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THERAPEUTIC POTENTIALS OF COW DERIVED PRODUCTS- A REVIEW

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ABSTRACT: Kamdhenu or Indian cow (*Bos indicus*) is worshipped as sacred animal by Hindus. The reason for worshipping is the tremendous therapeutic values of cow derived products like cow milk, cow milk curd, cow butter (ghee), cow urine, cow dung and a combination formulation Panchgavya. The use of these products has been well defined in ancient Ayurvedic texts like Charak samhita, Shushruta samhita, Brahad-Wagbhata etc. Cow ghee showed anticancer and hepatoprotective potential by altering the enzymatic activities whereas cow urine acts by an unknown mechanism. Analgesic activity is attributed to presence of steroidal moieties and volatile fatty components in it. Antioxidants isolated from cow urine are responsible for antidiabetic, immunomodulatory, antiepileptic, antibacterial, antifungal and antimicrobial activities. Cow ghee contains a number of saturated and unsaturated fatty acids that plays active roles in production of inflammatory mediators and wound healing processes. This study is to gather the scientific research findings to support the traditional uses of cow derived products and to create research interest in cow.

INTRODUCTION: All living creatures on earth are made up of five basic elements of nature, i.e. the Earth, Water, Fire, Air and Space which all together are called as Panchabhootas and their health is affected by Tridoshas, viz., Vata (air), Pitha (fire) and Kapha (Phlegm). Any disturbance in the harmony of natural ratio of these five elements may cause the disease. On the basis of these fundamental principles of life, different remedial systems were developed viz. Vrikshayurveda for plants, Mrigayurveda for animals and Ayurveda for human beings ¹.

Indian cow, *Bos indicus*, has been considered as sacred animal by Hindus. Cow is described as Kamdhenu (one which fulfills all the wishes) since Vedic times in Indian civilization. It is believed to be a “mobile hospital” for the treatment of various ailments. A number of diseases can be cured by the use of products derived from cow. The use of Cow urine, milk, ghee, curd and dung are well described in detail in ancient Ayurvedic scriptures such as Charaka samhita, Shushruta samhita and Brahad-Wagbhata.

According to ayurveda various cow products like cow's urine, cow's dung, cow's milk, ghee and curd are used to treat various disease conditions in human beings. These five products are called as Panchgavya. Its ghee based preparation is called as Panchgavya Ghrita (PG). Tremendous interest is generated in the therapeutic value of cow products

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due to the patent granted by USFDA (Patent no.6.410.059B1) to Council for Scientific and Industrial Research (CSIR) India for the synergistic activity of Cow urine distillate with some antibiotics and anticancer agents².

Cow milk is a healthy food because of low calorie, low cholesterol and high micro-nutrients, protein, calcium, vitamins, and plays an important role in meeting requirements of various essential nutrients. It contains carotenes, Vitamin A, Vitamin B complex group and Vitamin C. It possesses rejuvenatory health protecting properties and is one of the best vitalizers. It has bio-protective role in human health and is easily digestible^{3,4}. It is found to be effective in curing fever, pain, tumors, diabetes and weaknesses and importantly act as a medium to administer medicine. It delays the processes involved in aging⁵.

Curd from cow milk is considered as "Vatanashak", blood purifier, "Tridoshnashak" and found useful in "Pitha", blood related problems, piles and gastrointestinal disorders. Curd is an efficient probiotic with potential to control infections in a nondrug manner. Curd (Dahi) or Matha (whey or butter milk) is considered as digestive, nutritive and is useful in various gastrointestinal ailments by checking or controlling the growth of harmful organism. Lactic acid producing bacteria are present in curd and buttermilk that produces antifungal metabolites viz. cyclic dipeptides, phenyl lactic acid as well as proteinaceous compounds and 3-hydroxylated fatty acid^{3,4}.

Cow urine, used as an insecticide and as a regulator for various ailments like intestinal gas, acidity and cough. It is claimed to make humans wiser and can be used as a universally available and easily digestible medicine⁶. In classical texts of Ayurveda like Charaka Samhita and Shushruta Samhita, several medicinal properties of cow urine are described. Cow urine is known to help in weight loss and reversal of certain cardiac and kidney problems as well as indigestion, stomach ache and edema. Cow urine is considered useful in treating colic, jaundice, anemia, diarrhea, gastric infection, piles and skin diseases including vitiligo. It is also considered as an appetizer and is known to reverse

inflammation and acts as a diuretic as well as a nephroprotective agent. Indian Ayurvedic literature cites various medicinal properties of cow urine but there is very little scientific evidence in support⁷.

Cow ghee, the butter fat obtained from the cow milk has been claimed to have many medicinal properties like it is cooling in energy, rejuvenating, bestows luster and beauty, enhances memory and stamina, increases the intellect and promotes longevity. It is an aphrodisiac and protects the body from various diseases⁸.

Cow dung possesses antiseptic and disease preventive properties. Cow dung can act as skin tonic. When mixed with crushed neem leaves and smeared on skin, it proves good for boils and heat rashes. Cow dung also used as tooth polish and relieves toothache, so instead of toothpaste which is made of chemicals & dead bones of animals, it is a good alternative. The fresh cow dung kills the germs of Malaria and T.B. Smoke from ashes actually increases our eyelids to close and open so many times that lot of water from the eyes comes out which increases the vision life of a person. Cow dung is antiseptic and possesses prophylactic (disease preventive) properties^{3,4}. It destroys microorganisms that cause disease, fermentation and putrefaction. Cow dung also possesses antifungal components which inhibit growth of even coprophilous fungi and their activity is increased when used in combination with cow urine⁹.

Panchgavya, a term used to describe combination of five major products obtained from cow, which include cow's urine, milk, curd, ghee(butter) and dung. Panchgavya therapy or cowpathy utilizes these five products as they possess therapeutic potential and are used alone or in combination with some other drugs of herbal, animal or mineral origin in treatment of various disorders and diseases like flu, allergies, colds, cough, arthritis, rheumatoid arthritis, leucorrhoea, leucoderma, wound healing, heart disease, asthma, hepatitis, hypercholesterolemia, renal disorders, dietary and gastrointestinal track disorders, ulcer, asthma, tuberculosis, skin infections, chicken pox, leprosy and other bacterial/fungal/viral infections, aging, chemical intoxication, worm infestations, obesity etc. These remedies seem to be beneficial even for

deadly diseases like cancer, Acquired immunodeficiency deficiency syndrome (AIDS) and diabetes. Immunomodulatory and anti-inflammatory activity of Panchgavya is already being mentioned in Ayurveda^{3,4,6}.

This review article is aimed to gather all the scientific research findings supporting the use of cow derived products in prevention, treatment and cure of various ailments in both human beings and animals. Cow derived products viz. cow milk, cow ghee, cow urine, cow milk curd and cow dung along with combination Panchgavya possess various pharmacological activities like anticancer, antidiabetic, antimicrobial, antiseptic, antibacterial, antifungal, immunomodulatory, hepatoprotective, anticonvulsant, antistress, analgesic, antihemorrhoids and eye lubricant. The aim is to support the pharmacological potential of cow derived products with scientific results.

Anticancer activity:

In a study of feeding cow ghee versus soyabean oil on 7,12-dimethylbenz(a)-anthracene (DMBA) induced mammary carcinogenesis and expression of cox-2 and peroxisome proliferators activated receptors- γ (PPAR- γ) in mammary glands of rats revealed anticancer potential of cow ghee. In the DMBA(a carcinogen) treated groups, the animals given soybean oil had higher tumour incidence (65.4%), tumour weight (6.18 g) and tumour volume (6285 mm³) compared to those fed with cow ghee (26.6%, 1.67g, 1925 mm³, respectively). Tumour latency period was increased to 27 week on cow ghee as compared to 23 week on soyabean oil.

Histological analysis of tumours showed more rapid progression of carcinogenesis on soybean oil than on cow ghee fed rats. The expression of cyclooxygenase-2 was observed only in DMBA treated rats and it was significantly less on cow ghee than on soybean oil. The expression of PPAR- γ was also significantly more on cow ghee than on soybean oil. The study proved that dietary cow ghee opposed whereas soybean oil attenuates mammary carcinogenesis induced by DMBA. Also, the effect is mediated by decreased expression of cyclooxygenase-2 and increased expression of PPAR- γ in the former group¹⁰. The metabolism of

chemical carcinogen involves two steps; in the first step carcinogen is metabolized to a reactive molecule by phase-I enzymes and in the second step, active metabolite gets detoxified by several phase-II enzymes. Thus the relative activity of phase I and phase II enzymes would determine the extent of tumorigenesis. The phase I cytochrome P450 enzymes are membrane bound and their activities are influenced by the lipid environment. Therefore, altering membrane lipid composition by feeding animals on singular source of fat might affect carcinogen metabolism¹¹.

Further study carried out to know the exact mechanism behind the anticancer potential of cow ghee versus soyabean oil by observing the effects on carcinogen metabolizing enzymes in the rats. It was observed that cow ghee relative to soyabean oil decreased the activities of Cytochrome P450 (CYP) enzymes- CYP1A, CYP1A2, CYP1B1, and CYP2B2 which are responsible for activation of carcinogens in liver. The activities of Uridinediphospho-glucuronosyl transferase (UDPGT) and quinone reductase (QR) in liver, and γ -glutamyltranspeptidase (GGTP) and QR in mammary tissue were significantly increased in cow ghee fed rats than soyabean oil fed animals. The hepatic GGTP activity decreased in soyabean oil fed animals whereas it is unaffected in cow ghee fed group. The study proved that cow ghee compared to soybean oil downregulates the enzyme activities responsible for carcinogen activation in liver and upregulates carcinogen detoxification activities in liver and mammary tissues¹².

Cow urine also evaluated for efficacy on various cancer patients through a questionnaire in a clinical study. The symptoms (pain, inflammation, burning sensation, difficulty in swallowing, irritation, etc.) of cancer patients were categorized into severe, moderate and mild categories, respectively. During survey 7.35% patients withdraw themselves from the treatment and 92.64% patients continued the therapy. There was a high proportion (30.87%) of throat cancer and the other prevalent cancer was breast cancer (14.70%) followed by cervix and uterine cancer (5.88%), buccal cavity cancer and sinus (4.41%) lung cancer, lymphoma and bone cancer (2.94%), both throat and buccal (5.88%) and other cancer (8.82%), respectively. The study

revealed that the degree of severe, moderate and mild symptoms were 82.16%, 15.8% and 1.58% on the first day and 7.9%, 55.3% and 36.34% on the eighth day, respectively. It was observed that patients who were receiving cow urine therapy since 2-3 months were most benefited. Hence, this traditional therapy may really a boon to cancer patients¹³.

Analgesic activity:

In a study of cow urine and its distillate to assess the analgesic effect using rat tail immersion method it was observed that the animals received cow urine showed comparable analgesic effects to standard drug group received Diclofenac Sodium thereby strengthening the recommendations of Ayurvedic texts to use cow urine as reasonably safe, easily available and economic natural analgesic. Their analgesic activity is attributable to the steroidal moieties and some volatile fatty acids whose presence in cow urine is established through other parallel studies involving chemical and instrumental analysis¹⁴.

Antidiabetic activity:

The effect of cow urine formulation (Gomutra ark, GoA) on experimental alloxan-induced diabetes in rats was studied. Wistar albino rats of either sex weighing 200-250 g were used. The biochemical parameters observed were blood sugar, vitamin C and malondialdehyde(MDA) release. GoA significantly lowers blood glucose in diabetic rats although the observed effect was found to be less than standard antidiabetic, glibenclamide. It is suggested that GoA might have a significant protective effect against alloxan-induced type I Diabetes Mellitus. GoA contains volatile fatty acids like acetic acid 2 propenyl ester, acetic acid methyl ester, 2,2,3 trichloro propionic acid, Butanoic acid-3methyl, propyl ester, 1H indol-3-acetate, acetic acid phenyl ester, quinoline, which act as an antioxidant. The antioxidant potential might be contributing for the antihyperglycemic effect, by preventing formation of the free radicals which cause damage to the beta cells of pancreas. It significantly lowers the level of malondialdehyde and vitamin C in diabetic rats. No toxicity was observed even when cow urine was given 32 times of the study dose in acute toxicity and no significant change were observed when it was used

chronically, suggesting that cow urine is having a very high therapeutic index. The findings of the study supported the traditional use of cow urine in diabetes and have a high therapeutic index and safety profile for chronic use¹⁵.

In a study of use of cow urine distillate in diabetes rats, the diabetes was induced by administration of streptozotocin (50 mg/kg bw., i.p) dissolved in citrate buffer (0.1 M, pH 4.5). The anti diabetic effect of the (three different doses) and a standard drug Glibenclamide (0.25 mg/kg, p.o) was studied in these diabetic rats. The parameters employed in the study included assessment of fasting blood glucose levels, serum lipid profiles, liver glycogen levels and initial and final changes in body weight. The cow urine distillate produced a significant ($P<0.05$) reduction of the elevated blood glucose, serum cholesterol and serum triglycerides level when compared with the diabetic control. The diabetic rats treated with cow urine distillate also showed a significant increase in HDL levels and gain in body weight when compared with the diabetic control¹⁶.

Antihemorrhoids activity:

Hemorrhoids are a common anorectal condition defined as the symptomatic enlargement and distal displacement of the anal mucosa and classified as Grade I, II, III and IV on the basis of symptoms and severity. An inflammatory reaction and vascular hyperplasia may be present in Hemorrhoids¹⁷. Ayurvedic texts have an abundant literature regarding anti-microbial, bio-availability enhancer, free-radical scavenging properties of Cow-urine. Sushruta samhita states that Arsha can be treated by the four ways viz. Bhesaja (Internal medication), Kshara (Local application), Agnikarma (Cauterization), Shastrakarma (Surgery). This work is based on the Ayurvedic principle of Aushadhi Chikitsa. Cow-urine is a known appetizer (Agnivardhaka). Since Agnimandya is responsible for all types of the diseases, Gomutra through its Agnivardhaka effect relieves the Agnimandya. Cow-urine acts on the large intestine through its Mala-bhedana effect. This results into the smooth excretion of stool, thereby providing a greater relief to the patients of hemorrhoids e.g. relief from pain during defecation, bleeding, perianal itching¹⁸.

A clinical evaluation of efficacy of cow urine in hemorrhoids showed significant relief from pain during defecation, bleeding, perianal itching in Grade I & Grade II hemorrhoids thereby proving the oral supplementation with the cow-urine preventing the time-consuming, painful and expensive complication of Hemorrhoids of Grade I & grade II ¹⁹.

Hepatoprotective activity:

Panchgavya formulation when evaluated for hepatoprotective effects in rats using carbontetrachloride induced toxicity produced positive results. The parameters for protection was determined by measuring levels of serum marker enzymes like serum glutamate oxaloacetate transaminase (SGOT) serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP) and acid phosphatase (ACP). Silymarin was used as the standard drug for comparison. Panchgavya Ghrita (150-300 mg/kg, p.o.) markedly prevented CCl₄ induced elevation of levels of SGPT, SGOT, ACP and ALP. The results were comparable to that of standard drug Silymarin. Histopathological comparison of liver tissues exhibited almost normal architecture, as compared to control group ²⁰.

CNS Effects:

Antiepileptic activity:

Panchgavya Ghrita(PG) was screened for some neurological parameters in rats and it was found that PG protected rats from maximal electroshock (MES) induced convulsions, increased the spontaneous motor activity as measured by actophotometer and inhibited the pentobarbitone induced sleep time in rats without much influence on the general behavior of the rats except increase in the general activity. PG appears to possess anti convulsant property but the degree of protection might not be sufficient to use it as single antiepileptic agent. It is concluded that PG can be used as adjuvant in treatment of epilepsy ²¹.

Antistress Activity:

Panchgavaya Ghrita(PG) along with ethanolic extracts of Aloe barbadensis Mill was evaluated for antistress activity using Tail suspension model in mice against Alprazolam as standard. The combination was found to possess significant

antistress potential at the level $p < 0.01$ as compared with standards and controls. The synergistic action of Panchgavya ghrita and Aloe extract was attributed to the increased levels of GABA and decreased levels of dopamine and plasma corticosterone levels ²².

Nootropic activity:

Nootropic activity of Panchgavya Ghrita (PGG) was studied using Diazepam induced amnesia in mice and Morris Water Maze (MWM) test in rat model. Piracetam was used as standard drug. Panchgavya ghrita successfully reversed the amnesia induced by Diazepam (1mg/kg, i.p.). PGG was administered in three dose levels of PGG as X/2 (2.5gm/kg), X (5gm/kg) and 2X (10gm/kg) in mice and X/2 (1.75gm/kg), X (3.5gm/kg) and 2X (7.0gm/kg) in rats for 21 days. EPM test showed significant effect of 5gm/kg dose of Panchgavya ghrita. Also, Piracetam and Panchgavya ghrita at 3.5gm/kg have significant memory enhancement action in MWM test in rats suggesting possible use of PGG as adjuvant in mental disorder treatments ²³.

Immunomodulatory activity:

Cow urine distillate was found to have immunomodulatory effect as it enhances proliferation of T and B lymphocytes, blastogenesis and increases levels of IgG in mice and chicks (avian species) ^{24,25}.

Distillate and redistillate of Cow's urine was studied for protective effects on Human Polymorphonuclear Leukocytes challenged with established genotoxic chemicals. Actinomycin-D (0.1 μ mol/L) and hydrogen peroxide (150 μ mol/L) were used for inducing DNA strand break with 0.1% DMSO as negative control. The antioxidant status and volatile fatty acid levels were determined. The study showed that both actinomycin-D and peroxide caused statistically significant DNA unwinding of 80% & 75% respectively ($P < 0.001$) as revealed by fluorimetric analysis of DNA unwinding (FADU) but the damage could be protected with the redistilled cow's urine distillate (1, 50 & 100 μ L). The redistillate of cow's urine was found to possess total antioxidant status of around 2.6 mmol, contributed mainly by volatile fatty acids (1500

mg/L) as revealed by the GC-MS studies. These fatty acids and other antioxidants might cause the observed protective effects ²⁶.

The redistilled cow's urine distillate(RCUD) was found to possess strong antigenotoxic and anticlastogenic properties against human polymorphonuclear leukocytes(HPNLs) and human peripheral lymphocytes(HLC) in-vitro when treated with Cr^{+6} and MnO_2 . Manganese dioxide and hexavalent chromium are established genotoxicants and clastogens which could cause induction of DNA strand break, chromosomal aberration and micronucleus. Three different levels of RCUD- 1 $\mu\text{L/mL}$, 50 $\mu\text{L/mL}$ and 100 $\mu\text{L/mL}$ were used in the study. RCUD showed statistically significant against DNA strand break, chromosomal aberration and micronucleus formation. The effects can be contributed to the antioxidants present in RCUD ²⁷.

Antimicrobial and Antifungal activity:

In a study of Cow Urine Distillate against some clinical pathogenic microorganisms like *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Salmonella typhi* and fungus *Aspergillus niger* and *Aspergillus flavus*. Antibacterial activity of Cow Urine Distillate (5, 10 and 15 μL) when analyzed against the pathogenic microbes it was observed to be maximum against *Pseudomonas aeruginosa* (7.06 \pm 0.05, 8.08 \pm 0.18 and 10.4 \pm 1.23, mm in diameter, respectively) and *Salmonella typhi* (6.3 \pm 1.23, 8.06 \pm 0.17 and 10.4 \pm 1.2, mm in diameter, respectively). Antifungal activity of cow urine distillate was analysed against *Aspergillus niger* and *Aspergillus flavus* and comparison showed maximum growth suppression in *Aspergillus niger* (3 \pm 0.14, 6.3 \pm 1.2 and 7.06 \pm 0.04, mm in diameter) than *Aspergillus flavus* (2.03 \pm 0.25, 4.9 \pm 0.26 and 6.3 \pm 1.2, mm in diameter, respectively) ^{28,33}.

Anti microbial activity of cow urine and its distillate was tested using agar well method against microbes like *Escherichia coli*, *Staphylococcus aureus*, *Staphylococcus epidermitis*, *Bacillus subtilis*, *Klebsiella pneumoniae* and *Proteus vulgaris*. It was also found that cow urine and its distillate inhibited the free radicals as seen from scavenging of super oxide and DPPH radicals. Comparatively fresh cow urine was found to be

more active than its distillate. Comparatively fresh cow urine exhibited better activity as compared to its distillate. The activity of fresh cow urine was comparable with that of the standard, Ofloxacin ²⁹. Study of the antimicrobial activity of fresh Cow urine, photo activated Cow urine, Cow urine Distillate and sterile Cow urine on pathogens like *Bacillus subtilis*, *Escherichia coli*, *Proteus vulgaris*, *Salmonella typhi* and *Staphylococcus aureus* showed prominent effectiveness of photo activated Cow urine and sterile Cow urine to counter the pathogens whereas all the four cow urine samples promoted best antimicrobial activity against *Salmonella typhi* and *Bacillus subtilis* ^{30, 32, 34}.

Study of Cow urine extract of *Azadirachta indica* for its antimicrobial activity against Multi Drug Resistant (MDR) clinical isolates showed that Cow urine extract of *A.indica* is more active in comparison to its organic fraction for MDR *E.coli* and *Klebsiella pneumoniae*. Cefixime was used as standard ³¹.

Wound Healing and Antiulcer activity:

In a case study on a wound in a buffalo which did not respond to variable treatment that ranges from simple herbal preparation like turmeric to modern medicines (antibiotics) responded very well to the treatment by a formulation containing cow's ghee. Cow's ghee has been reported to exert significant wound healing activity. Its antifungal activity has also been shown to be independent of any antibiotic or antifungal agent, which may be included into the formulation. Ghee contains several saturated and unsaturated fatty acids which are capable of taking part in metabolic processes involved in any wound healing. It seems therefore worthwhile that the cow's ghee is explored further as an effective clinical agent ³⁵.

A study of wound healing activity of preparation containing *Aegle marmelos* leaves and cow ghee showed enhanced and rapid healing. The effects produced by topical application of combination of *Aegle marmelos* leaves extract and cow ghee with reference to wound contraction, wound closure, decrease in surface area of wound and tissue regeneration at the wound site were studied. The

wound healing activity was found to significant as the wound was healed completely in eight days³⁶.

Study of wound healing activity of cow urine in wistar albino rats by excision wound model revealed significant healing activity of cow urine. The parameter studied was the rate of wound contraction. The studies on excision wound healing revealed that there was a decrease in wound area. External application of urine showed significant increase in wound healing in male and female rats after Day 4 as compared to all other groups. However till the end of 14th day animals showed that only 0 % and 0.40.4 % of healing was left, which may be due to normal immunity of the animals whereas nitrofurazone, standard drug treated animals showed 0 % and 0.50.3 % healing. Study revealed that the cow urine on external application to the wound fastened the healing process³⁷.

In a study to evaluate the cow ghee containing formulation of *Aloe vera* for wound healing potential, histological examinations revealed good keratinization, epithelization, fibrosis and collagenation indicative of good healing process. The results were comparable with Framycetin sulphate cream (1% w/w). Incision wound for tensile strength, excision wound contraction and histological observations of regenerated tissues were used to investigate the healing potential of the formulation³⁸.

Eye Lubricant activity:

Computer Vision Syndrome (CVS) characterized by burning sensation, dryness, redness and itching in the eyes are related to Netradaha, Netrarukshtava, Netralalima, Netrakandu in Ayurveda. Lubricating drops can reduce the effects of dry eye in the syndrome. But its preservatives posses harm to eye. So long term use is not possible and effects of lubricating drops are temporary. A recent study in Japan revealed that the majority of lubricating eye drop users are not satisfied with the therapeutic effects. Goghrita (Cow ghee) is Snehonattam. It posses properties of Snigdha, Guru and Mrudu and because of these properties Goghrita is very useful for vitiated pitta and vatta dosha in CVS. Cow ghee has lubricating property which may be useful in reducing the

symptoms of CVS. It contains Vitamin A 3500/100gm, beta-carotene and Vitamin E. Vitamin A keeps the outer lining of eye ball moist and prevent blindness. Beta-carotene and Vitamin E are well known antioxidants. So Goghrita Eye drops (Aschyotana) can be used as alternative treatment in Computer Vision Syndrome³⁹.

CONCLUSION: This study concludes that cow possess a tremendous pharmacological and therapeutic potential. The reason behind the use of these cow derived products by the Indian civilization since a long time is justified from the research findings of various experimental studies on both human beings and animals. The grant of US Patent to the efficacy of cow urine in treatment of various deadly diseases has given a backup support for the researchers for further exploration of pharmacological potential of cow derived products. The cow derived products are proved to possess anticancer, antidiabetic, antimicrobial, antiseptic, antibacterial, antifungal, immunomodulatory, hepatoprotective, anticonvulsant, antistress, analgesic, antihemorrhoids and many other therapeutic uses which are still to be explored.

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