **Universitas Prima Indonesia**
Alamat : Jalan Danau Singkarak Gang Madrasah, Medan, SUMATERA UTARA, 20117
Kewarganegaraan : Indonesia
Jenis Ciptaan : **Poster**
Judul Ciptaan : **The Effectiveness Of Platelet-Rich Plasma On Lipid Profile Changes In Streptozotocin-Induced Diabetic Rats**

Tanggal dan tempat diumumkan untuk pertama kali : 19 April 2021, di Medan
di wilayah Indonesia atau di luar wilayah Indonesia

Jangka waktu perlindungan : Berlaku selama 50 (lima puluh) tahun sejak Ciptaan tersebut pertama kali dilakukan Pengumuman.

Nomor pencatatan : 000247921

adalah benar berdasarkan keterangan yang diberikan oleh Pemohon.

Surat Pencatatan Hak Cipta atau produk Hak terkait ini sesuai dengan Pasal 72 Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta.



a.n. MENTERI HUKUM DAN HAK ASASI MANUSIA
DIREKTUR JENDERAL KEKAYAAN INTELEKTUAL

Dr. Freddy Harris, S.H., LL.M., ACCS.
NIP. 196611181994031001

Disclaimer:

Dalam hal pemohon memberikan keterangan tidak sesuai dengan surat pernyataan, menteri berwenang untuk mencabut surat pencatatan permohonan.