

DRUGS ACTING ON THE SKIN AND MUCOUS MEMBRANES

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Background

- The integument or skin is the largest organ of the body, making up 16% of body weight, with a surface area of 1.8m².
- It has several functions, the most important being to form a physical barrier to the environment, allowing and limiting the inward and outward passage of water, electrolytes and various substances while providing protection against micro-organisms, ultraviolet radiation, toxic agents and mechanical insults.
- There are three structural layers to the skin: the epidermis (The external layer mainly composed of layers of Keratinocytes but also containing Melanocytes, Langerhans cells and Merkel cells), the dermis (The area of supportive connective tissue between the epidermis and the underlying subcutis: contains sweat glands, hair roots, nervous cells and fibers, blood and lymph vessels) and subcutis (The layer of loose connective tissue and fat beneath the dermis).
- Hair, nails, sebaceous, sweat and apocrine glands are regarded as derivatives of skin.
- Skin is a dynamic organ in a constant state of change, as cells of the outer layers are continuously shed and replaced by inner cells moving up to the surface.
- Although structurally consistent throughout the body, skin varies in thickness according to anatomical site and age of the individual.
- The skin is an area of the body that gives a disproportionate number of therapeutic problems, particularly in small animals.
- The underlying cause of persistent eczemas is often obscure, leaving the veterinary surgeon little choice but to attempt symptomatic treatment with what agents he/she has at his/her disposal.

Drugs acting on the skin and mucous membranes can be broadly classified in to the following categories:

1. Dermatological vehicles
2. Preparations for allergic, inflammatory and other immune mediated skin conditions.
These include:
 - a). Corticosteroids
 - b).Immunosuppressant's
 - c). Antihistamines
 - d).Essential fatty acid preparations
 - e). Prostaglandin E₁ analogues
3. Sunscreens
4. Anti-infective skin preparations
5. Keratolytics and Keratoplastic agents
6. Shampoos
7. Wound Management

8. Preparations for the ear

- Systemic disorders may also be responsible for clinical signs affecting the skin- e.g. hormonal disturbances including hypothyroidism or hyper-adreno-corticism, nutritional deficiency of for example zinc (Leading to parakeratosis-defined as hyperkeratinization of the epithelial cells of skin and esophagus (Joseph M. Nguta, MSc Thesis (UON), 2007; Joseph Nguta, In: Essential Trace Elements in Human and Animal Health, LAP Academic Publishers, Germany, 2010), in cattle and pigs fed on zinc deficient diet, or neoplasia such as exocrine pancreatic adenocarcinoma exhibited as feline paraneoplastic alopecia.

A). DERMATOLOGICAL AGENTS

- The skin is amenable (responsive) to treatment by local application of drugs because there is immediate contact between drug and target tissue.
- Both the vehicle and the active ingredients are important in treatment. The vehicle affects the degree of hydration of the skin, may have a mild anti-inflammatory effect, and may aid the penetration of the active ingredients into the skin.
- Before application of a topical preparation, it is important to prepare the area for treatment by clipping away hair or wool and removing contaminating debris with disinfectants or cleansing agents.
- The importance of skin preparation and regular application of treatment to the affected area should be stressed to the pet owners.
- The tendency for animals to lick the affected area immediately after application can be a major problem, especially in cats, and may result in worsening of the skin condition.
- Licking may be reduced by applying the preparation before feeding or exercise (which distract the animal) or by using methods of restraint such as an Elizabethan collar.
- Licking of treated areas also makes it important to avoid using substances that are potentially toxic if ingested.
- Hypersensitivity reactions to topical preparations may occur, leading to both local and systemic manifestations.
- For skin disorders, formulations are available as powders, sprays, shampoos, lotions, gels, creams and ointments. The choice of vehicle depends on the type of lesion and convenience of application.

- **a). Creams**
- Are water miscible and readily removed by licking and washing.
- They are less greasy and easier to apply than ointments.
- Aqueous cream, which soothes and hydrates the skin, is used as an emollient (These are substances that soften and sooth the skin) in the treatment of dry, scaling lesions.
- Frequent application is desirable. Available preparations include:

Aqueous cream: Emulsifying ointment 30%, phenoxyethanol 1%, in freshly boiled and cooled purified water.

b). Ointments

- Are greasy, normally anhydrous, insoluble in water and more occlusive than creams.
- Ointments are also effective emollient preparations.
- Ointments are used for chronic dry lesions and should be avoided in exudative lesions.
- The more commonly used ointment bases consist of soft paraffin or soft paraffin and liquid paraffin with hard paraffin.
- Such greasy preparations may not be suitable for pets in household conditions because they may stain furniture.
- Ointment preparations include:

Emulsifying ointment: Emulsifying wax 30%, white soft paraffin 50%, and liquid paraffin 20%.

Hydrous wool fat (Lanolin): Wool fat-50% in freshly boiled and cooled purified water.

White soft paraffin (White petroleum jelly)

Yellow soft paraffin (Yellow petroleum jelly)

c). Dusting powders

- Are finely divided powders that contain one or more active ingredients.
- Generally, they absorb moisture, which discourages bacterial growth.
- Dusting powders should not be used on wet, raw surfaces because adherent crusts and caking may result: they may be used in the treatment of wound infections.

d). Lotions

- Are usually aqueous solutions or suspensions for application without friction to inflamed unbroken skin.
- They cool by evaporation of solvents, require frequent application, and may leave a thin film of drug on the skin.
- Lotions are used in hairy areas and for lesions with minor exudation and ulceration.
- Care must be taken with nervous or excitable animals because lotions containing volatile substances can sting on application.
- Available preparations include:

Calamine (Non-proprietary)

Lotion –containing calamine 15%, zinc oxide 5%, glycerol 5%, bentonite 3%, sodium citrate 0.5%, liquefied phenol 0.5% in freshly boiled and cooled water to 200 ml.

Oily lotion-(BP 1980) containing calamine 5%, arachis oil 50%, oleic acid 0.5%, wool fat 1% in calcium hydroxide solution to 200 ml.

e) Pastes

- Are stiff preparations containing a high proportion of finely powdered solids.
- They are less occlusive than ointments and are used mainly for circumscribed, ulcerated lesions.
- Zinc oxide is a mild *astringent* (a chemical compound that tends to shrink or constrict body tissues) and has soothing and protective properties.
- Magnesium sulfate paste is used in the treatment of minor skin infections.
- Preparations available include:

Compound zinc sulfate paste- containing zinc oxide 25%, white soft paraffin 50%

Magnesium sulfate paste (Morison's paste)-Containing dried magnesium sulfate 45g, phenol 500mg, anhydrous glycerol 55g.

f). Gels

- Are semi solid aqueous solutions that are easy to apply, not greasy, miscible with water and wash off easily.

g). Sprays

- Are used as pressurized aerosols or in spraying units.
- They may be economical to use because of the ease of application with little waste, and can be easily directed.
- Sealed packaging means the risk of contamination of the remaining constituents is minimized.
- Additionally, the cooling effect produced by the evaporation of solvents may be beneficial in certain conditions.
- Some animals may show signs of anxiety in response to the noise produced by the spray.

h). Shampoos

- Are used as complementary therapy in association with other treatment or as sole preparations in the long term management of certain disorders such as seborrhea (a skin condition in which there is excessive secretion by the sebaceous glands, forming crusts with scales from the skin and dirt. (Also known as hypersteatosis or seborrhoeic dermatitis).
- They help to clean the skin and remove crusts and debris.
- Shampoos are formulated to reduce any irritant effects and are generally well tolerated.
- Effective rinsing is essential after the recommended contact time.
- Shampoos are indicated as vehicles for antipruritic and keratolytic drugs and for skin disinfecting and cleansing preparations.
- Shampoos can be poor vehicles for ectoparasiticides because they are rinsed off after use and therefore afford no residual protection if the parasite is still present in the environment: this is particularly important in the treatment of flea infestation.

i). Colloids

- Are painted on to the skin and allowed to dry to leave a flexible film over the site of the application.
- In veterinary medicine, their main use is to “seal” the teats of non lactating cows.
- Available preparations include:

Flexible collodion- containing castor oil 2.5%, colophony 2.5%, in a collodion basis, prepared by dissolving pyroxylin (10%) in a mixture of 3 volumes of ether and 1 volume of alcohol (90%). **Warning:** Highly flammable.

j). Liniments

- Are liquid preparations for external application usually by massage that contain analgesics and rubefacients (a substance for external application that produces redness of the skin by causing dilatation of the capillaries and an increase in blood circulation).

B). PREPARATIONS FOR ALLERGIC, INFLAMMATORY AND OTHER IMMUNE-MEDIATED SKIN CONDITIONS

- A wide variety of causative factors may be involved in these skin conditions.
- The selection of the type and duration of treatment depends on the inflammatory disease present.
- In every case, the underlying cause(s) should be identified and eliminated, if possible. If this can be done, long-term anti-inflammatory therapy is unnecessary.
- Hypersensitivity reactions to environmental allergens, including house dust mites, forage mites, danders, moulds, pollens, insect-bites-particularly fleas, and foods, are common causes of chronic dermatitis in dogs and cats.
- Diagnosis for environmental allergens may be possible by provocative intra-dermal testing or by *in vitro* measurement of allergen specific IgE in serum.
- Phenothiazines may have an antihistaminic effect and their use as sedatives should be avoided before hypersensitivity testing.
- Contact allergy is a relatively uncommon cause of dermatitis.
- Irritant contact reactions are more likely to induce inflammatory lesions on contact areas and relatively hairless parts of the skin.
- Ideally, allergies should be remedied by separation of the affected animal from the source of allergens. This is usually possible in contact or food allergy but may be difficult to achieve in the other allergic skin diseases.
- Allergies to dusts and pollens (atopy) can be controlled by hypo-sensitization using vaccines containing the allergens to which the animal has been shown to react.

- Various protocols for vaccine administration are used but generally these start with vaccination at short intervals over a period of weeks during the induction phase and then at approximately monthly intervals during maintenance which continues indefinitely. Manufacturers supply appropriate protocols with the vaccines.
- There is a risk of adverse reactions to the vaccines, including anaphylaxis, and thus vaccination must be monitored carefully, although adverse effects are rarely seen. A good response may be obtained in about 50% of dogs.
- Drug reactions may cause a very broad range of clinical signs ranging from urticaria and swelling to severe, acute, generalized and often fatal diseases such as erythema multiforme major and toxic epidermal necrolysis.
- Such reactions may occur in response to recently administered drugs but may also be caused by reactions to bacterial infections, tumors and agents in-corporated in the diet.
- Auto-immune dermatosis such as the pemphigus complex can be seen in drug reactions but may also arise when no causative factor can be identified.
- In general, hypersensitivity diseases require much less aggressive therapy than the auto-immune dermatoses.
- The following drug classes are used:

1. Corticosteroids

2. Immunosuppressants

3. Antihistamines

4. Topical anti-inflammatory skin preparations

5. Essential fatty acid preparations

6. Prostaglandin E₁ analogues

1. Corticosteroids

- Systemic corticosteroids are of great value in the treatment of inflammatory and immune-mediated skin conditions.
- Oral preparations with a short duration of action are preferred because therapy can be discontinued swiftly if adverse effects are seen.

- This is not possible with longer acting, injectable agents.
- In addition, fewer side-effects are associated with the use of short acting oral drugs than with other formulations of corticosteroids.
- However in severe acute diseases, short acting injectable corticosteroid formulations may be favored.
- In chronic diseases where corticosteroids are indicated, alternate day therapy should be used to minimize the risk of adrenal suppression.
- Depot corticosteroids such as methylprednisolone acetate should be reserved for cases in which the use of short acting preparations is impaired, for example in dogs or cats that will not tolerate oral dosing and the patient cannot be medicated by mouth.
- The dose and the type of corticosteroid used depend on the form and severity of the disease present.
- Topically, allergic diseases are managed with oral prednisolone at a dosage in dogs of 500 micrograms/kg (0.5mg/kg) daily or methylprednisolone at a dosage of 400 micrograms/kg (0.4mg/kg) daily until the pruritus is controlled and the dose is tapered to achieve the minimum effective alternate day dose.
- The dose should be reduced once remission is achieved.
- Glucocorticoid therapy may cause adverse effects (such as unacceptable polyuria, polydipsia and polyphagia) in some animals and alternate forms of therapy may be needed as an adjunct or a substitute for corticosteroids.
- Cats typically require double the corticosteroid doses used in dogs.
- Combination of antihistamines and corticosteroids with essential fatty acids has been shown to enhance their efficacy and enable lower doses of corticosteroids to be used for allergic conditions.
- In auto-immune diseases, much higher daily dosages are required (2 to 4mg/kg prednisolone or 1.5 to 3.0 mg/kg methylprednisolone for dogs).
- Such high dosages may be poorly tolerated and other immunosuppressive drugs such as azathioprine, gold salts, or chlorambucil may be needed as additional therapy in order to allow a reduction in the dose of glucocorticoids.
- However the management of such severe diseases with potentially toxic drugs should be undertaken with caution.

- Megestrol acetate should not be used to control, “feline milliary dermatitis” (papular crusting dermatitis) or eosinophilic granuloma complex. The side-effects are unacceptable and equally good effects can be obtained with corticosteroids.

2. Immunosuppressants

Ciclosporin (Cyclosporin):

- Ciclosporin (Cyclosporin) is a lipophilic cyclic polypeptide secreted by the fungus *Tolypocladium inflatum*.
- Ciclosporin blocks the transcription of the genes encoding several cytokines. Its main effect is achieved by blocking transcription of IL-2 and subsequently its synthesis. Secondary effects include inhibition of IFN gamma (Interferon gamma); IL-3, IL-4, IL-5, IL-8 and granulocyte macrophage colony stimulating factor (GM-CSF).
- As a result, ciclosporin affects the function of mast cells, eosinophils, and antigen presenting cells.
- These effects include inhibition of eosinophil survival, release of toxic granules, cytokine secretions and recruitment of eosinophils to the site of inflammation, inhibition of mast cell survival, activation, degranulation and reduction in the number of epidermal langerhans cells and cytokine secretion from keratinocytes.
- Ciclosporin is a potent immunomodulator used for organ transplantation and immune-mediated dermatological conditions in humans.
- More recently, it has been used in dogs for atopic dermatitis, peri-anal fistulas, sebaceous adenitis, cutaneous lupus and idiopathic sterile nodular panniculitis. Initial studies showed ciclosporin to be ineffective as sole therapy for pemphigus complex.

Side effects

- Despite its low cytotoxicity relative to its immunosuppressive potency, patients should be closely monitored for adverse effects.
- The more immediate side effects include gastro-intestinal disturbances such as anorexia, vomiting, diarrhea and abdominal discomfort, and also involuntary shaking. Other signs include gingival hyperplasia, papillomatosis, hirsutism, immunosuppression, nephropathy and infections.

- Particular care should be taken in cats predisposed to viral infections, toxoplasmosis and renal failure.
- Nephrotoxicity and hypertension have been well documented in humans on long term therapy. They have not been well documented in dogs and cats, however, monitoring blood pressure in predisposed animals is recommended.

Drug interactions

- Interactions with drugs that inhibit cytochrome P-450 microsomal enzyme activity increase serum ciclosporin concentration, which can potentiate toxicity.
- Most of the evidence is documented in humans and mice; however, interaction with ketoconazole has been reported in dogs.
- Monitoring levels of ciclosporin in the blood is recommended when combined with ketoconazole or other drugs known to interfere with ciclosporin metabolism.

Indications

Atopic dermatitis; ocular disease; immune-mediated diseases as an immunosuppressant; perianal fistula; furunculosis; sebaceous adenitis.

Contra-indications

- Dogs less than six months of age or less than 2kg body weight
- Animals with history of malignant disease or progressive malignant disorders
- Vaccination during or within 2 weeks of treatment
- Diabetes mellitus
- Concomitant use of other immunosuppressants

Warnings

- Serum creatinine concentration should be monitored in animals with renal impairment.
- Risk/benefit should be assessed before use in breeding dogs;
- Care with concurrent ketoconazole, fluconazole, itraconazole, diltiazem, erythromycin, clarithromycin, norfloxacin, phenytoin, metoclopramide and vitamin E.

Dose

Administration at least 2 hours before or after feeding directly into the animal's mouth.

Dogs:

Atopic dermatitis, by mouth, 5mg/kg once daily until clinical improvement, usually 4 weeks, and then 5mg/kg on alternate days or every 3-4 days.

Available preparations include:

POM (Prescription only medicine) Atopica (Novartis) UK

Capsules, ciclosporin 10mg; 25mg; 50mg; 100mg, for dogs.

3. Antihistamines

- Antihistamines are antagonists of the histamine H₁ receptor and include: chlorphenamine; clemastine; diphenhydramine; hydroxyzine; promethazine; mepyramine; tripelemamine and alimemazine. H₂ receptor antagonists are ineffective.
- Antihistamines diminish or abolish the main actions of histamine in the body by competitive reversible blockade of histamine receptor sites.
- Histamine is only one of many autacoids involved in hypersensitivity reactions and so antihistamines have limited use in the treatment of allergic disorders in animals.
- The effects of antihistamines may not be observed for 1 to 2 weeks and they are most effective for preventing rather than for rapidly reducing pruritus.
- Some authorities indicate initial use of glucocorticoids in conjunction with antihistamines. Glucocorticoid therapy is stopped when pruritus is eliminated; antihistamine treatment is continued.
- Systemic antihistamines may be used to control pruritus in allergic reactions such as urticaria and allergic skin problems including food allergies.
- It is generally accepted that 10% to 15% of dogs are likely to respond to treatment with H₁ receptor antagonists but there is considerable individual variation between dogs and it is not possible to predict which antihistamines will be effective in any particular dog.
- Orally administered antihistamines reported to be effective include: chlorphenamine; clemastine; diphenhydramine; hydroxyzine and alimemazine.
- In cats, efficacy has been reported with chlorphenamine and clemastine.
- Antihistamines are frequently sedative. Combination preparations of antihistamines and corticosteroids are available in some countries.

Alimemazine tartrate

Indications

Pruritus in allergic skin dis-orders

Side effects

CNS depression, drowsiness

Dose

Dogs with pruritus, 1-2 mg/kg, orally, 3 times daily. Available preparations include:

POM (Prescription only medicine) Vallergen (Castlemed) UK

Tablets, alimemazine tartrate, 10mg,

Syrup, alimemazine tartrate, 1.5 mg/mL

Syrup forte, alimemazine tartrate, 6 mg/mL

Chlorphenamine maleate (Chlorpheniramine maleate)

Indications

- Pruritus in allergic skin dis-orders
- Pre-medication for drugs that may induce anaphylactic reaction
- mild sedation
- compulsive scratching

Contra-indications

- Urine retention
- Glaucoma
- Hyperthyroidism

Dose

a).Dogs:

i). Pruritus in allergic skin dis-orders, by mouth, 4-8 mg, 2-3 times daily (Maximum dose 500 micrograms/kg twice daily).

ii). Behavior modification, by mouth, 220 micrograms/kg, 3 times daily (Maximum dose, 1 mg/kg daily)

iii). Premedication, by slow intravenous injection over one minute, 5-10 mg diluted in syringe with blood.

b). Cats

i). Pruritus in allergic skin dis-orders, by mouth, 2-4mg twice daily

ii). Behavior modification, by mouth, 1-2 mg/cat, 2-3 times daily (low dose); 2-4mg/cat twice daily (high dose)

iii). Premedication, by slow intravenous injection over one minute, 5-10 mg diluted in syringe with blood. *Preparations available include:*

Chlorphenamine (Non-proprietary) UK

- **P tablets (Pharmacy only product), chlorphenamine maleate 4mg**
- **P oral solution, chlorphenamine maleate 400microgral/mL;**
- **POM injection, chlorphenamine maleate 10 mg/ml**

Clemastine

Indications

Pruritus in allergic skin conditions

Dose:

Dogs, Cats: 100 microgram/kg, orally, given twice daily. *Available preparations include:*

P Travegil (Novartis Consumer health) UK

Tablets, scored, clemastine as hydrogen fumarate, 1 mg.

Diphenhydramine hydrochloride

Indications

- Pruritus in allergic skin dis-orders
- relief of coughing

- mild sedation
- motion sickness

Contra-indications

- Urine retention
- Glaucoma and
- hyperthyroidism

Side effects

CNS depression; drowsiness

Dose

a).Dogs

Usually by mouth.

- i). Motion sickness, 2-4 mg/kg, 3 times daily
- ii). Pruritus, 2 mg/kg, 3 times daily
- iii). Sedation, 2-4 mg/kg, 2-3 times daily.

b). Cats

2-4 mg/kg, 2-3 times daily. *Available preparations include:*

P Nytol (GSK Consumer Healthcare) UK

Tablets, diphenhydramine hydrochloride 2.5 mg, 50 mg.

4. Essential fatty acids (EFAs).

- Zinc, niacin, retinol (Vitamin A) and vitamin C are co-factors favoring the conversion of dihomogamma-linolenic acid to the anti-inflammatory 1 series.
- EFA deficiency leads to the development of a dry, scurfy coat, hair loss, epidermal peeling and exudation, skin lichenification and increased susceptibility to infection.
- Frank EFA deficiency is uncommon in animals fed normal diets but may occur as a result of intestinal mal-absorption, and hepatic or pancreatic impairment.

- There is evidence that EFA supplementation can ameliorate allergic skin diseases, particularly atopy in the dogs and can lead to improvements in coat condition.
- It may aid in the control of “miliary dermatitis” (Papular crusting dermatitis) in cats.
- Dietary supplementation with evening primrose oil, and with mixtures of evening primrose oil and marine fish oil, has been shown to be effective in canine atopy (Also known as canine atopic dermatitis is an allergy in dogs that are sensitive to environmental allergens, such as pollens, spores or dust).
- Although the effect appears to be dose-related, optimum dosages and the most effective combinations of these oils have not yet been determined.
- Daily doses of 172 mg/kg of evening primrose oil with 44 mg/kg of marine fish oil have been used in dogs over periods of one year without ill effects.
- In cats, preliminary data indicate some efficacy in allergic skin disease at doses of evening primrose oil of 0.5 to 1.0 g daily and fish oil up to 107 mg daily.
- Side effects are rare and may include mild and transient diarrhea and vomiting.
- These effects can be minimized and absorption of the oils increased if they are given with food.
- Evening primrose oil may lower the seizure threshold and should be used with caution in epileptics.
- If there is evidence of intolerance to fish, then fish oil should be avoided.
- Recent studies have shown that high dosage of marine fish oil alone can be effective in reducing inflammation in canine atopy. Proprietary preparations of EFAs are available, and they may also contain vitamins and minerals.

Essential fatty acids

Indications

Pruritus; dermatitis

Available preparations include:

Coatex (Vetplus) UK

Capsules or oral liquid, docosahexaenoic acid 10.7mg, gamolenic acid 110mg, linolenic acid 190 mg, eicosapentaenoic acid 154mg, vitamins, minerals, for dogs, cats.

Complederm (Virbac) UK

Oral liquid, docosahexaenoic acid 4.45mg, eicosapentaenoic acid 6.75mg, gamolenic acid 2.02 mg, linoleic acid 460 mg/mL, vitamins, minerals, for dogs, cats

Dose: *Dogs, cats*, by mouth, 5-25ml (depending on body weight and condition) daily with food.

GSL (a product that can be sold over the counter to the general public) Efa Coat Oil (Schering-plough) UK

Drops, gamolenic acid 18.4mg, linolenic acid 145 mg/5drops, vitamins, for dogs and cats.

Dose

Dogs, by mouth, 8 drops; *Cats*, by mouth, 5 drops; *Kittens*, by mouth, 1-2 drops

GSL Efa Vet 330 (Schering-Plough) UK

Capsules, docosahexaenoic acid 3.4 mg, eicosapentaenoic acid 5.15mg, gamolenic acid 15.4 mg, linoleic acid 138.6mg, vitamins, minerals, for dogs, cats.

Dose: *Dogs, cats*, by mouth, 1 capsule/5kg with food.

GSL Efa Vet 660 (Schering-Plough) UK

Capsules, docosahexaenoic acid 6.8 mg, eicosapentaenoic acid 10.3 mg, gamolenic acid 30.8mg, linoleic acid 277.2mg, vitamins, minerals, for dogs.

Dose

Dogs, by mouth, 1 capsule/10 kg with food.

GSL Efa Vet Regular (Schering-Plough) UK

Capsules, docosahexaenoic acid 11.6 mg, eicosapentaenoic acid 17.3 mg, gamolenic acid 34.4 mg, linoleic acid 309.6 mg, vitamin E 10mg, for dogs and cats.

Dose

Dogs, cats, by mouth, 1 capsule/10kg with food.

Note: For maintenance following Efa-Vet™ 660 supplementation.

Nutriderm (Ceva) UK

Capsules, docosahexaenoic acid 12 mg, gamolenic acid 40 mg, linoleic acid 300mg, eicosapentaenoic acid 18 mg, for dogs, cats.

Dose

Dogs, by mouth, (up to 12 kg body weight) 1 capsule daily: (>12 kg body weight), 2 capsules daily.

Cats, by mouth, 1 capsule daily.

Viacutan (Boehringer) UK

Oral liquid, docosahexaenoic acid 6.6 mg, eicosa-pentaenoic acid 9.9 mg, gamolenic acid 105mg, linoleic acid 190 mg, vitamin E 10 mg/unit dose, for dogs, cats (1 unit dose=0.55mL)

Dose

Dogs, cats, by mouth, 1-2 dose units/10 kg.

5. Prostaglandin E₁ analogues

- The pathogenesis of atopic dermatitis is complex, and several different mechanisms are involved, not all of which are fully understood.
- There is evidence, that several types of inflammatory cells including mast cells, B and T lymphocytes, neutrophils and eosinophils are involved in atopic dermatitis.
- The late phase reaction, seen between the 6th and the 24th hour is due to infiltration of inflammatory cells by chemosis at the site of inflammation following an immediate hypersensitivity reaction.
- In atopic humans, misoprostol, a synthetic analogue of prostaglandin E₁, selectively inhibits the late phase reaction by blocking the secretion of cytokines by TH1 cells-T lymphocytes expressing CD4 cells are also known as helper T cells, divided into Th1 and Th2 (Type 1 helper (Th1) cells produce interferon-gamma, interleukin (IL)-2, and tumour necrosis factor (TNF)-beta, which activate macrophages and are responsible for cell-mediated immunity and phagocyte-dependent protective responses.
- By contrast, type 2 Th (Th2) helper cells produce IL-4, IL-5, IL-10, and IL-13, which are responsible for strong antibody production, eosinophil activation, and inhibition of several macrophage functions, thus providing phagocyte-independent protective responses.

- Th1 cells mainly develop following infections by intracellular bacteria and some viruses, whereas Th2 cells predominate in response to infestations by gastrointestinal nematodes, granulocyte activation, and chemotaxis of inflammatory cells.
- A randomized placebo controlled study in dogs showed a 30% improvement in the level of pruritus and skin lesions after 3 weeks of treatment with misoprostol.
- This drug may be of value in dogs where adverse effects of glucocorticoids and the cost of ciclosporin preclude their use.

Misoprostrol

Indications

- Canine atopic dermatitis
- NSAID-associated gastric and duodenal ulceration

Contra-indications

Pregnant animals

Side effects

They are dose dependent and may include: diarrhea; abdominal pain; nausea; abortion in pregnant animals.

Warnings: Pregnant women should avoid exposure to misoprostrol.

Dose: *Dogs*, by mouth, 5 micrograms/kg 3 times daily.

C). Sunscreens

- Exposure of the skin to ultra-violet light causes damage that is related to the light intensity, duration of exposure and skin sensitivity.
- Phototoxic reactions occur in skin with low levels of pigmentation which are not protected by the coat.
- The resulting solar dermatitis varies from a mild erythematous and scaling reaction to swelling with associated cysts, bullae, folliculitis, furunculosis, and scarring.
- Chronic light exposure may lead to the development of squamous cell carcinoma.

- Photosensitivity reactions are caused when photodynamic agents in the skin are exposed to ultraviolet light and cause tissue damage.
- Photodynamic agents may be generated by abnormalities of hepatic function, aberrant pigment synthesis, or may be derived from substances, ingested, injected, or absorbed through the skin.
- The increasing levels of ultraviolet light penetration, which are now being experienced, are leading to an increasing amount of damage to the skin.
- Animals that spend a lot of time outdoors and which are sparsely coated or lacking in pigmentation are especially at risk.
- Sun avoidance is the best solution but protective clothing and use of topically applied stains for example felt-tipped pen on depigmented skin are effective.
- Sunscreens which are water resistant and have a sun protection factor (SPF) of over 15 are useful and should be applied at least once daily but they do not eliminate damage totally and chronic effects may still occur.
- Pigs kept outdoors should be provided with a mud bath.
- Tattooing does not prevent sun exposure because the pigment is introduced into the dermis underneath the susceptible surface layers of the skin.

D). Anti-infective skin preparations: They include:

1. Topical antibacterial skin preparations
2. Topical antifungal skin preparations
3. Preparations for minor cuts and abrasions

- An infection may be the principle cause of a skin condition or may be secondary to skin trauma or an underlying dis-order. These can include: endocrine imbalances; hypersensitivity; immunosuppression or nutritional imbalances.

1. Topical antibacterial skin preparations

- Bacteria commonly causing primary skin infections in animals include: *Staphylococcus*; *Streptococcus*; *Proteus spp*; *Escherichia coli* and *Dermatophilus congolensis* (“*Mycotic dermatitis*”, *rain scald* or *mud fever*).
- *Dermatophilosis* is seen in horses kept outdoors and is associated with wet weather.

- Ideally, affected animals should be housed; if lesions can be kept dry, affected areas will regress spontaneously in several weeks.
- The organism remains viable in the environment and therefore crusts should be disposed off carefully.
- Topical treatment is often employed using topical *antibacterials, zinc sulfate, lime sulfur, and iodine* containing compounds.
- *Dermatophilus congolensis* is susceptible to many antibacterials.
- Antibacterials incorporated into topical preparations include: chlortetracycline; oxytetracycline, which may be effective against superficial infections caused by bacteria including: *Bacillus; Actinomyces; Clostridium; Streptococci and Staphylococci*.
- Fusidic acid is particularly effective against infections caused by *Staphylococci; Actinomyces; Neisseria* and some *Clostridium species*.
- An important aspect of topical therapy in skin infection is the removal of accumulated scales, crusts and skin secretions, which provide a habitat for the bacteria and contain irritant bacterial metabolites.
- Therefore shampoos containing keratolytic, keratoplastic and degreasing agents may be useful as adjunctive treatment.
- Topical antibacterial treatment may be used alone or in combination with systemic therapy.
- Systemic antibacterial treatment is necessary for all but the most superficial skin infections. Treatment for several weeks may be necessary.
- Recurrence will be seen unless the underlying cause is determined and treated.
- In horses, sheep and pigs, systemic therapy is based mainly on the *Penicillins, erythromycin and Potentiated Sulphonamides*.
- *Cefalexin, Clindamycin, Amoxicillin with Clavulanic acid, Enrofloxacin, Erythromycin, Lincomycin, Marbofloxacin, Potentiated Sulphonamides and Tylosin* are indicated for skin infections in dogs and cats.

Chlortetracycline hydrochloride

Indications

Skin infections, hoof lesions

Warnings:

- Operators should avoid inhalation of dust
- Wash hands after handling the product. Available preparations include:

POM Auromycin Topical Powder (Fort Dodge) UK

Dusting powder, chlortetracycline hydrochloride 2%; benzocaine 1%.

Withdrawal periods: Slaughter withdrawal period is nil, milk withdrawal period is nil.

Fusidic acid**Indications**

- Skin infections caused by gram positive bacteria
- Otitis externa. Available preparations include:

POM Fucidin (LEO) UK

Cream, fusidic acid 2%;

Ointment, sodium fusidate 2%

Silver sulfadiazine (Silver sulphadiazine)**Indications**

- Bacterial and fungal skin infections, in particular *Pseudomonas aeruginosa* infection;
- burns
- Otitis externa

Contra-indications

- Hypersensitivity to sulphonamides
- Neonates
- Pregnant animals

Warnings:

- Operators should wear protective gloves
- Drug may accumulate in patients with hepatic or renal impairment.

Dose: Apply as necessary to affected area to an approximate thickness of 1.5mm. *Available preparations include:*

POM Flamazine (S&N Health) UK

Cream, silver sulfadiazine 1%.

2. Topical antifungal skin preparations

- Most fungal infections of the skin and keratin structures of domestic animals are caused by *Trichophyton* and *Microsporum* species. They are commonly referred to as ringworms and are zoonotic infections.
- *Malassezia pachydermatis* (*Pityrosporum canis*) is a cause of pruritic skin disease in dogs, particularly in seborrhoeic conditions and in otitis externa.
- *Candida albicans* infection causes muco-cutaneous ulcerations in dogs but is rare.
- Ringworm is usually a self-limiting disease.
- Drug therapy can often shorten the duration of the disease, although in some species, notably long haired cats and dogs, response to treatment may be poor.
- Paronchial infections (an *infection* of the skin around the nails) may also be refractory to treatment.
- The success of drug therapy depends on additional management aimed at reducing and limiting infection such as careful clipping around the lesions in dogs and cats, limiting grooming, isolating the animal and using antifungal washes on the affected animal and local environment.
- Griseofulvin and ketoconazole are used for systemic treatment of ringworm.
- Ketoconazole is effective in *Malassezia pachydermatis* infection of the skin.
- Itraconazole is also effective against ringworm in dogs and cats and appears to be much less hepatotoxic and associated with fewer side effects than ketoconazole.
- Topical antifungals may be used for the treatment of ringworm, although drug toxicity, due to ingestion through self-grooming, the necessity for clipping of the fur and repeated application and limited efficacy of the preparation should be taken into account.
- Topical enilconazole, clotrimazole and ketoconazole are effective for *Malassezia pachydermatis* infection.

- However, the treatment of choice is a shampoo containing chlorhexidine and miconazole (shampoo containing selenium sulfide may also be effective).
- Topical enilconazole or miconazole may be used in conjunction with systemic griseofulvin for the treatment of ringworm. Povidone iodine is also used as a fungicide.
- Natamycin is a polyene antifungal antibacterial, which may be used for topical treatment and also for disinfection of the ringworm-contaminated environment and horse tackle (accessories worn by horses in the course of their use as domesticated animal).
- A vaccine is available for immunization against ringworm in cattle.

Clotrimazole

Indications

- *Malassezia pachydermatis* dermatitis
- Otitis externa.

Dose: Apply 2-3 times daily for 2-4 weeks to the affected area and massage gently. *Available preparations include:*

P Clotrimazole (Non-Proprietary) UK

Cream, clotrimazole 1%; *Solution*, clotrimazole 1% in macrogol 400 (polyethylene glycol 400).

Enilconazole

Indications

- Ringworm
- *Malassezia pachydermatis* infection

Warnings: Operators should wear suitable protective clothing.

Dose

Horses, by wash, 0.2% solution every 3 days for 4 applications.

Cattle, by wash or spray, 0.2% solution every 3 days for 4 applications. *Available preparations include:*

P Imaverol (Sanseen) UK

Liquid concentrate, enilconazole 10%, for horses, cattle, dogs. To be diluted before use.

Withdrawal periods:

- Should not be used in horses intended for human consumption.
- Cattle, slaughter withdrawal period is nil; milk withdrawal period is nil.
- Dilute 1 volume in 50 volumes of water (=enilconazole 0.2%).

Ketoconazole**Indications**

Malassezia pachydermatis infection.

Warning:

- Use with caution in pregnant animals;
- Hepatic impairment. *Available preparations include:*

P Nizoral (Janseen-Cilag) UK

Shampoo, ketoconazole 2%.

Miconazole**Indications**

- *Malassezia pachydermatis* and staphylococcus intermedius infection in dogs,
- Ringworm in cats (in conjunction with systemic griseofulvin).

Warnings:

- Puppies or kittens should not come in contact with treated nursing bitches or queens until the coat has dried;
- Rarely pruritic reaction in atopic dogs or cats with allergic skin disease;
- Maximum treatment length in cats is 16 weeks;
- Should only be used in conjunction with griseofulvin in cats;
- Operators should wear suitable protective clothing when shampooing cats with ringworm. *Available preparations include:*

POM Malaseb (LEO) UK

Shampoo, chlorhexidine gluconate 2%, miconazole nitrate 2%, for dogs and cats.

Natamycin

Indications

Ringworm.

Warnings:

- Treated animals should not be exposed to sunlight for several hours;
- Galvanized or plastic containers should not be used because natamycin reacts with metals such as copper.

Dose:

- *Horses, cattle*, by spray, using 1 litre per adult animal or local application,
- 0.01% solution, repeat after 4 to 5 days and again after 14 days if required. *Available preparations include:*

POM Mycophyt (Intervet) UK

Suspension, powder for reconstitution, and dilution, natamycin 0.01%, for horses and cattle. Reconstitute and dilute with 2 litres (for 2-g bottle) water or 10 litres (10-g bottle) water (=natamycin 0.01%).

Withdrawal periods: Slaughter withdrawal period is nil; milk withdrawal period is nil.

3. Preparations for minor cuts and abrasions

- These preparations are used to treat minor skin infections and abrasions, and to prevent infection following surgery or when dehorning.
- They are applied as necessary in the form of dusting powder, ointments or sprays.
- Preparations containing benzoic acid, cresol or phenols should not be used on cats (Cats have significantly lower tolerance to the preparations).

Indications

Minor cuts and abrasions. *Available preparations include:*

GSL Aeroclenz (Battle Hayward & Bower) UK

Aerosol spray, benzalkonium chloride, 1.61%, suitable dye.

Withdrawal periods: Slaughter withdrawal period is nil; milk withdrawal period is nil.

GSL Antiseptic Wound Powder (Johnsons) UK

Dusting powder, chloramines 2%, for dogs, cats.

GSL Antiseptic Ointment (Bob Martin) UK

Ointment, chloroxylenol 2%, oil of camphor 4%, salicylic acid 0.5%, terebene 1%, for dogs and cats.

Cetrimide cream

Cetrimide 0.5% in a suitable water miscible base such as cetosteary alcohol 5%, liquid paraffin 50% in freshly boiled and cooled purified water.

GSL Cetream (Pettifer) UK

Cream, cetrimide 0.5%, for horses.

GSL Green Oils (Pettifer) UK

Liquid, arachis oil 36.03%, chloroxylenol 0.27%, gum turpentine 31.71% for horses.

GSL Green Oils Healing Gel (Pettifer) UK

Gel camphor 0.43%, chloroxylenol 0.2%, eucalyptus oil 0.87%, for horses.

GSL Otodex Skin Cream (Petlife) UK

Cream, chlorocresol 0.5%, phenoxyethanol 0.72%, lidocaine hcl 0.05%, zinc oxide 9%, for dogs, cats.

GSL Hydrophane Protocon Gold (Battle Hayward and Bower) UK

Gel, sulfur 10%, salicylic acid 10%, for horses.

Withdrawal periods: Should not be used in horses intended for human consumption.

Contra-indications:

- Application to white heels
- Application to race horses within 12 hours of competing
- Bandaging of treated areas.

GSL Saniphor (Battle Hayward & Bower) UK

Spray, available iodine as povidone-iodine 0.5%, for horses.

Withdrawal periods: Should not be used in horses intended for human consumption

GSL Veterinary Wound Powder (Battle Hayward & Bower) UK

Dusting powder, chloramines 2%, for horses.

GSL Veterinary Antiseptic Spray (Battle Hayward & Bower) UK

Aerosol spray, benzalkonium chloride 1.61%, for sheep.

Withdrawal periods: Slaughter withdrawal period nil; milk withdrawal period nil.

E). Keratolytics and Keratoplastic Agents

- Keratolytic agents promote shedding of cornified cells from the stratum corneum, keratoplastic agents slow the rate of proliferation of keratinocytes, allowing them to develop and function more normally.
- Primary keratinization dis-orders are skin diseases in which excessive scale formation occurs in epidermal structures including the hair follicle and inter-follicular epidermis.
- They manifest as blocked follicles (comedones), superficial scale (dry, waxy or greasy seborrhea), and follicular casts.
- Secondary superficial bacteria and yeast (*Malassezia pachydermatis*) infections commonly occur.
- Treatment of primary keratinization disorders may involve the use of topical or systemic substances.
- Topical treatments include keratolytic shampoos and antimicrobials.
- Systemic treatments include vitamins and minerals, in particular zinc, and essential fatty acids.
- Oral and topical retinoid therapy is also used for the treatment and control of some of these conditions. *Available preparations include:*

Isotretinoin

Indications

Primary keratinization dis-orders

Side effects

- Keratoconjunctivitis sicca
- Joint and leg pain
- Mild elevation of serum alanine-aminotransferase, cholesterol and triglyceride concentrations
- Inhibition of spermatogenesis
- Possible extended teratogenic effect as a result of tissue storage for long periods.

Warnings: Monitor changes in haematology, blood chemistry, urine and tear production, teratogenic in humans

Dose

Dogs, by mouth, 1-2 mg/kg daily for 8-12 weeks for control then reduce to alternate day therapy if possible. *Available preparations include:*

POM Isotretinoin (Non-Proprietary) UK

Capsules, Isotretinoin 5 mg, 20 mg.

POM Roaccutane (Roche) UK

Capsules, Isotretinoin 5mg, 20mg.

Tretinoin

Indications

Primary keratinization disorders

Side effects

Occasional allergic or irritant reaction, particularly in cats.

Warning: Gloves should be worn when applying the preparations; should not be applied by pregnant women.

Dose

Dogs, cats: Apply daily until remission, then as necessary for maintenance. *Available preparations include:*

POM Retin A (Janseen-Cilag) UK

Cream, tretinoin, 0.025%

Gel, tretinoin 0.01%, 0.025%

Lotion, tretinoin, 0.025%.

F). Shampoos

- Shampoos are used as complementary therapy in association with other treatment or as sole preparations in the long-term management of certain dis-orders such as seborrhea.
- They help to clean the skin and remove crusts and debris.
- Shampoos are formulated to reduce any irritant effects and are generally well tolerated.
- Effective rinsing is essential after the recommended contact time.
- Shampoos are available for general cleansing, conditioning and moisturizing. They are formulated to be used alone or in combination or with other treatments for skin dis-orders.
- These preparations may also have emollient, humectants (Substance that preserves the moisture or water content of the skin), cooling, antiseptic, keratoplastic, keratolytic, astringent or antipruritic properties. The efficacy of these preparations is limited particularly for the control of flea infestation.

Shampoos and lotions

Drug	Condition	Preparations
1). Antibacterials		

Benzoyl peroxide ¹	Pyoderma	Paxcutol (Virbac)
Chlorhexidine	Skin cleansing	Nolvasan (Fort Dodge)
Ethyl lactate	Superficial pyoderma	Etiderm (Virbac)
Hexetidine	Skin cleansing	Hexocil (Pfizer)
Piroctone olamine	Skin cleansing	Sebomild P (Virbac)
2). Antifungal drugs		
Ketoconazole	<i>Malassezia pachydermatis</i> infection	Nizoral; Norclear
Miconazole/Chlorhexidine	Seborrhoeic dermatitis; <i>Malassezia pachydermatis</i> infection	Malaseb (LEO) UK
3). Keratolytic and Keratoplastic agents		
Benzoyl peroxide ²	Pyoderma; Seborrhea	Paxcutol (Virbac)
Salicylic acid	Mild Seborrhea	Coatex medicated (Vetplus); Sebomild P (Virbac).
Selenium sulfide	Mild Seborrhea	Seleen (Sanofi)
4). Immunomodulators		
Linoleic acid, Mono and oligosaccharides, Vitamin E	Allergy	Allermyl shampoo or lotion (Virbac)
5). Skin cleansers	Normal to sensitive skins	Allermyl (Virbac); Epi-Soothe (Virbac); Logic dry shampoo (Ceva); MalAcetic Shampoo (Dermapet); Neutrale (LEO); Sebocalm

		(Virbac).
6). Moisturisers		
Chitosanide		Allermyl (Virbac); Sebomild P (Virbac); Humilac spray (Virbac); MalAcetic conditioner (Dermapet).

¹There are many preparations available. This is not a comprehensive list.

²May be drying or irritant to the skin

G). Wound management

1. Skin cleansers and disinfectants

2. Materials for wound management

Background

- Animal wounds occur frequently and need to be assessed and treated similarly to wounds in humans.
- The objective of any wound management regimen is to heal the wound in the shortest time possible and with minimum pain, discomfort and scarring for the patient.
- Open wounds such as abrasions, lacerations, avulsions, ballistic, penetrating, hernias and excised or surgical wounds are most common in the domestic species and are characterized by a break in the skin.
- Closed wounds include contusions, bruises, ruptures and sprains.
- At present, little is known about the precise mechanism for wound healing in the different domestic animal species but since the same cell types are involved, it seem reasonable that the same fundamental principles are applicable.
- Wound healing in large mammals occurs by the same processes seen in other domestic mammals such as dogs and cats.

- The main difference is cellular repair time, which is frequently much shorter in small mammals due to their accelerated metabolic rate.
- Any wound may be classified according to the number of skin layers affected.
- Damage limited to the epidermis is regarded as a superficial wound which will heal rapidly by regeneration of epithelial cells.
- A partial thickness wound involves the deeper dermal layer and includes vessel damage. Its repair is more complex.
- A full thickness wound involves the subcutaneous fat layer and beyond.
- Its healing will require the synthesis of new connective tissue and it takes longer to heal because it contracts, whereas partial thickness wounds do not.
- Wound healing follows a specific sequence of phases which result ultimately in connective tissue repair and the formation of a fibrous scar.
- The first phase is the inflammatory phase (reaction) which is followed by the proliferative (repair) and finally by the maturation (regeneration) phase.
- These phases are not independent and overlap throughout the entire wound healing process.
- Wound healing may take from three weeks to two years, with granulation tissue beginning to develop about four days after the original injury.
- In the distal limb, particularly of horses, large tissue deficits may lead to the production of excessive, exuberant granulation tissue.
- The precise cause of this condition is not known but some of the factors involved are thought to be increased movement, lack of soft tissue covering, excessive contamination and a reduction in blood supply.
- The use of effective pressure bandaging or cast application should be encouraged.
- The management of excessive granulation tissue varies and includes application of topical steroidal/antibacterial ointment, pressure bandaging, sharp excision or caustics (silver nitrate).
- Many wounds of the trunk and upper limbs heal well by secondary intention with good cosmetic results but those of the distal extremities tend to heal slowly with production of excessive scar tissue and skin grafting is often useful.

- Both systemic and local factors may change the successful continuation of each of the stages of wound repair.
- The systemic factors include the nutritional status of the animal, concurrent therapy such as corticosteroids, prostaglandin inhibition, oncolytic agents and clinical conditions such as anemia and diabetes.
- The objective of wound care are to prepare the wound for surgical closure while minimizing the risk of wound infection or to control wound infection thereby promoting wound healing.
- The aim of any treatment is to turn the animal to normal function and cosmetic appearance. The selection of the wound treatment for each particular case involves many interdependent factors.
- The duration of the injury is important because wounds have a better prognosis the sooner they are sutured or treated.
- The cause of the injury will influence the prognosis for healing and also the likelihood of infection.
- Sharp lacerations are generally less prone to infection than shearing wounds caused by barbed wire, bite wounds or degloving (a type of avulsion in which an extensive section of skin is completely torn off the underlying tissue, severing its blood supply). In medicine, an **avulsion** is an injury in which a body structure is forcibly detached.
- Previous treatment by the owner, for example the over-enthusiastic use of antiseptics or local antibiotics, may mean that the wound may no longer undergo primary closure by suturing.
- The location, depth and configuration of the wound, the degree of contamination, the intended use of the animal, and the co-operation of the patient and the owner should also be considered.

1. Skin cleansers and Disinfectants

- The preparation of any wound before treatment is of fundamental importance.
- The hair should be clipped from a wide area around wound edges.
- Hair clippings that may enter the wound are very difficult to remove and may function as foreign bodies whose presence will lead to an increase in wound healing time.

- The wound should be protected during clipping by either the insertion of sterile moist swabs which are easily removed or K-Y Jelly (J&J) which will be subsequently rinsed off with sterile sodium chloride 0.9% solution (Normal saline).
- Alcohol (70%) is commonly used for its solvent properties for the removal of superficial contamination.
- Cetrimide, Chlorhexidine, and Povidone-iodine are used for skin dis-infection.
- Contaminated wounds should be thoroughly lavaged with isotonic solutions such as sodium chloride 0.9% solution (Normal saline) or ringer's solution.
- If the wound is less than three hours old, antibacterials in the lavage solution will decrease the occurrence of wound infection.
- After three hours, antibacterials in lavage are no more effective than lavage alone.
- All gross contamination should be removed if possible but lavage should not be continued excessively as this will cause tissue maceration.
- Infected wounds should be treated with hypertonic solutions such as magnesium sulfate 10% solution or paste or sodium chloride 5% to 10% solution.
- Following removal of debris, necrotic or obviously devitalized tissue should be surgically debrided. Multiple debridements are often necessary.
- Antibacterial therapy and tetanus prophylaxis in horses are essential.
- Non surgical debridement involves use of agent such as Intrasite Gel (S&N Hlth), Debrisan (Pfizer) or Aserbine (Distripher), which removes debris without damage to new granulation tissue via the establishment of an osmotic gradient within the wound.
- Although still often used in animals, wet to dry bandaging of wounds for non surgical debridement is contraindicated.
- This procedure involves the use of moisturized gauze swabs packed into the wound and covered by open weave bandage or gauze and allowed to dry.
- When dry, removal of the packing will inevitably lead to destruction of some regenerating healthy tissue.

Alcohol

Indications

Skin preparation before injection or surgery

Warnings: Flammable; avoid broken skin. Available preparations include industrial methylated spirit.

Cetrimide

Indications

Skin disinfection; foot rot.

Contraindications: Concurrent use of soaps and anionic detergents. *Available preparations include:*

Cetrimide solution

Cetrimide 1% in freshly boiled and cooled purified water. Use undiluted.

Cetrimide solution strong

A 20% to 40% aqueous solution of cetrimide, containing not more than 10% alcohol, isopropyl alcohol or industrial methylated spirit. It may be perfumed and may contain coloring matter.

Chlorhexidine

Indications

Skin disinfection and cleansing

Contra-indications: Concurrent use of soaps and anionic detergents. *Available preparations include:*

Hibiscrub Veterinary (Schering-Plough) UK

Solution, chlorhexidine gluconate solution BP 20% (=chlorhexidine gluconate 4%)

Novalsan surgical Scrub (Forte Dodge) UK

Solution, chlorhexidine acetate 2%.

Novalsan shampoo (Forte Dodge) UK

Shampoo, chlorhexidine acetate 0.5%, for horses, dogs and cats.

GSL Savlon Veterinary Antiseptic Concentrate (Schering Plough) UK

Liquid concentrate, chlorhexidine gluconate solution BP 7.5% (=chlorhexidine gluconate 1.5%), Cetrimide 15%. To be diluted before use. Dilute 1 volume with 30 volumes alcohol 70% for skin disinfection. Dilute 1 volume with 100 volumes water for wound cleansing.

Vetasept Chlorhexidine Skin Scrub Blue (Animal Care) UK

Solution, chlorhexidine gluconate 0.5%, industrial methylated spirit.

Hexetidine

Indications

Skin cleansing. *Available preparations include:*

Hexocil (Pfizer) UK

Shampoo, hexetidine 0.55%.

Hydrogen Peroxide

Indications

Skin cleansing and disinfection of wounds. *Available preparations include:*

Hydrogen peroxide solution, 3%

Hydrogen peroxide (10 volumes), to be diluted before use.

Iodine compounds

Indications

Skin disinfection

Contra-indications: Concurrent use of other antiseptics or detergents. *Available preparations include:*

Povidone Antiseptic Solution (Novartis) UK

Solution, available iodine (as povidone iodine) 1%. May be diluted before use. Use undiluted for wound cleansing.

Povidone Surgical Scrub (Novartis) UK

Solution, available iodine as povidone iodine 0.75%. Use undiluted for skin disinfection.

Vetasept Povidone-Iodine Alcoholic Tincture (Animal care) UK

Solution, available iodine as povidone iodine, 1%.

Sodium chloride

Indications

Skin and wound cleansing. *Available preparations include:*

Aquspray (Animal care) UK

Aerosol spray, sodium chloride 0.9%.

2. Materials for wound management

- a). Vapor permeable adhesive films
- b). Foam dressings
- c). Hydro gel dressings
- d). Xerogel dressings
- e). Hydrocolloid dressings
- f). Collagen dressings
- g). Silver dressings
- h). Tissue adhesives.

Background

- Veterinary wound management is still in its infancy.
- If a wound cannot be closed primarily because of a large soft tissue defect, or because it is infected, then closure must be delayed and the wound dressed.
- The type of dressing applied to open wounds varies depending on whether additional debridement is necessary and to what degree movement will disrupt wound healing.
- Passive materials which plug and conceal, such as gauze and absorbent cotton now have limited application in wound management.
- The development of interactive materials such as vapor permeable adhesive polymeric films, polymeric foams, hydrogels, xerogels, hydrocolloids, collagens, superabsorbents, hydrofibres and hydropolymers mark the progression towards the production of an ideal wound dressing and are now used to enhance the healing cascade by controlling the micro-environment at the wound surface thereby promoting wound healing.

- Bioactive materials are now being developed which will lead to improved healing by direct stimulation of one or more steps in the healing cascade.
- Wounds need to be continually assessed at all stages of the healing process and an appropriate dressing regime devised for the wound at the time.
- No single dressing will meet all the criteria required in all of the healing stages.
- Local factors which delay healing may be avoided by providing products that will produce the optimal micro-environment for healing.
- This micro-environment should be moist at the wound interface but remove excess exudates to avoid sloughing.
- The tissue temperature should be maintained and the injury protected from infective organisms, foreign particles and toxic compounds.
- In addition, when the dressing is changed, there should be no secondary trauma due to adherence.
- The products used for wound management are categorized by the materials from which the dressings are made.
- They have the ability to create or maintain a moist local environment for wound healing without tissue maceration.
- They have variable absorbent and adhesive properties, conformability, and ability to rehydrate necrotic tissue.
- A primary dressing is one which is placed in direct contact with the surface of the wound whereas a secondary dressing is a material which covers a primary dressing and holds it in place.
- An island dressing comprises a central absorbent pad surrounded by an adhesive area.
- Unfortunately, the current presentation, packaging and size ranges of the available products may present difficulties when being considered for use in Veterinary wound management.
- Within the discussed dressing categories, examples are chosen to illustrate the products available.

1. Vapor permeable adhesive films

- These are polymeric, transparent films coated on one side with an adhesive. The adhesive is inactivated by contact with moisture and will not therefore stick to moist skin or the wound bed.
- These films are permeable to water vapor, oxygen and carbon dioxide but occlusive to water and bacteria.
- The film retains a moist environment at the surface of absorbent viscose pad. Alginate hanks, packing and ribbon dressings are available for deeper cavity wounds and sinuses.
- Alginates have been shown to be effective in the management of injuries where there has been substantial tissue loss as in degloving injuries and have reduced the number of surgical procedures which could normally have been expected in addition to accelerating healing.
- The non adhesive formulations will require a secondary dressing.
- Xerogel dressings are used to manage lacerations, post operative wounds, donor sites and non bleeding wounds where long periods are required between dressing changes.
- Dextranomers for example, Debrisan, are xerogel polymers of the polysaccharide dextran are available as beads or paste. These are used for debridement of moist sloughing wounds whether clean or infected and small area burns.
- Collagen containing xerogels contain collagen of bovine origin which is non antigenic due to enzyme purification.
- Addition of a collagen to a wound bed may accelerate wound repair by the provision of a matrix for cellular migration.
- The dry materials absorb exudates to form a gel. The materials require a secondary dressing.
- They are recommended for use in any recalcitrant wounds, moist sloughing wounds, ulcers-whether clean or infected and small burn areas. *Available preparations include:*

Algisite (S&N Hlth) UK; Algosteri (S &N Hlth) UK; Comfeel Seasorb Filler (Coloplast) UK; Debrisan (Pharmacia) UK; Kaltostat (Conva Tec) UK; Sorbsan (Uno-Medical) UK; Tegagen (3M) UK.

2. Hydrocolloid dressings

- These dressings are flexible, highly absorbent, and occlusive or semi occlusive adhesive pads formulated from hydrophilic polymers incorporated into a hydrophobic adhesive.

- The dressings may be backed by a polymeric film and may be contoured to fit difficult areas.
- However, they fail to adhere for any significant period to muscular areas of great flexion such as the neck or shoulders. The pads do not require a secondary dressing.
- When used to treat veterinary wounds, hydrocolloid dressings applied to relatively immobile muscular areas have resulted in a decrease of up to 30% in healing time from injury to hair growth.
- The dressings are removed by soaking with sodium chloride 0.9% solution (Normal saline).
- Hydrocolloids are used for wounds with moderate exudates such as pressure sores, minor burns, granulating wounds and wounds exhibiting slough or necrotic tissue.
- Hydrocolloid pastes are used in conjunction with dressings for cavity wounds and heavily exuding wounds.
- Superabsorbent hydrocolloid dressings (CombiDERM) have a highly absorbent material into an island pad which is covered by a non woven absorbent and surrounded by an extra thin hydrocolloid as the adhesive portion.
- The covering acts as a transfer layer while its surface stays dry. This is used for heavily exuding ulcers.
- Hydrofibre dressings, such as aquacel, are non woven pads which form a gel in contact with fluid. This gel is similar to a sheet hydrogel in that it does not conduct fluid laterally.
- Therefore, there is no maceration of the skin surrounding the wound but moisture is maintained in contact with the wound bed.
- The highly absorbent capacity reduces the frequency of dressing changes. They are used for heavily exuding wounds or wounds where an extended wear time is desired. *Available preparations include:*

Aquacel (Conva Tec) UK; CombiDERM (Conva Tec) UK; Comfeel (Coloplast) UK; Granuflex (Conva Tec) UK; Granugel (Conva Tec) UK; Tegasorb (3M) UK.

3. Collagen dressings

- Collagen comprises approximately 30% of the body and is found in the connective tissue of skin, tendons, bones and cartilage.

- It is the major component of the extracellular matrix (granulation tissue) and at least 10 different types of collagen have been identified.
- It is used as a hemostat, an absorbable suture material, and artificial skin, bone filling material and wound dressing.
- There is a small risk of antigenicity with collagen use but the benefit outweighs this risk.
- It is available as sheets, particles, pastes or gels. The dry material absorbs serous exudates to form a gel.
- VetBioSIST is an invaluable aid to the healing of skin deficits and other lesions in some exotic species.
- It is presented as single lyophilized sheets and contains collagen types I, III and V.
- All collagen dressings require a secondary dressing and are recommended for use with any recalcitrant wound (difficult to manage wounds), moist sloughing wounds whether clean or infected and small area burns. *Available preparations include:*

Promogran (J & J) UK and VetBioSIST (Global Vet Products) UK.

4. Silver dressings

Advanced wound management products containing silver have been developed to treat difficult to heal wounds, chronic ulcers and extensive burns.

H). Preparations for the ear

1. Ear cleansers and sebotyics

- A significant proportion of otic disorders in animals will improve with flushing and cleansing of the ear canal to remove wax and debris.
- Preparations are available using solvents such as propylene glycol, squalane or xylene and incorporating benzoic acid, acetic acid, boric acid and salicylic acid.

Indications

Ear cleansing. *Available preparations include:*

Auroclens (Arnolds) UK

Liquid, vegetable oil emulsion, for dogs and cats.

P Dermisal (Pfizer) UK

Cream, benzoic acid 0.025%, malic acid 0.375%, propylene glycol 1.75%, salicylic acid 0.006%, for horses, cattle, dogs and cats.

Withdrawal periods: Cattle-Slaughter withdrawal period nil, milk withdrawal period nil.

Contraindications: Concurrent use of teat dips or other disinfectants.

Epi-Otic (Virbac) UK

Solution, lactic acid 2.5%, salicylic acid 0.1%, for dogs and cats.

GSL Logic Ear Cleaner (Ceva) UK

Solution, xylene, 2%, for dogs and cats.

MalAcetic Otic (Dermapet) UK

Solution, acetic acid 2%, boric acid 2%, for dogs, cats.

MalAcetic Wet Wipes (Dermapet) UK

Wipes, acetic acid 2%, boric acid 2%, for dogs, cats.

Nolvasan Otic (Fort Dodge) UK

Solution, chlorhexidine acetate 0.2%, for dogs, cats.

Sancerum (Schering Plough) UK

Solution, chloroxylenol, docusate sodium, lactic acid, propylene glycol, salicylic acid.

Specicare LEO Dog Ear Cleaner (LEO) UK

Solution, boric acid, isopropanol, propylene glycol, sodium borate (borax) for dogs.

Specicare LEO Cat Ear Cleaner (LEO) UK

Solution, glycerol, propylene glycol, for cats.

REFERENCES

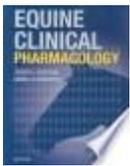
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[Yolande M. Bishop](#)

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