Development of cow urine based disinfectant

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Abstract
Because of over-emphasis on the use of chemicals to control infection due to microorganisms, more problems have been created rather than being addressed. Disinfectant prepared during this study is 100% natural and is based on cow urine and biodegradable and antibacterial plant extracts (Neem, Tulsi, Ritha and Pine oil) possessing pleasant aromatherapeutic vapour. No additional artificial dyes or fragrances have been used. Different compositions were tried to get optimum disinfectant action. The results showed that the higher concentration of both Neem and Tulsi extract possess maximum efficacy. The main aim of this product development is to provide employment to the rural youth and to use safe disinfectant for cleaning floors, etc.

Keywords: Cow urine, Disinfectant, Neem, Tulsi, Ritha, Pine oil, Phenolic compounds, RWC test.
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Cow urine
Cow urine has natural disinfectant and antiseptic qualities. In traditional medicines cow urine was consumed as an effective and simple medicine. It contains 24 types of salts as well as iron, calcium, phosphorous, carbonic acid, potash and lactose. The main constituent of cow urine that shows disinfectant activity is carbolic acid, which is a mixture of phenol and cresol.

Neem (Azadirachta indica A. Juss.; Family — Meliaceae)
Recently, neem leaves have been studied scientifically and it is reported that they contain different chemical constituents, viz. azadirachtin, meliantrol and salanin which are responsible for the pesticidal, larvicidal and insecticidal activities.

As a disinfectant, the extract from neem leaves (0.5 - 42 % azadirachtin) is believed to break the life cycle of microorganisms. Studies have shown that active compounds in the leaves inhibited the secretion of hormones into the blood inhibiting the moulting and reproductive function in microorganisms1, 2. Neem extract kills an extremely wide range of bacteria, fungi, viruses, protozoa and parasites.

Introduction
Disinfection is the killing or removal of those agents, which cause infection. A disinfectant is therefore, a germicide. Disinfectant substances are employed to neutralize the action of pathogenic organisms and to prevent the spread of contagious or infectious diseases. The efficacy of any disinfectant is based on its power of destroying or of rendering inert, specific poisons or disease germs.

Chemically phenol and phenolic compounds are very effective disinfectants. A 5% aqueous solution of phenol rapidly kills the vegetative cells of microorganisms whereas spores are resistant. Many derivatives of phenol have been prepared and evaluated for their antimicrobial activity.

Plants produce essential oils to protect themselves from germs without harming the plant’s healthy tissue. These essential oils have been used in medicine to kill germs for thousands of years. Many oils contain phenolic compounds as their principal constituent; those most commonly found are azadirachtin, thymol, eugenol, carvacrol and to lesser extent, phenol ester, methyl eugenol ether and anthonl.

This herbal disinfectant is easy to use, avoids wiping with germ infested cloths, non-corrosive, safe to use on most surfaces, safe to skin, safe to breathe, environmentally friendly and biodegradable.

Materials and Methods
In the present work following raw materials were used to prepare natural disinfectant: cow urine, pine oil and neem, tulsi and ritha extracts.
Tulsi (*Ocimum sanctum* Linn.; Family — *Lamiaceae*)

*Tulsi* leaves contain a kind of bright yellow volatile oil, which is useful against insects and bacteria. The principle constituents of this oil are 70% eugenol, 20% eugenol methyl ether and 3% carvacrol.

Ritha (*Sapindus trifoliatus* Linn.; Family — *Sapindaceae*)

This is soap-nut tree of Northern India. The fruits are acrid, bitter, thermagenetic, emetic, astringent, expectorant and anathematic. The fruits are largely used as soap substitute for washing. The fleshy portion of *ritha* fruit contains 11.5 % saponin and gives soapy feel to the product.

Pine oil (*Pinus* spp.; Family — *Pinaceae*)

Pine oil is the steam distilled essential oil (volatile oil) extracted from the fresh branch tips of Pine tree. It is colourless to slightly yellow, clear, transparent liquid. The chemical constituent include 20 - 30 % α-pinene with lesser amount of 3-carene dipentene, 5 -10 % β-pinen, D-limonone, α-terpinene, γ-terpinene, camphene, satrinene, terpinolene, α-cadinol, butyric acid, valeric acid and isocaproic acid.

Pine oil has the natural disinfectant properties and germicidal properties because of presence of α-pinene. It has also been used as a fragrance and flavouring compound in this product.

The leaves of *neem*, *tulsi* and *ritha* fruits were collected and stored. Firstly the *neem* leaves were cut to pieces in the chipper. The crushed material is then sent to hydro-distillation unit and boiled with proper amount of water for nearly one hour. Then resulting mixture was passed through the filter. The filtered extract was stored in a storage tank. Similar procedure was followed for preparing *tulsi* and *ritha* extract.

The stored cow urine was first passed through clarifier and then sent to the mixing unit. Pine oil was added to the resulting mixture in proper amount to add aroma to the mixture. The above all extracts and other solutions were mixed in a mixing unit in different proportion. Different compositions tried to find the optimum proportion of the constituents to give maximum disinfections activity are given in Table 1. The disinfectant activities of different compositions are given in Table 2.

**Results and Discussion**

Table 1 shows the different compositions of disinfectants prepared. The concentrations of cow urine, *neem* extract and *tulsi* extract were varied to get the maximum efficacy. *Ritha* extract and pine oil were added at constant concentration in 100 ml of the solution thus produced.

The Rideal-Walker Coefficient (RWC) test was carried for each composition. The testing were done on bacteria such as *Salmonella typhi* and *Staphylococcus aureus*, as they have strong lifecycle as compared to other bacteria and that's why they need more concentrated chemicals to destroy their lifecycle. Table 2 shows the results of Rideal-Walker test. The results obtained for 1 ml of culture for a particular concentration having duration of about 22 - 24 hours.
The positive sign in the table indicates that, the particular sample and at particular concentration, there is growth of bacteria i.e. at that concentration, the sample don’t have bactericidal effect. Whereas the negative sign indicates that the bactericidal activity for particular sample at particular concentration.

The results revealed that sample G gave the best result as compared to other samples. Sample G showed bactericidal activity at and above 150 µl/ml of culture whereas sample H also gave bactericidal activity at and above 200 µl/ml of culture.

**Conclusion**

For cleaning purpose 150 ml of this product may be added in one litre of water. The product is easy to prepare and can be marketed. It is totally environment friendly and is ideal for use in our modern world. It can be used on any surface that requires cleaning e.g. walls, floors, tiles, bathrooms, toilets and other dirty places. Moreover organizations like Govigyan Anusandhan Kendra, Deolapar, District Nagpur has taken the initiative to commercialize the product and to generate employment.

**References**


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**Table 1 : Different compositions of disinfectants**

<table>
<thead>
<tr>
<th>Composition</th>
<th>Neem extract (ml)</th>
<th>Tulsi extract (ml)</th>
<th>Cow urine (ml)</th>
<th>Ritha extract (ml)</th>
<th>Pine oil (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample C</td>
<td>25</td>
<td>37.5</td>
<td>37.5</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Sample E</td>
<td>37.5</td>
<td>25</td>
<td>37.5</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Sample G</td>
<td>37.5</td>
<td>37.5</td>
<td>25</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Sample H</td>
<td>60</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Sample I</td>
<td>20</td>
<td>20</td>
<td>60</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

**Table 2 : Activity of different compositions of disinfectant**

<table>
<thead>
<tr>
<th>Concentration</th>
<th>( C_{50} ) (µl)</th>
<th>( C_{100} ) (µl)</th>
<th>( C_{150} ) (µl)</th>
<th>( C_{200} ) (µl)</th>
<th>( C_{250} ) (µl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample C</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Sample E</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Sample G</td>
<td>+</td>
<td>+</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Sample H</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Sample I</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Note: Positive (+) sign indicates the growth of bacteria; Negative (−) sign indicates no growth.
Diabetes mellitus is a medical disorder characterized by varying or persistent hyperglycemia (elevated blood sugar levels) with or without glycosuria (sugar in urine). There are two factors that are characteristic of diabetes mellitus — decreased production of insulin or decreased sensitivity of body tissues to insulin or a combination of both. Insulin is a hormone secreted by beta cells of the pancreas which move glucose from the bloodstream into muscle, fat, and liver cells for usage or storage.

There are two major types of diabetes mellitus: Type 1 diabetes is usually diagnosed in childhood. The body makes little or no insulin, and daily injections of insulin are required to sustain life. It is also known as Insulin Dependant Diabetes Mellitus (IDDM). Without adequate insulin, glucose builds up in the bloodstream instead of going into the cells. The body is unable to use this glucose for energy despite high levels in the bloodstream, leading to increased hunger. In addition, the high levels of glucose in the blood causes the patient to urinate more, which in turn causes excessive thirst.

Type 2 diabetes is far more common than Type 1 and makes up 90% or more of all cases of diabetes. It usually occurs in adulthood. Here, the pancreas does not make enough insulin to keep blood glucose levels normal, often because the body does not respond well to the insulin. Type 2 diabetes is becoming more common due to the growing number of older adults, increasing obesity and failure to exercise. It is also known as Non Insulin Dependant Diabetes Mellitus (NIDDM).

Some uncommon types of diabetes are also found e.g. gestational diabetes in which hyperglycemia develops at any time during pregnancy. It is temporary and fully treatable, but if untreated it may cause problems with the pregnancy.

Risk Factors for Diabetes

- Persons with family history of diabetes have a great risk for developing of the diabetes.
- Obese persons with age greater than 45 years.
**Unani Tips**

- Gestational diabetes or delivering a baby weighing more than 4.5 Kg.
- Persons having high blood pressure, high blood levels of triglycerides and cholesterol.
- Low activity level and poor diet.

**Symptoms**

High levels of glucose in blood can cause several problems, including frequent urination, excessive thirst, hunger, fatigue, weight loss and blurry vision. However, because type-2 diabetes develops slowly, some people with high blood sugar experience no symptoms at all. Erectile dysfunction in men, frequent infection and slow healing is also present in diabetic patients.

Dangerous symptoms in diabetics include the smell of acetone on the patient's breath (a sign of ketoacidosis), kussmaul breathing (a rapid, deep breathing) and any altered state of consciousness or arousal (hostility and mania are both possible, as is confusion and lethargy). The most dangerous form of altered consciousness is the so-called "diabetic coma" which produces unconsciousness. Early symptoms of impending diabetic coma include polyuria, nausea, vomiting and abdominal pain, with lethargy and somnolence a later development, progressing to unconsciousness and death if untreated.

Diagnosis is confirmed by investigations such as two fasting plasma glucose levels above 110 mg/dl on two different days or plasma glucose level more the 200 mg/dl after ingestion of 75g of glucose. Other tests includes glucose tolerance test (G.T.T.) and urine analysis for sugar and ketone bodies.

**Complications**

Among the major risks of the disorder are chronic problems affecting multiple organ systems which will eventually arise in patients with poor glycemic control. Many of these arise from damage to the blood vessels. These illnesses can be divided into the following:

1. **Small vessel disease complications**
   - Proliferative retinopathy which can lead to blindness.
   - Peripheral neuropathy which, particularly when combined with damaged blood vessels, can lead to foot ulcers and possibly progressing to necrosis, infection and gangrene, sometimes requiring limb amputation.
   - Nephropathy which can lead to renal failure.

2. **Large vessel disease complications**
   - Ischemic heart disease caused by both large and small vessel disease.
   - Stroke.
   - Peripheral vascular disease which

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**DO's**

- Choose an enjoyable physical activity that is appropriate for current fitness level. Regular exercise is important for everyone. It helps control the amount of glucose in the blood and also helps burn excess calories and fat to achieve optimal weight.
- Exercise every day at the same time of the day, if possible.
- Monitor blood glucose levels before and after exercise.
- Carry food that contains a fast-acting carbohydrate in case you become hypoglycemic during or after exercise.
- Carry a diabetes identification card and a mobile phone.
- Drink extra fluids that do not contain sugar before, during and after exercise.
- Check your feet every day, and report sores or changes and signs of infection.

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**DONT's**

- The patients should not eat sugar and sugar rich food.
- Avoid dietary fat (specifically saturated fat).
- Smoking is dangerous as it hinders blood flow to the feet.
- Do not take alcohol, which increases the risk of nerve damage.
• Peripheral vascular disease which contributes to foot ulcers and the risk of amputation.

Diabetes mellitus is the most common cause of adult kidney failure worldwide. Retinal damage (from microangiopathy) makes it the most common cause of blindness among non-elderly persons. Hypoglycemia due to over dose of insulin, ketoacidosis, diabetic coma are also common in diabetics. Investigations to rule out the complications should also be done like Blood Urea, Serum Creatinine, ECG, Retinoscopy, etc.

Home Remedies

Following preparations are useful in the management of diabetes:

Preparation No. 1
Take water extract of Giloe [Tinospora cordifolia (Willd.) Miers ex Hook. f. & Thoms.] stem 100 mg twice daily.

Preparation No. 2
Take 1/2 teaspoonful leaf juice of Karela (Momordica charantia Linn.) and 1/2 teaspoonful powder of Zard Chob (Curcuma longa Linn.), mixed in one teaspoon gel of Gheekawar (Aloe vera Linn.). Take the mixture twice a day before lunch and dinner.

Preparation No. 3
Mix and grind seeds of Methi (Trigonella foenum-graecum Linn.) 100 g, Zard Chob (Curcuma longa Linn.) and Dakhni Mirch (Piper nigrum Linn.) 50g each. Take one teaspoon of this powder with a glass of milk twice daily.

Preparation No. 4
Take Jamun [Syzygium cuminii (Linn.) Skeels] seed powder 10g or juice of Karela (Momordica charantia Linn.) 30ml twice daily.

Preparation No. 5
Take 500 mg powder of Qust Shireen (Saussurea lappa C. B. Clarke) twice a day.

Preparation No. 6
Boil 15 fresh leaves of Mango (Mangifera indica Linn.) in one glass of water and leave it overnight. Filter this water and drink first thing in the morning.

Preparation No. 7
Take powder of Zeera Safaid (Cuminum cyminum Linn.) 5 mg daily twice a day.

Preparation No. 8
Take decoction of Abhal (Juniperus communis Linn.) 20 ml thrice daily.

Preparation No. 9
Take a cup of juice of leaves of Bael (Aegle marmelos Correa ex Roxb.) twice in a day.

Qurs-e-Tabasheer, Qurs-e-Tabasheer loli, Safoof-e-Zayabitus and Doolabi are few of the pharmacopoeial preparations available in the market, which can be used under physician's advice.

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Dietary changes may be helpful to diabetics

The blood sugar-raising effect of a food is called its “glycemic index”, which depends on how rapidly its carbohydrate is absorbed. Hence, eating a diet high in carbohydrate-rich foods with low glycemic indices is associated with a low risk of Type 2 diabetes. Beans, peas, fruit and oats have low glycemic indices, despite their high carbohydrate content. Currently, the American Diabetic Association (ADA) guidelines do not prohibit the use of moderate amounts of sugar, as long as the goals of normalizing blood levels of glucose, triglycerides, and cholesterol are being achieved. High-fiber supplements, such as psyllium, guar gum (found in beans), pectin (from fruit), oat bran, and glucomannan (derived from Amorphophallus sp. rhizomes), have improved glucose tolerance in some studies. Positive results have also been reported with the consumption of 1-3 ounces of powdered fenugreek seeds per day. Nonetheless, most doctors advise people with diabetes to eat a diet high in fiber. Focus should be placed on fruits, vegetables, seeds, oats, and whole-grain products (http://www.universityhealth.org/17453.cfm).