Evaluation of Antihyperlipidemic Activity of Polyherbal Capsules

Soujanya H, Purushothaman M, Jagadeeshwari S, Shiva Kumar K

Department of Pharmaceutics, Scient Institute of Pharmacy, Ibrahimpatnam, Hyderabad-501506, Telangana, India

**Article History:**
- Received on: 06 Sep 2018
- Revised on: 08 Oct 2018
- Accepted on: 18 Nov 2018
- Published on: 28 Dec 2018

**Keywords:**
Herbal Microspheres, Psidium, high fat diet

**ABSTRACT**
Hypercholesterolemia is one of the dreadful conditions that coexist in almost all the heart and endocrine-related dysfunctions. Simply elevated cholesterol levels in the blood is termed as hypercholesterolemia. Hyperlipidemia is also a synonym term and used to define elevated lipid levels. It affects almost all human beings in the world currently because of the changes in the food and living habits of the people. Most works proved those chemical constituents are antioxidants that demonstrate that the assertion that the oxidation is the main problem in causing the hyperlipidemia. So, in this research, antioxidant herbs like Psidium guava, Tephrosia and Moringa are used to prepare a gel that targets the fat deposits in the body and investigate for the antihyperlipidemic property. Herbal microspheres were prepared using the extracts of Tephrosia, Moringa and Psidium, which are incorporated into the sodium alginate and calcium carbonate. These microspheres were tested for their hyperlipidemic activity along with the extracts as such, and the results showed the microspheres showing better activity compared to the extracts compared to the standard drug atorvastatin.

**INTRODUCTION**
Hypercholesterolemia is one of the dreadful conditions that coexist in almost all the heart and endocrine-related dysfunctions. Simply elevated cholesterol levels in the blood is termed as hypercholesterolemia. Hyperlipidemia is also a synonym term and used to define elevated lipid levels. It affects almost all human beings in the world currently in view of the changes in the food and living habits of the people [1, 2]. There had been rising problems with the increase in the athero-genic indices of the people that cause the atherogenesis caused by the hyperlipidemia. This is caused due to the unhealthy lifestyle habits and food intake, improper exercise habits, work-life imbalances, stress and other related factors of genetics [3]. There are a few other diseases that are caused due to hypercholesterolemia. They are CHF, AHD, stroke, cerebral diseases related to the vasculature and also cause endocrine dysfunction to organs like pancreas [4].

The abnormality in the lipid profile leading to these many diseases can be simply overcome by making few changes in the lifestyle habits, food habits eating healthy low-calorie food, avoiding processed foods and adding dietary supplements in the diet [5]. Some drugs can treat the disease and effectively lower the lipid levels in the blood. Considering their potency, they are used in the effective treatment of the disease, but some potential side effects are involved in synthetic drugs. So the herbs and medicinal plants are only options to counter the disease without producing significant side effects [6].

Most of the medicinal plants were taken from the...
traditional literature and scripts and medical systems. They do not have scientific evidence or documentation to support the hyperlipidemic activity of the plants [7]. There had been significant researches in recent days to investigate the potency of the herbs to treat the hyperlipidemia and without notable side effects. Medicinal plants were proven to possess hyperlipidemic activity with a consideration of the chemical constituents in them [8]. Most works showed those chemical constituents are antioxidants that proves that the assertion that the oxidation is the main problem in causing the hyperlipidemia.

So, in this research, antioxidant herbs like Psidium guava, Tephrosia and Moringa are used to prepare a gel that targets the fat deposits in the body and investigate for the antihyperlipidemic property.

PROCEDURE
Collection & Extraction of herbs
The leaves of the plant, Tephrosia papulnia, Psidium guava and Moringa oleifera [9–11] were collected from the supplier, and then they are dried in the shade for about 5 days. After they are dried, the leaves were collected and powdered and extracted using ethanol using maceration method. 5gm of powder was allowed to soak in the 100ml of ethanol for about days with occasional stirring. The extract was filtered, and the filtrate was evaporated to drying. The extract thus obtained was weighed and used in the preparation of microcapsules.

Preparation of microcapsules
A weighed amount of extract was selected as per Table 1 and mixed with 5gm of sodium alginate. This was combined with 10ml of distilled water and stirred well using a magnetic stirrer.

Table 1: Preparation of polyherbal Microspheres

| Plant         | Part used | Quantities |
|---------------|-----------|------------|
| Tephrosia     | Leaves 25mg |
| Psidium      | Leaves 25mg |
| Moringa      | Leaves 25mg |
| Sodium alginate | 10g       |
| Calcium carbonate | 10%w/v  |
| Distilled water       | Qs        |

A solution of calcium carbonate was prepared with 10 % w/v concentration in distilled water. The sodium alginate solution was taken in a syringe and poured dropwise into the calcium carbonate solution, and the microspheres were formed incorporating the extract into them. The extract weight was calculated before preparing microspheres, so the final dose of the extract was 100mg/1gm of microspheres.

Animal work
Albino Wistar rats were used to study the investigation of the hyperlipidemic activity of the microspheres on the high-fat diet-induced rats. The rats were weighed around 140-160gm, and they were kept in propylene cages and acclimatized in air conditioning for two days with free pellet food and water. The rats were divided into seven groups of animals with 6 in each group, and the first one was noted as a control group. Therefore, no drug or inducing agent is given to this group of animals. From the second group of rats, a high-fat diet like cholesterol diet was given to rats for 20 days 30mins after administration of the drugs and extracts and microspheres. Cholesterol and cholic acid were mixed with coconut oil and were fed to the rats as a part of the diet, and weight differences were noted too.

Drugs were not administered to group 2, so it was considered a negative control group. Group 3-7 were given with standard drug atorvastatin, Psidium extract (PE) 200mg/kg, Tephrosia extract (TE) at 200mg/kg and other group was given the microspheres at 1gm per kg for 20 days. Last four days, the rats were left alone without administering any drugs. On the last day, the rats were sacrificed to draw blood from the orbital region and the blood was centrifuged at 5000rpm to separate the serum. The serum separated was collected and analyzed for lipid profile of the rats [12–14].

RESULTS & DATA
Hyperlipidemia has successfully induced in the rats with a high-fat diet in group 2 rats. The weight of the rats was gained to 200gm, which was almost 50% more than the normal weight of the rats used in the experiments. The groups two had shown an elevation in the LDL, TG, TC and VLDL values which indicates that there is an increase in the bad cholesterol values, total cholesterol, triglycerides, low-density lipids. But the HDL values were lowered, which indicates further problematic condition if the hyperlipidemia that induced in group 2. Table 2

In other groups, the extracts showed a better activity when compared to the standard drug. There was a depression in the lipid levels (TG, TC and LDL). This indicates and supports the lipid-lowering capacity of the extracts in the experiments. Figure 1
### Table 2: Antihyperlipidemic activity of Microspheres

| Groups       | Body weight gm | HDL  | TC's     | TG's     | LDL     | VLDL    |
|--------------|----------------|------|----------|----------|---------|---------|
| Control      | 150.3±1.2      | 30.8±4.70 | 70.24±7.82 | 84.51±7.23 | 33.10±2.69 | 22.47±2.15 |
| Negative control | 232.1±2.4     | 25.01±4.86202.43 | 15.19123.9±8.01 | 146.72±11.47 | 28.36±3.98 |
| Atorvastatin | 158.5±1.7      | 32.62±5.3469.7±5.50 | 78.2±10.16 | 45.98±5.82 | 20.84±1.63 |
| PE 200mg/kg  | 170.6±3.6      | 26.59±3.48885.4±8.67 | 85.29±7.54 | 69.54±6.31 | 23.38±2.02 |
| TE 200mg/kg  | 167.4±1.0      | 28.94±4.0687.6±6.73 | 96.63±8.85 | 58.46±7.02 | 24.59±1.24 |
| ME 200mg/kg  | 154.1±2.8      | 29.32±2.7599.8±11.25* | 110.79±3.37*41.21±2.83** | 25.62±4.06* |
| Microspheres | 172.7±3.5      | 27.04±3.6795.10±13.46*132.45±3.28 | 44.68±2.71** | 30.71±3.12** |

**Figure 1: Antihyperlipidemic Activity of Microspheres**

The HDL levels were also elevated in the test, which indicated that there was an increase in support of the extracts to control the hyperlipidemia. Furthermore, the microspheres produced by the extract incorporation into the microspheres produced by sodium alginate showed a similar activity with the extracts and standard drug. There is more lowering of bad cholesterol and triglycerides and lipids. There was a much higher elevation of the HDL levels, which was desirable with the antihyperlipidemic drug.

**CONCLUSION**

Herbal microspheres were prepared using the extracts of Tephrosia, Moringa and Psidium, which are incorporated into the sodium alginate and calcium carbonate. These microspheres were tested for their hyperlipidemic activity along with the extracts as such, and the results showed the microspheres showing better activity compared to the extracts compared to the standard drug atorvastatin.

**Conflict of Interest**

The authors declare that they have no conflict of interest for this study.

**Funding Support**

The authors declare that they have no funding support for this study.
ACKNOWLEDGEMENT

The authors are thankful to all who have extended their constant support for the completion of the work.

REFERENCES

[1] Robert W, Mahley, Thomas P, Goodman B. Gilman’s. 2006. The Pharmacological Basis of Therapeutics, 11th Edn.;

[2] Stone NJ, Robinson J, Lichtenstein AH, Merz NB, Blum CB. Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice guidelines. American heart association; 2013.

[3] Kasper DL, Braunwald E, Fauci AS, Hauser, Longo J. Harrison’s principles of internal medicine.16th Edn. Mc Graw Hill; 2008.

[4] Rang HP, Dale MM, Ritter JM, Flower RJ. Pharmacology, 6th Edn:324;p. 324–324.

[5] Prashar Y, Venkataraman S. Evaluation of Ethanolic extract of Bauhinia Variegata linn. In high fat diet induced obesity in Rats. International Journal of Phytopharmacology. 2010;1(2):103–108.

[6] Shiddamallayya N, Yaseen A, Gopakumar K. Medicobotanical survey of kumar parvatha kukke subramanya. Indian Journal of Traditional Knowledge. 2010;9(1):96–99.

[7] Soudahmini E, Ganesh M, Senthi, Panayappa, Madhu C, Divakar. Herbal remedies of Madugga tribes of Siruvani forest, South India. Natural Product Radiance; 2003.

[8] Reddy AK, Jyothi M, Joy A, Kumar CK. Lannea coromandelica: The Researcher’s Tree. Journal of Pharmacy Research. 2011;4(3):577–579.

[9] Patil PV, Huger S, Nanjappaiah HM, Kalyane N, Chowdhry M. Phytopharmacology of Tephrosia purpurea Linn: An Overview”. Pharmacologyonline. 2011;3:1111–1140.

[10] Visavadiya NP, Narasimhacharya AVRL. Ameliorative Effects of Herbal Combinations in Hyperlipidemia. Oxidative Medicine and Cellular Longevity. 2011;2011:1–8. Available from: 10.1155/2011/160408.

[11] Rajanandh MG, Satishkumar MN, Elango K, Suresh B. Moringa oleifera Lam. A herbal medicine for hyperlipidemia. A preclinical report. Asian Pacific Journal of Tropical Diseases; 2012.

[12] Chaudhary HR, Brocks DR. The Single Dose Poloxamer 407 Model of Hyperlipidemia; Systemic Effects on Lipids Assessed Using Pharmacokinetic Methods, and its Effects on Adipokines. Journal of Pharmacy & Pharmaceutical Sciences. 2013;16(1):65–65. Available from: 10.18433/j37g7m.

[13] Johnston TP. The P-407–Induced Murine Model of Dose-Controlled Hyperlipidemia and Atherosclerosis. Journal of Cardiovascular Pharmacology. 2004;43(4):595–606. Available from: 10.1097/00005344-200404000-00016.

[14] Venkidesh R, Dilipkumar, Lakshmi SM, Saravanakumar A, Subhash. Anti-diabetic activity of smilax chinensis l. Extract in streptozotocin-induced diabetic rats. International Journal of Phytopharmacology. 2010;1(2):68–73.