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An In-Vitro Study on the Effect of Haemolysis in the Rbc's Treated with Polyvinyl Alcohol (Pvoh)

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ABSTRACT

Microplastics have created a havoc in ecosystem.With the complexity that is included in making plastic products, the degradability of the said goes for a toss.In the context of plastics being found in water table to presence in the placenta has baffled not just the scientific community but also common man.Humans went ahead and searched for new options the water soluble plastics.These water soluble plastics came in with a big problem.Before they could degrade completely they entered the ecosystem.Dearth of data available on water soluble plastics in making it a new mystery.The impacts of these newly invented product on the environment,organisms is still unknown.In recent times,the idea of using polyvinyl alcohol has become very adamant with various invention using it as a drug delivery system,wound healing patches etc.There are no noted side effects yet if consumed orally but very less data available if entered into blood stream. The target of this study was to evaluate the haemolysis of RBCs treated by PVOH in vitro. Study has two main stages including sampling, preparation of PVOH suspension and haemolysis test. When 1 drop of RBC suspensions were treated for 60 min at room temperature with 0.1% to 1.0% PV (OH), they exhibited a significant level of haemolysis.

Keyword: *Erythrocytosis, Haemolysis, RBC, Water Soluble Plastics, Polyvinyl Alcohol, Human, Microplastics, Nano Plastics*

1. INTRODUCTION

Microplastics and nano plastics (<5mm) are created when there is weathering process on a larger product of plastic. In the stretch of 60 years plastics have evolved and those have found ways into the ecosystem. Plastics which are made with a combination of materials like plasticizers, flame retardants, antioxidants etc.[1] The said finished plastic products when discarded responsibly the processes like thermal degradation, photo-oxidation and hydrolytic degradation can be used. These methods are known to cause more harmful effects on the environment.[2] MNPs- complex molecules find their way in micro and nano sizes in varied ecosystems. The use of materials like textiles, tires etc which are used daily in the mortal world; the usage of these products cause these micro and nano particle release. There is still a lack of technology to prevent or even remediate the side effects caused. Microplastics and nano plastics are now in to food systems. Already evidences of them reaching the marine habitats and accumulating in those environments have caused a big concern. There is a dearth of technology to quantify these plastics. [3] Even if any technology were to be invented the quantification can create a cease to these efforts.

Currently, the toxicity data on MNPs is unclear and the further idea that inflammation caused in case of cardiovascular events and a potential increase in risk can be seen. Furthermore, presence of MNPs in placenta, lungs, intestine has been evident of the ongoing damage from these molecules.[4] The world is being fed with microplastics and various plastic products in a form efficient items like cosmetics, home products etc. [5]With very little opportunity for sustainability and these products being highly affordable they find their ways in to every household. The sewages are filled with these and they find their way to the ocean. Even if these products are now not distinct to the naked eye they're mere presence in the ecosystem is very little studied. Humongous volumes of plastic waste being dumped in to the ecosystem. [1] With very little knowledge in the masses regarding the biodegradability and harmful effects of the dumping of plastics where these molecules remain until the said molecule completes their lifetime. The presence of those molecules can be seen even in arctic due to circulation of waters in rivers as well as oceans. The lack of technology to investigate nano plastics have created a new question- Does really plastic degrade or any role elsewhere?

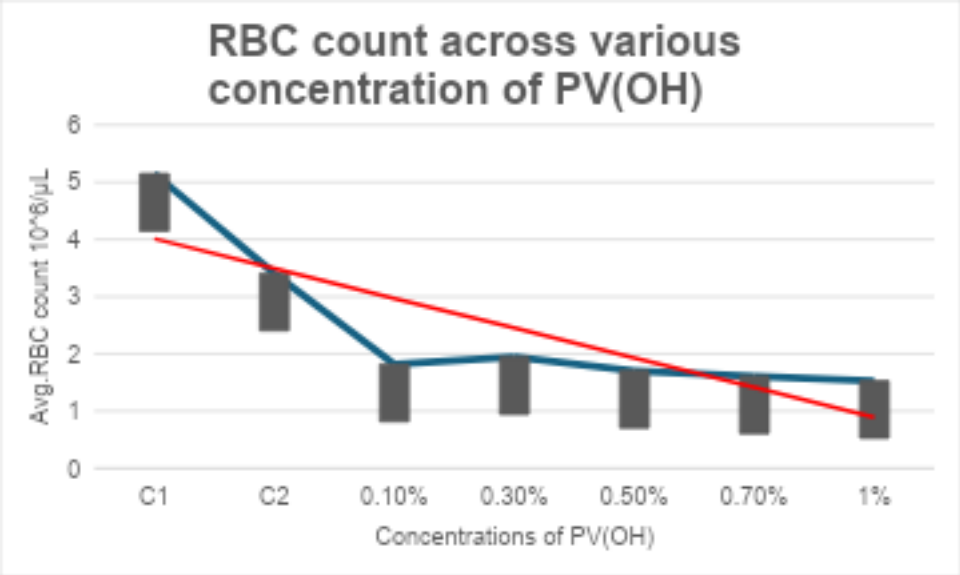
The alternatives to plastics have been in the circles for quiet some time. The biodegradable plastics! The focus here is the production and waste management. Emergence of bioplastics and biobased plastics have made the alternative raw materials list. Current scenario is now questioning the ill-effects of this biodegradable plastics as not all of them are degradable even being bioplastics. [7] The data unavailability of these new molecules have created a new threat

2. METHODOLOGY

Polyvinyl alcohol (HiMedia, GRM6170) was used.Blood was collected in EDTA vacutainers of 10 consented Male adults between the age of 20 to 30 years. The Males were confirmed to be healthy and currently under no medications or suffering from any diseases. The collected was in 7 vials 2mL each. Collected blood was treated for 60 mins at RT with 0.1% to 1.0% concentrations of PV (OH) using Rao *et al.*, 2011 and Mesdaghinia *et al*, 2019 with minor changes. The number of RBC's were noted down with respective to concentrations.

3. RESULTS

The vials treated with polyvinyl alcohol for 60 mins show significant decrease in RBC values as compare to C2.There is a constancy at 0.7% and 1.0% concentrations. The C1 is untreated vial which shows actual number of RBC at time t=60 mins.



C1	C2	1	2	3	4	5
Blood	Blood +DW	0.1% PV(OH)	0.3% PV(OH)	0.5% PV(OH)	0.7% PV(OH)	1.0% PV(OH)
Fig:-1 Vacutainer contents at time t=0						

4. CONCLUSION

The vials of PV(OH) were compared with C2 vials as it had Distilled water.As distilled water might dilute the numeral of RBCs under analysis. The inference of the C1 vials suggest all the individuals were healthy. There is a decrease in the number of RBCs in the series. 0.7% and 1.0% shows a stability in values stating that after 0.7% of concentrations the values might be similar.

Poly vinyl alcohol is a synthetic polymer made as an alternative to non-biodegradable plastics. Mere it being biodegradable and can easily replace the plastics in various products have now been used widely. Currently being used in water soluble dyes, detergents [10] used in the cement industry as a pre-treatment agent[11] .Due to its low gas permeability ,this PVA is now a promising candidate for food packaging.[12] Also, being used in soft contact lenses, eyedrops, tissue adhesion barriers, artificial cartilage etc.[13] These molecules were found to be harming and malformations were observed in *Xenopus* and *Danio* even if considered non-toxic .[14] Experiment conducted by Reviere *et.al.*(1980) on Beagles to create a model for glomerulonephritis; inferred that there was a measurable decrease in blood and urine constituents suggesting measurable

changes in dogs.[15]

Generation of waste water from households using PV (OH) laden products initiate their way into the seawage water treatment plants, but as there are no ways to identify the said degraded product. Around 3500 mtu/yr is sequestered in agricultural soils in the US. As PVA has a byproduct ethylene which can affect the crops.[16]

In a study conducted on human cervicovaginal mucus.In PVA coating could not be adequately removed and the said suggested for an alternative.[17] Hence, the common routes of exposure of microplastics being ingestion contaminated food and water, and utensils are the origins. The potentiality of bioaccumulation outweighs the benefits of MNPs functionality.[18,19,20,21] PVA being an irritant is also evident.[22]

It is evident that PVA can replace the non-degradable plastics but at the cost of human health and environmental health. Further study is needed to determine more alternatives and the role what may PVA play in environment currently as they have already been resident to us.

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