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Efektifitas Penggunaan Platelet Agitator Terhadap Jumlah Trombosit di UTD PMI Kota Surabaya

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ABSTRACT

During storage, the metabolic activity of platelets and residual leukocytes continues to consume nutrients and produce harmful metabolic products. Activation of clotting factors, cellular debris, and proteolytic enzymes found in the plasma suspension had an adverse effect on platelets. Many structural changes in the platelet cytoskeleton and antigens on the surface membrane during storage are associated with poor recovery and survival post-transfusion in vivo. In vitro tests used to assess changes in platelets are generally only platelet count, concentrate volume, pH for 5 days, and leukocytes. Platelet components must be stored in a Platelet Agitator with a storage temperature of 22ºC ±2ºC. This research was conducted at UTD PMI Surabaya City. To see the effectiveness of the platelet component storage in the Platelet Agitator. Based on the results of internal quality tests for TC products at UTD PMI Surabaya City in 2019 from 30 blood bags. This research was carried out for 3 months in January - April 2019. The results of the study: Platelet levels increased in good quality in blood component products. Platelets as many as 15 blood bags (100%) and decreased quality of platelet levels which were not good before using the platelet agitator tool for 6 blood bags (40%). Conclusion: Platelet levels after using the platelet agitator device, there were 15 blood bags (100%) that met the specifications.

ABSTRAK

Selama penyimpanan, aktivitas metabolic dari trombosit dan residual leukosit berlanjut untuk mengkonsumsi nutrient dan menghasilkan produk metabolik yang berbahaya. Aktivasi faktor pembekuan, celular debris, dan enzim proteolitik ditemukan dalam plasma suspensi yang berefek kurang baik terhadap trombosit. Banyak perubahan structural pada sitoskeleton trombosit dan antigen di membrane permukaan selama penyimpanan dan berhubungan dengan buruknya recovery dan survival post transfusi in vivo. Tes in vitro yang digunakan untuk menilai perubahan pada trombosit umumnya hanya jumlah trombosit, volume konsentrat, pH selama 5 hari, dan leukosit. Komponen Trombosit harus disimpan pada Platelet Agitator dengan suhu penyimpanan 22ºC ± 2ºC. Penelitian ini dilaksanakan di UTD PMI Kota Surabaya. Untuk melihat efektifitas penyimpanan komponen Trombosit pada Platelet Agitator. Berdasarkan hasil uji mutu internal untuk produk TC di UTD PMI Kota Surabaya pada tahun 2019 dari 30 kantong darah. Penelitian ini dilaksanakan selama 3 bulan pada bulan Januari – April 2019. Hasil penelitian : Kadar Trombosit mengalami kenaikan kualitas baik pada produk komponen darah Trombosit sebanyak 15 kantong darah (100%) dan mengalami penurunan kualitas kadar trombosit kurang baik sebelum menggunakan alat platelet agitator sebanyak 6 kantong darah (40%). Kesimpulan :Kadar Trombosit setelah menggunakan alat platelet agitator terdapat 15 kantong darah (100%) yang memenuhi spesifikasi.

Kata Kunci : Trmbosit Konsentrat (TC), Platetelet agitator

Background

The structure of platelets contains proteins on the surface that are useful for the attachment of platelets to the walls of blood vessels. These proteins have similarities with proteins in muscle, which can change shape when subjected to certain situations. Platelets also contain granules 7 which can secrete other proteins needed for strengthening damaged blood vessels. Platelet function is related to defense, but not against foreign objects or cells. Platelets have an important function in the body's efforts to maintain tissue integrity in the event of an injury. Platelets participate in the effort to close the wound, so the body does not experience blood loss.

When the platelets come into contact with the damaged vessel surface, the platelets will be activated. Platelets begin to swell, are irregular in shape with bumps protruding from their surface; Contractile proteins contract strongly and cause the release of granules containing various active factors, platelets become sticky so that they adhere to damaged blood vessels, 8 secrete large amounts of ADP and its enzymes form thromboxane A2, which is also secreted in the blood. ADP and thromboxane then cause platelet aggregation to the activated site. Thus, any injury or damage to the vessel wall will cause a cycle of activation of the platelets whose numbers continue to increase which causes them to attract more additional platelets, thus forming a platelet plug.

Processing of blood components is an effort to increase the effectiveness and efficiency of blood transfusions. Giving blood components increases the safety of transfusion because only blood components that are really needed will be received by the patient, so that transfusion reactions can be reduced the likelihood. Thus, the transfusion becomes more effective with the processing of components from one bag of whole blood can produce two to four types of blood components such as concentrated red blood cells, plasma, Anti-Hemophilic Factors (AHF) and concentrated platelets. Blood components provide clinicians with a treatment option in treating patients who respond better to blood components than to whole blood or when it is necessary to minimize transfusion volume.

Methode

This research was conducted at UTD PMI Surabaya City. To see the effectiveness of the platelet component storage in the Platelet Agitator. Based on the results of internal quality tests

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for TC products at UTD PMI Surabaya City in 2019 from 30 blood bags. This research was conducted for 3 months from January to April 2019.

Result And Discussion

Tabel 1.Cross tabulation of platelet levels before and after using a platelet agitator at UTD PMI Surabaya City.

Platelet Agitator / QC product		Before use Platelet agitator		After use Platelet Agitator	
No.		Frekuensi	(%)	Frekuensi	(%)
1	Pass Spesification	9	60	15	100
2	Not pass spesification	6	40	0	0
Total		15	100	15	100

Based on Table 1, the cross distribution of the frequency of platelet levels increased in good quality in blood component products. Platelets were 15 blood bags (100%) and decreased quality of platelet levels were not good before using the platelet agitator device as many as 6 blood bags (40%).

The process of aggregation of platelets will take place if the activation and stimulation of platelets is sufficient. In the early aggregation phase, platelets are oval in shape with pseudopods. This initial aggregation is due to the ADP, fibrinogen, and calcium secreted from the granules. On the surface of the platelets, there are glycoprotein IIb/IIIa that can bind to extracellular calcium. Then, fibrinogen will bind to the calcium-glycoprotein IIb/III complex and form a bridge-like bond. This binding will facilitate platelet aggregation in the early phase. This process is called primary/reversible aggregation, because aggregation can still return. In secondary aggregation, the role of ADP, serotonin, and epinephrine is very large. This advanced phase is irreversible.

The temperature factor during storage also plays a role in maintaining the quality of platelets during storage. The optimal temperature for platelet storage is about 20ºC-24ºC with continuous gentle agitation. Temperatures that are cooler than this optimal temperature can slow the growth of contaminant bacteria, but can cause structural changes in platelets to become spherical and activate platelets. These structural changes are evidence of permanent damage to the platelets caused by the release of calcium ions from the platelets, or the influx

of calcium into the platelet membrane which causes actin filaments to move and activate the platelets. These changes are common in platelets being transported at temperatures below 20ºC for a short duration (24 hours). In addition to premature activation, lower temperatures can lead to early phagocytosis by macrophages in the liver, resulting in a much shorter lifespan for circulating platelets.

During storage, the metabolic activity of platelets and residual leukocytes continues to consume nutrients and produce harmful metabolic products. Activation of clotting factors, cellular debris, and proteolytic enzymes found in the plasma suspension had an adverse effect on platelets. Many structural changes in the platelet cytoskeleton and antigens on the surface membrane during storage are associated with poor recovery and survival post-transfusion in vivo. In vitro tests used to assess changes in platelets are generally only platelet count, concentrate volume, pH for 5 days, and leukocytes.

Concentrated platelets treated using the PRP method is considered an effective treatment that has the highest platelet count compared to whole blood transfusion. Platelet activation can result in the release of granule contents, cytokines and other factors during preparation and storage of platelets that can cause a non-haemolytic transfusion fever reaction (FNHTR) in transfusion. Activation can also affect platelet metabolism, platelet function and platelet morphology. Upon activation, platelets release a group of biologically active proteins that then activate cellular recruitment, growth, and morphogenesis, and modulate the inflammatory response. The platelet activation rate was significantly higher in PRP platelets than in BCR.

To prevent the activation of platelets, the stored platelets are placed in an agitator in an incubator that can keep the platelets from being activated. Agitator is a storage place for platelets that is maintained by agitation or shaking at a certain speed to keep platelets from being activated.

Conclusion

Platelet levels before using the platelet agitator, there were 9 bags of good blood components (60%) and 6 bags of blood (40%). Platelet levels after using the platelet agitator device, there were 15 blood bags (100%) of good quality. There is an effectiveness of the use of a platelet agitator on platelet levels in UTD PMI Surabaya City.

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