

URINARY

Protexin[®]
VETERINARY

Smarter pet care, powered by biotics.

Urinary Range for Dogs & Cats

Products to support
urinary health.

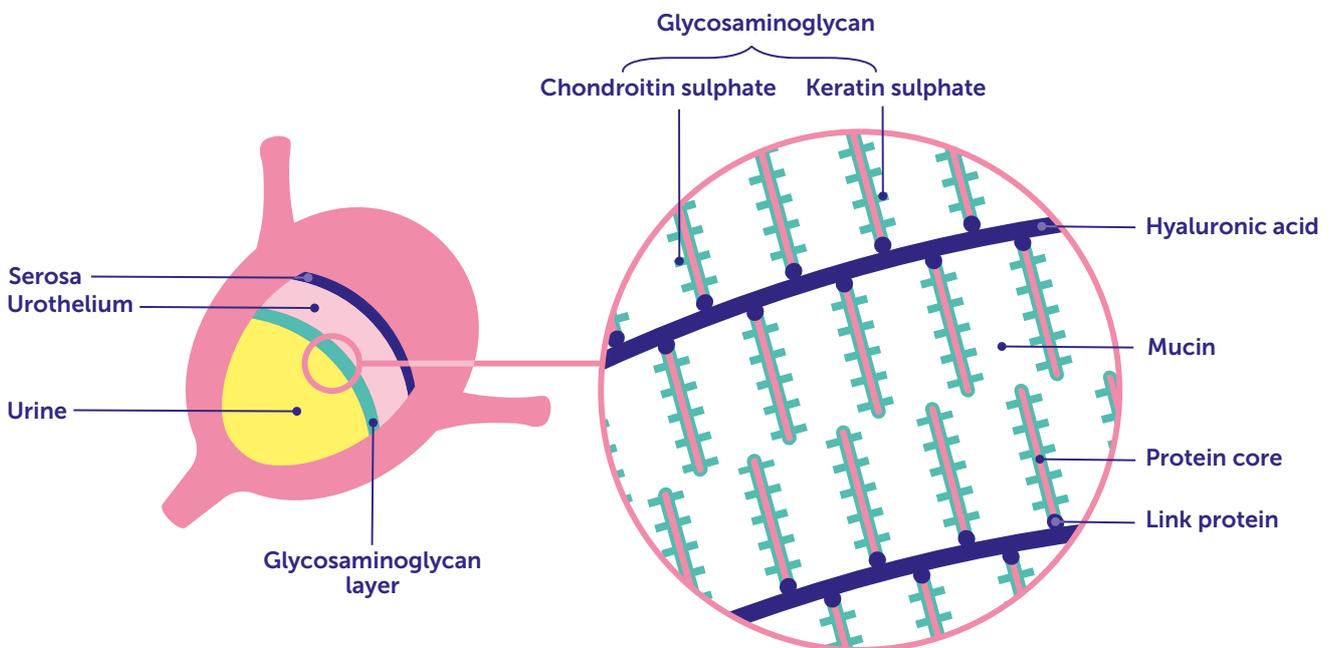


A healthy urinary tract is important for a healthy pet. Urinary health can be affected by interactions with several other body systems including the gastrointestinal tract and nervous system.¹⁻³

The bladder

The bladder wall is made up of multiple layers, with the uroepithelium (also known as transitional epithelium due to its ability to reorganise during stretch) being the

innermost layer.^{4,5} The delicate uroepithelial cells which make up the bladder mucosa are lined by the protective glycosaminoglycan (GAG) layer.⁶⁻⁹



Glycosaminoglycan layer

The luminal surface of the urinary tract is covered by a protective barrier called the glycosaminoglycan layer.⁶⁻¹⁰ GAGs are mucopolysaccharide chains composed of long unbranched polysaccharide molecules, which when linked to proteins form proteoglycans.¹¹ Due to the negative charge at the surface

of urothelial GAGs, they form a gel-like consistency.¹² This layer of mucus helps protect the urothelium from substances within the urine, such as microbes or crystals.^{6,7,11,13,14} A healthy GAG layer helps maintain normal levels of permeability of this protective barrier which allows for urothelial layer renewal.⁶



Cystophan

Cystophan provides high-level support for feline urinary health.



Dual-source glycosaminoglycan support to maintain a strong GAG layer in the bladder.



Dual support for a healthy bladder lining and normal stress levels.



Easy-to-administer sprinkle capsules with an artificial chicken flavour to aid palatability and compliance.

Ingredients

GAG support

N-acetyl D-glucosamine

N-acetyl D-glucosamine is a GAG precursor.^{7,11} Two of the main GAGs are keratin sulphate and chondroitin sulphate,^{11,12} which contain N-acetyl D-glucosamine units. Giving exogenous N-acetyl D-glucosamine helps to maintain the amount of GAGs in the urinary bladder wall.¹¹

Hyaluronic acid

Hyaluronic acid is one of the main components of the GAG layer that lines the bladder.^{10,15,16} The GAGs attach to a protein core, forming a proteoglycan which is attached to the hyaluronic acid via a link protein.^{12,17} Hyaluronic acid has been found to positively modulate urothelial permeability and stimulate GAG synthesis in humans.^{11,12,18}

L-tryptophan & serotonin

Feline urinary health has been shown to be affected by stress.^{1,11,19,20} Therefore, supporting normal emotional regulation can benefit feline bladder health.¹⁹

Serotonin has an extremely important physiological function in the body, especially in supporting normal levels of stress and anxiety.^{21,22} L-tryptophan is an essential amino acid and sole precursor to serotonin. Systemic availability of tryptophan is essential for serotonin synthesis within the central

nervous system, as serotonin itself cannot pass the blood–brain barrier.²³ Tryptophan has been implicated as a key molecule in the regulation of mood.^{24,25} Studies have demonstrated tryptophan's ability to support normal behaviour in dogs and cats^{26,27} and help regulate a normal stress response in various other species.²⁸⁻³⁰

Ingredients

Each capsule contains:

-  125mg N-acetyl D-glucosamine
-  37.5mg L-tryptophan
-  10mg hyaluronic acid
-  Artificial chicken flavour to aid palatability. Suitable for use in animals with allergies to meat proteins.

Instructions for use

Give the initial amount for at least two weeks before reducing to the maintenance amount.

 The capsules are opened, and the contents sprinkled onto food.

 Give for as long as considered necessary.

Weight of cat	Loading level (for at least 2 weeks)	Maintenance level
≤3kg	1 capsule per day	½ capsule per day (or 1 capsule every other day)
>3kg	2 capsules per day	1 capsule per day



CystoPro

CystoPro provides high-level support for canine and feline urinary health.

 Proanthocyanidins (PACs) to help reduce the ability of *E. coli* to attach to the urothelium, complementing the GAG layer's natural protective function.³¹⁻⁴⁰

 Glycosaminoglycan support for the maintenance of a strong GAG layer in the bladder.¹¹

 *Enterococcus faecium* (PXN-33) – a probiotic^{41,42} to support the microbiome and reduce non-commensal bacteria.⁴³⁻⁴⁶

 Mannan-oligosaccharide (MOS) – a prebiotic which supports the intestinal microbiota^{47,48} and has been shown to stimulate the immune system.⁴⁸⁻⁵⁰

 Easy-to-administer sprinkle capsule with an artificial chicken flavour to aid palatability and compliance.

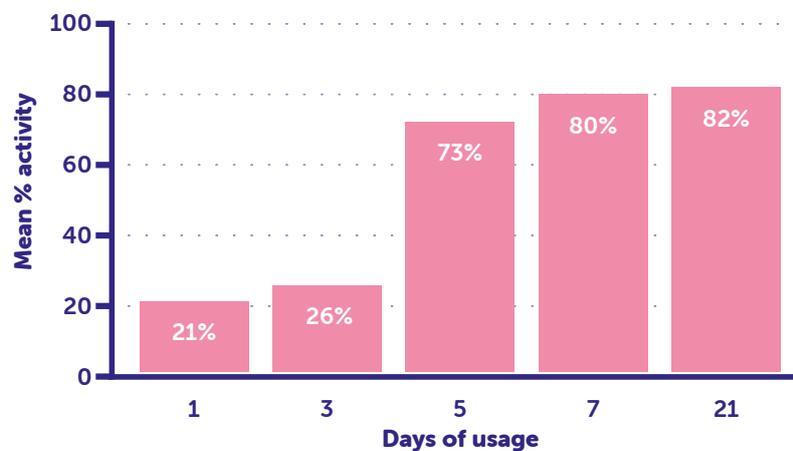


Proanthocyanidins

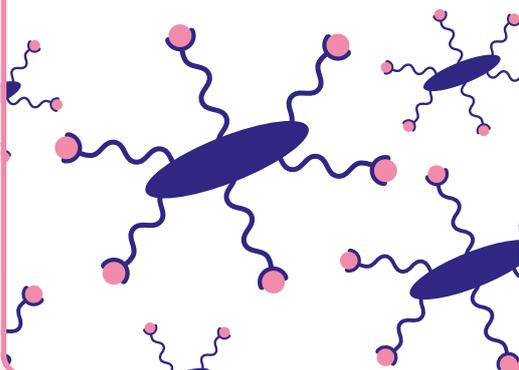
Proanthocyanidins are a class of biologically active flavonoids and are one of the strongest antioxidants in nature.^{38,51,52} The PACs used in CystoPro are sourced from the North American cranberry, *Vaccinium macrocarpon*. This specific species contains A-type linkage as well as the B-type linkage found in many other PACs. The A-type linkage contributes to the anti-adhesion activity of the PACs which reduces the ability of *E. coli* to attach to the urothelium and complements the GAG layer's natural protective function.^{31-40, 53}

Male beagle dogs (aged 3-8 years old) were given a standardised cranberry extract (1mg/kg PACs) daily for 21 days. Urine samples were collected on days 1, 3, 5, 7 and 21 and tested in an *ex vivo* assay for the ability to agglutinate human red blood cells (HRBC) specific for P-fimbriated *E. coli*.³¹ The results of the study demonstrate that PACs significantly reduce the ability of *E. coli* to adhere to the urinary tract.

Mean daily anti-adhesion activity against *E. coli*.



PACs act to reduce the adhesion of P-fimbriated *E. coli* to the urothelium.



By reducing the bacterial attachment to the urothelium of the lower urinary tract, the bacteria fail to colonise and are instead voided in the urine.



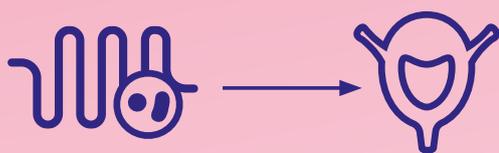


N-acetyl D-glucosamine

As discussed earlier, the luminal surface of the urinary tract is covered by a protective barrier of GAGs.^{6,7} GAGs are negatively charged polysaccharide chains that help prevent microbes from adhering to the sensitive urothelium.^{7,54} Therefore, a strong, resilient GAG layer is important for the bladder's normal resilience against bacteria adhering to the urothelial cells.^{55,56}

Giving exogenous N-acetyl D-glucosamine helps to maintain the amount of GAGs lining the urinary bladder wall, allowing for normal permeability of the protective barrier lining the urothelial layer.^{6,11,55}





Gut-bladder axis

It is believed that the maintenance of urinary tract health is in part mediated through the gut–bladder axis.^{2,46}

Gastrointestinal microbiome health and microbial richness have been directly linked to maintaining urinary tract health.²

The gut is a major reservoir of bacteria. Consequently a healthy gut microbiota and a strong GAG layer are both believed to promote urinary health and the normal resilience of the bladder to bacteria.^{2,6,11,46,57,58}



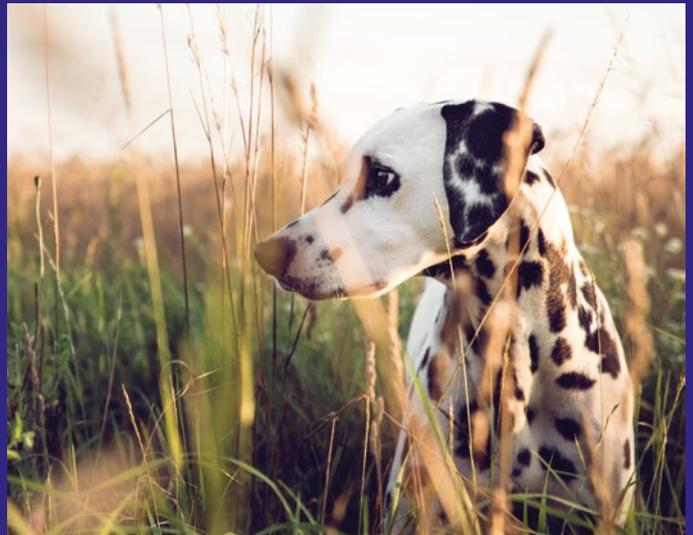
Protexin Biotics

Our Protexin Biotics have been expertly developed to support a healthy microbiome. The microbiome is essential for the normal functioning of the gastrointestinal tract and for the gut's interaction with the urinary tract and the rest of the body. Our Protexin Biotics help support the natural balance in the animal's gut and keep them at their best.

Probiotics

Probiotics are live microorganisms shown to support the microbiome.

CystoPro contains *Enterococcus faecium* (PXN-33) – a probiotic^{41,42} that has been shown to survive exposure to a low pH, intended to mimic the acidic stomach environment.⁵⁹ Probiotics affect the diversity of the microbiota and reduce non-commensal bacteria within the gastrointestinal tract so can reduce the risk of ascending bacteria of faecal origin entering and colonising the urinary tract.⁴³⁻⁴⁶



Prebiotics

Prebiotics selectively feed beneficial bacteria, supporting a diverse and healthy microbiome.

Prebiotics resist being broken down by the host; instead they reach the distal intestine where they are fermented by beneficial bacteria⁶⁰ to produce short-chain fatty acids which have been shown to provide many health benefits in humans.^{61,62}

CystoPro contains mannan-oligosaccharide (MOS) which is created from purified yeast cell walls and is commonly used as a prebiotic to support the intestinal microbiota.⁴⁷⁻⁴⁹ It can also bind to bacteria, preventing them from binding to the host enterocytes and therefore complementing the gut's natural defences. In addition to this it also stimulates the innate immune system.^{49,50}

Ingredients

Each capsule of CystoPro contains:

-  20mg proanthocyanidins
-  125mg N-acetyl D-glucosamine
-  Probiotic *Enterococcus faecium* (PXN-33) 1×10^{11} CFU/kg
-  Mannan-oligosaccharide
-  Artificial chicken flavour to aid palatability. Suitable for use in animals with allergies to meat proteins.

Instructions for use

-  Give for as long as considered necessary.
-  The capsules are opened, and the contents sprinkled on the food.

Weight of pet	Capsules per day
<20kg	1 capsule
20-40kg	2 capsules
40-60kg	3 capsules

Available in box of 30 capsules.





GASTROINTESTINAL

URINARY

HEPATIC

For information on our full range of products for dogs, cats and rabbits, please visit our website.

For references please visit protexinvet.com/urinary-refs or scan

