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Homoeopathic pathogeneses of dioscorea villosa and the role of dysregulated cholesterol metabolism by the action of diosgenin: A review

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Abstract
Background: *Dioscorea villosa* (*Dioscorea*) is one of the important homoeopathic medicines for gastro-intestinal, sexual, cardiovascular, peripheral inflammatory or neurological affections. Diosgenin is the primary active ingredient of *Dioscorea* which is responsible for all possible revealed actions of this plant.
Objective: To know background patho-physiology for development of homoeopathic pathogeneses of *Dioscorea.*
Method & Result: Homoeopathic pathogeneses of *Dioscorea*, have been collected from 11 homoeopathic books and 1article. A comprehensive online search on different actions of diosgenin and dioscorea itself (18 research and 5 reviews), for hyperactivity of cholesterol as well as lipid metabolism in different patho-physiological fields (14 research and 17 reviews), along with other related articles have been assessed by using PubMed and other sources and appraised according to their research outcome.
Conclusion: By the action of diosgenin, altered or dysregulated cholesterol metabolism might have a background patho-physiological role to develop homoeopathic pathogeneses of *Dioscorea.*

Keywords: *Dioscorea villosa*, diosgenin, homoeopathic pathogeneses, altered cholesterol metabolism

Introduction
Dioscorea is one of the well-known homoeopathic medicines. It is prepared from the root of Dioscorea villosa, commonly known as Wild yam by tincture preparation. The primary active ingredient of *Dioscorea* is diosgenin. Due to structural similarity with cholesterol [1, 3], diosgenin was hypothesized to have action in systemic cholesterol metabolism. Several research studies proved its action on it, starting from absorption to its excretion. Diosgenin significantly decreases serum cholesterol levels by inhibiting its absorption, increasing biliary secretion and faecal excretion[3-9]. Not only that, it can elevate high-density lipoproteins (HDL) and can decrease low-density lipoproteins (LDL) and triglyceride levels [10, 12]. Other than the cholesterol metabolic activity, diosgenin also has oestrogenic [13, 15] as well as anti-inflammatory and anti-allergic property [16, 21].
As a homoeopathic medicine *Dioscorea* is important for gastro-intestinal affections with a characteristic colic relieved by stretching the body out, or by walking about. Besides this gastro-intestinal sphere, it also has genito-urinary, cardio-vascular, peripheral neurological and inflammatory manifestations [22, 33]. Behind all these pathological conditions, the active ingredient diosgenin seems to have important role by its altered cholesterol metabolism which might be the underlying pathological essence of homoeopathic pathogeneses of *Dioscorea* [34].

Homoeopathic pathogeneses of *dioscorea* [22, 33]
Extensive proving of *Dioscorea* was done by Dr. A. M. Cushing, Dr. J. U. Woods, Dr. W. H. Burt, Dr. T. Nichol, Dr. H. A. Summer and Dr. J. C. Michener and was recorded in Encyclopedia of Pure Materia Medica by Dr. T. F. Allen [22]. Based on these proving symptoms, verifications as well as clinical experiences in different pathological conditions are also described by different pioneers. As per these descriptions, *Dioscorea* is one of the important homoeopathic medicines for bilious or flatulent colic with feeble digestion; colic with diarrhoea or dysentery. This characteristic spasmodic type of colic is relieved by stretching the body out, or by walking about. It is verified in proving as well as in clinical observation. In this respect, Dr. W. I. Pierce recorded his clinical experience as the patients

not only press hard against the abdomen, but also bend forward in order to obtain relief [25]. Other pathogeneses like, hard dry lumpy stool followed by great pain and distress in haemorrhoids. In sexual sphere, there was constant excitement of genital organs with strong and frequent erections day and night, amorous dreams with emissions. In cardiovascular sphere, sharp/ darting pain in region of heart is found arresting motion and breathing, similar symptoms are described in angina pectoris. Likewise, symptoms of cramping pain in back side of thigh along with sensation of muscles seem too short, painful when walking, is described under pathological condition of sciatica. It may also be related to circulatory insufficiency. Very painful or sharp pain, tenderness on pressure in thumb or back of thumb or in bones of fingers; pain on underside of great toe, as if pin was driven into it etc. which are clinically verified in peripheral inflammatory pathological conditions described as whitlow or paronychia or felon. Besides those, other clinical pathological conditions like, gallstones [31], spasmodic stricture of urethra [29, 32], acute painful varicocele [33] were described in the pathogeneses of *Dioscorea*.

Altered cholesterol metabolism and its patho-physiological activity

Diosgenin has significant action on cholesterol metabolism. It has hypocholesterolemic effect by inhibiting cholesterol absorption, increasing biliary cholesterol secretion and increasing faecal excretion [3, 9]. In different research studies it has been found that, it not only decreases LDL and triglyceride but also can elevate serum HDL and protects against aetherosclerosis [10, 12]. On the other side, cholesterol is an important risk factor for cardiovascular disease. Hypercholesterolemia is one of the key components of aetherosclerotic plaques [35, 36]. Progressive accumulation of cholesterol in the arterial wall causes aetherosclerosis, the pathologic process underlying most heart attacks and strokes [37, 38]. Cholesterol and triglyceride changes are considered as important predictors of ischemic heart disease [39]. Similar with the coronary artery disease, they have also an active role in the development of peripheral vascular disease [40].

In Gastro-intestinal affections, hypercholesterolemia, hypertriglyceridemia or low HDL levels can elevate the risk of gall bladder disease [41, 42]. 70% of gallstones are composed primarily of cholesterol, either pure or mixed with pigment, mucoglycoprotein and calcium carbonate[43]. To form stone, primarily it requires excess cholesterol secretion as cholesterol supersaturated bile along with gall bladder motility defect and/ or the presence of pro-crystallizing factors such as mucous glycoprotein or immunoglobulins, which is stimulated by gall bladder inflammation [44]. In this respect though there is no definite association with hyperlipidemia, but a low HDL cholesterol and hypertriglyceridemia carry an increased risk to develop stones [42, 45, 49]. Hypertriglyceridemia is one of the three most common causes of acute pancreatitis. Others are alcohol and gall stones [50, 51]. Acute abdominal pain may be related to pancreatic affection due to secondary cause of altered cholesterol metabolism [52, 54]. Increased levels of LDL promote cholesterol accumulation and an inflammatory response in the artery wall. In intestine it may be a cause of intestinal inflammation to produce colic with diarrhoea or dysentery related to food allergy [55]. Hypercholesterolemia had a deleterious effect on fatty infiltration and is one of the well-known causes of non-alcoholic fatty liver disease. Though this condition is commonly asymptomatic, but fatigue and right upper quadrant abdominal pain are also reported by a portion of patients [56, 57].

On the other side in relation to the characteristic modality, abdominal pain while reclining and relieved by sitting up is often retroperitoneal [58].

In sexual sphere, though diosgenin has an influence on secretion of dehydroepiandrosterone (DHEA) [59] but, cholesterol is the precursor to the production of DHEA and androgens or oestrogen is made from DHEA [60, 62]. Hyperactivity of cholesterol based hormones DHEA and/ or testosterone might be responsible for increased sexual response in male [63, 64].

In the field of host defence, it has been found that Herpes Simplex Virus type-1 (HSV-1) replication depends on cholesterol [65]. And HSV-1 is responsible for several infective disease conditions as also found in whitlow or panaratium or felon[66]. On the other side, lymphatic system has an important role in host defence. It represents principle route of transport from tissues for antigen and immune cells. Impaired lymphatic function predispose to infection [67]. A state of hypercholesterolemia is found to be associated with lymphatic vascular changes, leads to obstruction of lymphatic drainage [68]. Altered cholesterol metabolism may also play a role on peripheral neuropathies. It has been studied that hyperlipidemia is a novel risk factor for these [69]. Atherosclerosis of arteries supplying the lumber region has been suggested as a mechanism leading to inter-vertebral disc degeneration causes sciatica [70, 71].

Discussion

In gastro-intestinal sphere, bilious or flatulent colic with feeble digestion, with diarrhoea or dysentery, or related to food allergy can be described by the patho-physiological effect of altered cholesterol metabolism. Not only that, conditions related to gallstone formation also be related with this same patho-physiologic changes. In this regard, characteristic modalities of abdominal pain while reclining and relieved by sitting may have retroperitoneal source[58]. On the other side, experience of Dr. W. I. Pierce also opens a door on the positive action of *Dioscorea* even when patient gets relieve on bending forward [25].

In sexual sphere, constant sexual excitement with strong and frequent erections or amorous dreams with emissions can be the result of hyperactivity of cholesterol based hormone DHEA or other androgens. In female, oestrogen is one of them. It has been found that, *Dioscorea* also has oestrogenic property [13-15]. Patho-physiological background of urethral stricture and vericocele may also be described by the action of hyper-oestrogenic effect [72, 76].

In cardiovascular sphere, altered cholesterol metabolism is directly related to atherosclerotic changes which cause ischemic heart disease and peripheral circulatory insufficiency resulting muscular pain on lower extremities. Not only that, atherosclerosis of arteries supplying the limbs region may cause intervertebral disc degeneration which may cause sciatica [70, 71].

Symptoms related to peripheral inflammatory conditions like whitlow or panaratium or felon might be explained by the alteration of host defence related to impaired lymphatic functions or HSV1 infections due to dysregulated cholesterol metabolism [65, 67].

Conclusion

So, by the action of diosgenin, altered or dysregulated cholesterol metabolism seems to have patho-physiologic role for the development of *Dioscorea* pathogeneses.

In homoeopathic practice, expressions and intensity of disease manifestations vary from one patient to another. It is because of individual's constitutional tendencies including its susceptibility. In proving, different groups of prover manifested different groups of signs and symptoms with absence of others. The collected all signs and symptoms define the area of definite pathogeneses of that drug substance. So, the patient of clinical field or the provers of drug-proving can give expressions of their suffering may differ from one individual to other. But the tendencies and target areas of drug as well as the background patho-physiological essence of differing expressed manifestations, is definite.

Here, patho-physiological background of homoeopathic pathogeneses of *Dioscorea* might be explained by the action of diosgenin, and altered or dysregulated cholesterol seems to be the initiating factor to develop this pathogeneses. But, scientific research studies are necessary for its final approval.

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