Pentravan Vehicles

Beyond Use Date Summary

Updated November 2025

Pentravan and Pentravan Plus cream bases are oil-in-water emulsions that use liposomal technology to provide transdermal delivery of medications. The permeation capabilities of Pentravan-line vehicles have been studied across a wide range of active pharmaceutical ingredients (APIs) and demonstrated compatibility, anti-microbial effectiveness, and effective permeation. Pentravan is a lower viscosity vehicle that can tolerate API concentration in the 10-15% range. Pentravan Plus has a higher viscosity and more robust thickening system and can tolerate API concentration up to 30%. Both vehicles are suitable for transdermal use in human and veterinary patients.

Key Ingredients in both Pentravan and Pentravan Plus:

Isopropyl Myristate: Permeation enhancer and emollient

Isopropyl Palmitate: Permeation enhancer and common component of pluronic lecithin organogels (PLO gels)

Soy Lecithin: Permeation enhancer and source of phospholipids, which are key components of liposomes

Sorbic acid/benzoic acid/potassium sorbate: a gentle, paraben-free preservative system

Free of Many Common Allergens:

These vehicles are free from peanuts, tree nuts, sesame oil, dairy products, eggs, shellfish, gluten, wheat or wheat derivatives, and corn. These products are BSE/TSE free and do not contain any animal derived products.

Permeation and Clinical Studies:

API	Study Type	Notes
Aprepitant[1]	Permeation - Synthetic membranes and pig ear epidermis using Franz diffusion cells	Aprepitant 1.6%, ondansetron 1.6%, and dexamethasone 1.2%, medications commonly used for chemotherapy induced nausea, were evaluated in Pentravan with ethanol, polysorbate 20, polysorbate 80, and isopropyl myristate to wet. Aprepitant permeation was not considered significant, but significant ondansetron and dexamethasone permeation was noted.
Clarithromycin[25]	Pre-formulation	Clarithromycin 1% with ethoxy diglycol, ascorbic acid in Pentravan for the potential treatment of Buruli ulcers. Clarithromycin was noted to be stable in the cream base and researchers proposed it may be a useful vehicle for future studies in patients.

Curcumin[28]	Clinical – in mice	Curcumin 12.5mg, 18.8mg, and 25mg/g in Pentravan was found to improve inflammation in mice with inflammatory bowel disease and to protect against oxidative stress.
Cyclosporine[2]	Case series - Human	Cyclosporine 5% in Pentravan for management of erosive pustulosis of the scalp looked at 17 patients treated with the study product over a period of 30 days. Patients noted significantly decreased dermal inflammation and improved skin morphology with all patients noting improvement and three seeing complete resolution. Four of the 17 patients treated noted mild adverse effects limited to mild redness or itching.
Desmopressin[3]	Permeation – ex vivo human skin using Franz diffusion cells	Desmopressin 0.4% in Pentravan wet with ethoxy diglycol was applied to the skin. A total dosage of 24mg was applied and approximately 21.5% of the applied dose was found to permeate through the layers of skin.
Dexamethasone[1]	Permeation - Synthetic membranes and pig ear epidermis using Franz diffusion cells	Aprepitant 1.6%, ondansetron 1.6%, and dexamethasone 1.2%, medications commonly used for chemotherapy induced nausea, were evaluated in Pentravan with ethanol, polysorbate 20, polysorbate 80, and isopropyl myristate to wet. Aprepitant permeation was not considered significant, but significant ondansetron and dexamethasone permeation was noted.
Diclofenac Sodium[18]	Permeation – Ex vivo human skin with Franz diffusion cells	Diclofenac sodium 2% permeation through excised human skin was evaluated in Pentravan alone, Pentravan with 10% menthol and 5% ethanol, and compared to a second vehicle with and without permeation enhancers as well as the commercial product. Permeation of diclofenac sodium with Pentravan and the separate product were both superior to the commercial diclofenac product.
Enrofloxacin[4,19,20]	Permeation – Ex vivo pig skin using Franz diffusion cells Clinical – transdermal study in various snake species (and an ex vivo study in snakes)	Enrofloxacin 5% in Pentravan was applied to excised pig ear skin, enrofloxacin was found to permeate the skin in the Pentravan vehicle, though the custom-made organogel vehicle performed better in this test. A second study evaluating enrofloxacin dosed at 50mg/kg in three different snake species noted detectable enrofloxacin in some of the tested snake species. Researchers conclude that the transdermal route could be reasonable for certain reptile species.
Estradiol[5]	Permeation – Ex vivo human skin	Three creams: progesterone 5%, estradiol 0.1%, and estradiol 0.1%/estriol 0.4% cream each with ethoxy diglycol to wet were compounded in Pentravan and applied to excised human skin. The study found 76.8% total progesterone permeation, 85-99.0% estradiol permeation, and 49.9% estriol permeation through the layers of skin and into what would be systemic circulation over a 48 hour period.
Estriol[5,23]	Permeation – Ex vivo human skin Clinical – Case report	Three creams: progesterone 5%, estradiol 0.1%, and estradiol 0.1%/estriol 0.4% cream each with ethoxy diglycol to wet were compounded in Pentravan and applied to excised human skin. The study found 76.8% total progesterone permeation, 85-99.0% estradiol permeation, and 49.9% estriol permeation through the layers of skin and into what would be systemic circulation over a 48 hour period. A case report of estriol 0.05%, testosterone 0.28% with argan oil to wet in Pentravan found successful treatment with 0.25mL applied daily for 28 days in a 29-month-old patient with labial adhesions.
Ibuprofen[12]	Permeation – ex vivo human skin	Ibuprofen 0.5% was applied to excised skin and permeation was monitored over 24 hours and compared to a commercially available product (study performed in Poland) containing the same concentration of drug. Permeation from Pentravan was found to be superior.
Ketoprofen[6,11]	Permeation – ex vivo human skin	Ketoprofen 10% in Pentravan was compared to Ketoprofen 10% in a traditional PLO gel, permeation was found to be 3.8 fold higher for the

		Pentravan group as compared to the PLO group.
Lidocaine HCl[11]	Permeation – ex vivo human skin	Ketoprofen 2.5% and lidocaine HCl 4% compounding in Pentravan with 5% ethanol to wet with 10% menthol, camphor, or capsicum tincture as permeation enhancers. Permeation was evaluated over 24 hours and significant permeation was found with all study products.
Maropitant[7]	Clinical - case series in cats	Eight cats between 2-7kg were treated with 4mg maropitant (from tablets) compounded in Pentravan at 4mg/0.1mL daily for 5 days. Doses were applied to the pinna. Cats treated showed a 63% decrease in the number of vomiting episodes and a noticeable improvement in appetite suggesting good permeation of the API.
Metformin HCl[8]	Permeation – ex vivo human skin	Metformin HCl 10% with ethoxy diglycol to wet was applied to excised human skin. The study noted that permeated dose was similar to that of oral administration (46.7% vs ~50% respectively).
Naproxen[9]	Permeation – ex vivo human skin with Franz diffusion cells	Naproxen 10% was compounded into Pentravan using menthol (10%) or capsicum tincture (10%) as permeation enhancers. Significant permeation was noted in both groups, though, it was superior with the use of capsicum tincture as a permeation enhancer and the cream remained stable and homogenous for longer with capsicum tincture as opposed to menthol.
Ondansetron[1]	Permeation - Synthetic membranes and pig ear epidermis using Franz diffusion cells	Aprepitant 1.6%, ondansetron 1.6%, and dexamethasone 1.2%, medications commonly used for chemotherapy induced nausea, were evaluated in Pentravan with ethanol, polysorbate 20, polysorbate 80, and isopropyl myristate to wet. Aprepitant permeation was not considered significant, but significant ondansetron and dexamethasone permeation was noted.
Oxandrolone[10]	Permeation – Excised human skin	Oxandrolone 2% with ethoxy diglycol 5% as a wetting agent was compounded in Pentravan and applied to excised human skin. Permeation was evaluated over 24 hours and an estimated 25.9% of the dose was found to permeate through the skin and would theoretically be absorbed systemically.
Piroxicam[13]	Permeation – vaginal porcine mucosa with Franz diffusion cells	Piroxicam 2% was applied to excised vaginal porcine mucosa. Significant local permeation was noted over 24 hours, leading the authors to conclude that piroxicam for local management of vaginal pain could be feasible.
Progesterone[5]	Permeation – Ex vivo human skin	Three creams: progesterone 5%, estradiol 0.1%, and estradiol 0.1%/estriol 0.4% cream each with ethoxy diglycol to wet were compounded in Pentravan and applied to excised human skin. The study found 76.8% total progesterone permeation, 85-99.0% estradiol permeation, and 49.9% estriol permeation through the layers of skin and into what would be systemic circulation over a 48-hour period.
Ramipril[22]	Permeation – in vivo in rats	Ramipril 1mg in Pentravan applied transdermally to rats under heat showed complete and rapid delivery and subsequent expected reduction of blood pressure in rats.
Resveratrol[14]	Clinical – wound healing in mice	Resveratrol 2% in Pentravan vs DMSO in Pentravan applied daily for 10 days to wounds. The researchers hypothesized topical resveratrol may improve wound healing through enhanced VEGF and increased collagen.
Selumetinib[24]	Permeation and Pre-formulation and ex-vivo	A study evaluated 2% selumetinib in Pentravan for the management of neurofibromatosis and found significant delivery of drug into the excised skin.
Sirolimus[21]	Clinical – case study	One study of sirolimus 0.1% applied twice daily in a patient with Kaposi's Sarcoma (Kaposi's Disease) found significant improvement over 3 and 6 months of application in 11 out of 13 patients evaluated.
Tadalafil[15,16]	Clinical – topical vs oral tadalafil for erectile dysfunction	A crossover study of tadalafil 20mg topical vs 20mg oral in 35 patients. Transdermal tadalafil was applied 10-15min prior to intercourse. Significant improvements were noted in relationship measures such as the dyadic adjustment scale both in topical and oral tadalafil, with topical tadalafil presenting significant benefits

		especially in the younger (<51 years of age) group. A second crossover study in 35 patients also compared 20mg tadalafil topical in Pentravan (with ethoxy diglycol to wet) to 20mg tadalafil oral. The study found tadalafil cream to be noninferior to oral tadalafil, and adverse effects (such as dizziness, headache, nasal congestion) were reduced in the topical group. A statistically significant portion of patients preferred cream to oral tablet.
Testosterone[6,23,26,27]	Permeation – ex vivo human skin Clinical – case report Clinical – vaginal absorption	Testosterone 10% in Pentravan was compared to 10% in PLO. Permeation was found to be 1.7 fold higher with Pentravan as compared to the PLO group. A case report of estriol 0.05%, testosterone 0.28% with argan oil to wet in Pentravan found successful treatment with 0.25mL applied daily for 28 days in a 29-month-old patient with labial adhesions. Reports of testosterone in Pentravan found significantly increased absorption with 3mg/mL in Pentravan applied vaginally as compared to a hydroalcoholic vehicle.
Tramadol[17]	Permeation – ex vivo cat inner ear skin	Tramadol 10% in Pentravan vs Lipoderm found penetration with 5 and 10mg doses in both vehicles with high variability. A significant difference in absorption between vehicles was not noted.

BUD Studies (Pentravan)

API and Range	Excipients	BUD*	Container Closure**
[29]Clonazepam 0.1-5%	5% Diethylene Glycol Monoethyl Ether	180 days	Polypropylene
[29]Diclofenac Sodium 1-10%	5-10% Diethylene Glycol Monoethyl Ether	Diclofenac sodium 1% - 180 days Diclofenac sodium 10% - phase separation began at 30 days, so testing was discontinued	Polypropylene
[29]Estriol 0.01-2%	0.5-2% Diethylene Glycol Monoethyl Ether	180 days	Polypropylene
[29]Lidocaine 0.5-10%	0.5-10% Diethylene Glycol Monoethyl Ether	120 days	Polypropylene
[29]Melatonin 0.05-5%	5% PEG 400, 0.05% Butylated Hydroxytoluene	Melatonin 5% - 180 days Melatonin 0.05% - 60 days	Polypropylene
[29]Testosterone 0.5-10%	5-7.5 % Diethylene Glycol Monoethyl Ether	180 days	Polypropylene

*all studies were conducted at room temperature
**polypropylene containers include Topi-Click or Uno-Dose

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