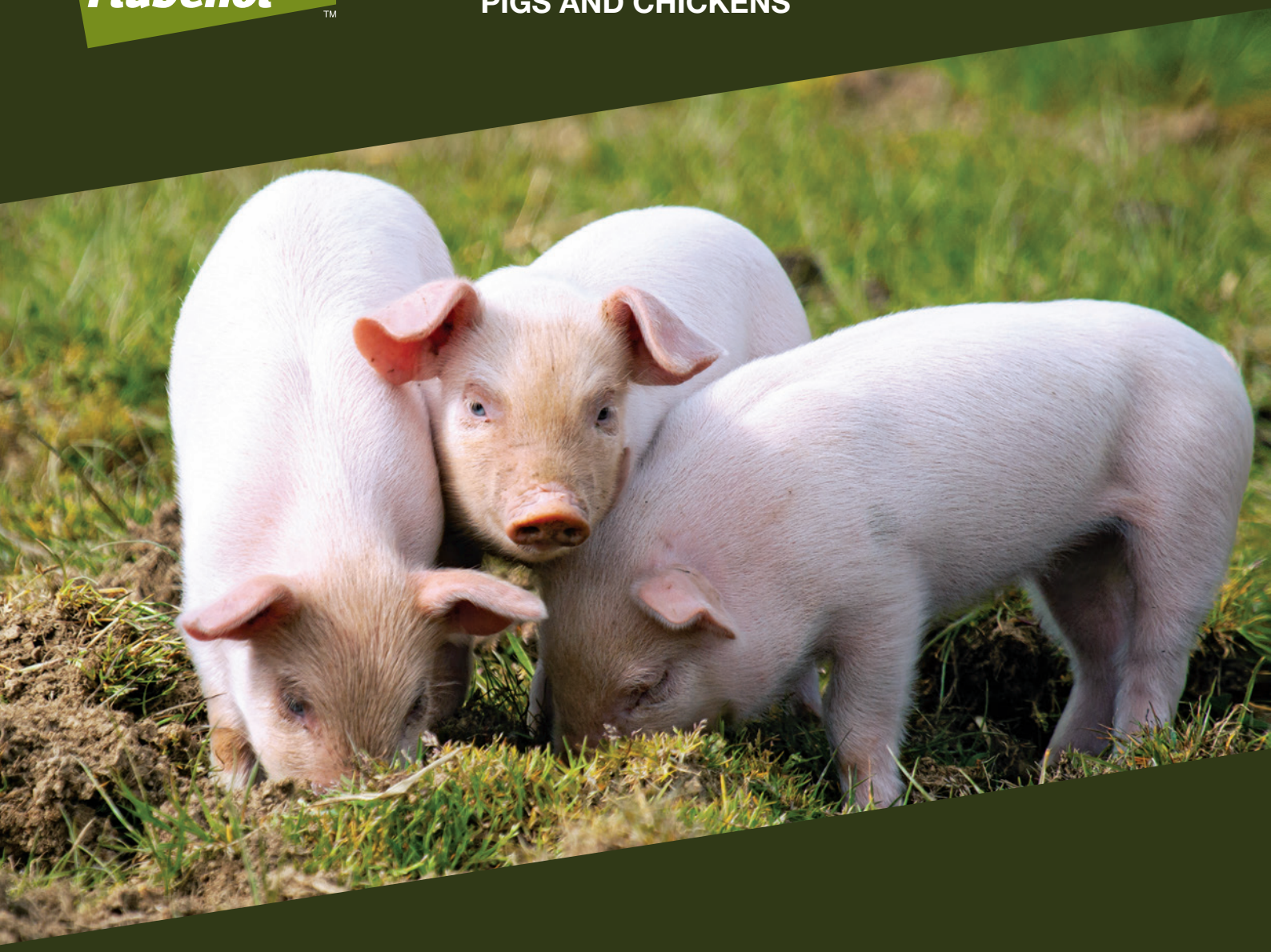
Elanco™

Flubenol™

FLUBENOL™ ORAL WORMER FOR PIGS AND CHICKENS



A truly broad spectrum anthelmintic, Flubenol Oral Wormer is active against important swine worm species at both adult and immature stages:

Ascaris suum **(Large roundworm)**
Hyostrongylus rubidus **(Red stomach worm)**
Oesophagostomum dentatum **(Nodular worm)**
Metastrongylus apri **(Lungworm)**

Flubenol is effective against:
Adult stages
All immature stages (larvae)

- Flubenol contains flubendazole, a benzimidazole parasiticide which is effective against ALL developmental stages of the commonly found worms in pigs (larvicide and adulticide)[1-3]
- Flubenol is easily administered in the feed, and is stable following conditioning and pelleting temperatures[4]
- Flubenol is odourless and tasteless, with no reported effects on feed palatability

Elanco™
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Oral Wormer for Pigs and Chickens

FLUBENDAZOLE MODE OF ACTION[1,2]

- Flubendazole acts by binding to tubulin, a structural protein of microtubules. In the worms, the blocking of microtubules affects the uptake of glucose, which eventually results in empty glycogen reserves. Without energy, the worms are paralyzed and die, or are expelled.
- Since cell division is also disturbed, worm egg production and development is also blocked, i.e. has an ovicidal effect.

THE EFFECT OF WORM INFESTATION IN YOUR PIG HERD

While worm infections may often be subclinical, they have a significant impact on feed conversion, growth rate, the development of secondary infections and the ability to mount an effective immune response.[5-9]

Endoparasiticism may occur with or without clinical signs

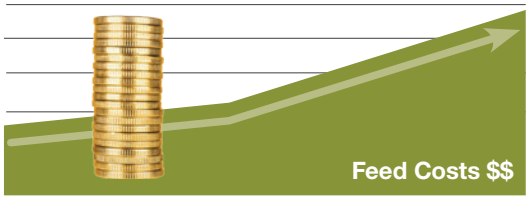
Untreated worm burdens cause economic loss due to reductions in performance which mainly relate to reduced feed intake, damage to the intestine resulting in poor nutrient absorption and immunological stress.[5]

Average daily feed intake	▼ 5%
Average daily liveweight gain	▼ 31%
Feed conversion ratio	▲ 17%
Time to finishing	▲ 4%

Results from a meta-analysis on the effects of endoparasites on pig performance[5]

A US study indicated that a high subclinical infection with 5 common worm parasites in pigs in which no deaths or obvious morbidity occurred, resulted in up to 13% more feed required for gain than for uninfected pigs.[8] Milk spots reported from the abattoir further indicates that *Ascaris suum* eats away at your profits.

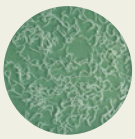
Worms and profitability



Hyostrongylus rubidus "Red stomach worm"

Adult worms live in the stomach, and heavy infections can result in gastric ulceration and bleeding. Infections result in lower weight gains and loss of condition.[10,11]

The life cycle is direct, and pigs are infected when taking in eggs from contaminated pasture or soil.



Oesophagostomum dentatum "Nodular worm"

Sows are susceptible to a build-up of nodular worms due to the 'dampening down' effect this worm has on the immune system.[7] While sows may show no clinical signs, the larval stage of the worm can cause significant nodular damage to the large intestine. The effects of nodular worms include decreases in number of live newborns and birthweights.[10]

Ascaris suum "Large roundworm"

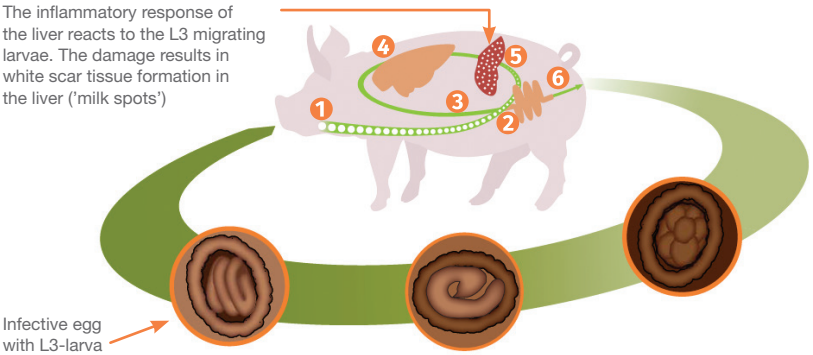
The large roundworm, *Ascaris suum*, is the most important parasitism in pigs worldwide. The prevalence of *A. suum* infection varies by production system, but few pig herds are entirely free of infection.[8,11]

Ascaris suum increases the FCR of infected pigs, reduces the growth rate of fattening pigs and results in liver condemnations at slaughter. *Ascaris suum* is a known risk factor for pathogenic *E.coli* and *Pasteurella* spp. infections.[6,8,11]

How do the pigs become infected with L3-larva Large roundworm *(A. suum)*?[11]

Infection via the faecal-oral route.

Adult females can lay hundreds of thousands of eggs per day (between 200,000 to 2 million per female/day), leading to rapid contamination of pasture and buildings. Eggs can survive for years and many routine disinfectants are not effective against ascarid eggs, so once infection is established on your farm it is very difficult to eliminate. The eggs are also sticky, and are easily spread by mechanical vectors such as insects, birds, equipment, boots etc. Exposure to sunlight reduces survival significantly.[11]



1. Ingestion of infective egg containing L3-larva
2. Larvae establish in the intestinal tract, and start migrating 1 - 3 days after ingestion
3. Hatched larvae penetrate the intestinal wall and migrate via the liver to the lungs
4. Larvae migrate up the bronchi, are coughed up and swallowed
5. These larvae re-establish in the intestine, where they moult to adult worms. Here they produce hundreds of thousands of eggs per day.
6. Unembryonated eggs are passed in faeces

Besides its activity against adult stages of the worm, flubendazole has activity against migrating larval stages[12] as well as inhibiting embryonation of eggs (development of L3 larvae in the egg)[13]

The Deworming Strategy

The amount of time it takes for the parasite to complete its lifecycle is known as the PRE-PATENT PERIOD i.e. the time from when the worm egg or larva is ingested by the pig until worm eggs appear in the faeces. This is important when it comes to building strategic worming programmes.

- An effective strategic worming programme should be based on the pre-patent period of the worm species involved. Shorter pre-patent periods require shorter treatment intervals for strategic control. The aim is to treat infection before the shedding of eggs occurs, thereby breaking the lifecycle.
- All pigs on the holding must be wormed at the same time.
- All new arrivals must be wormed prior to introduction to the herd.
- Consult your veterinarian for initial identification of problem species. Treat relevant infections at the intervals shown below:[11,14]

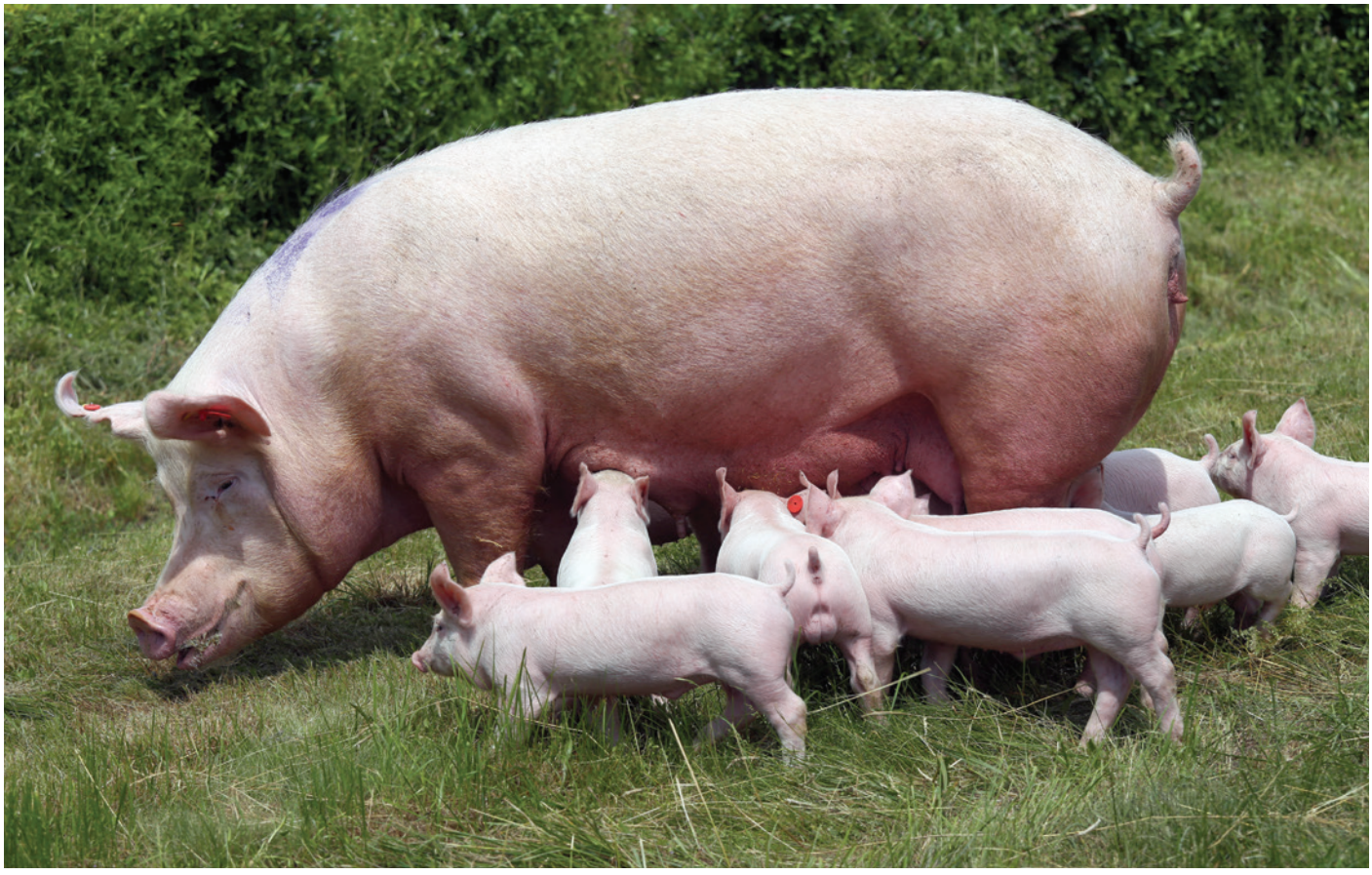
	Approximate pre-patent period	Suggested treatment interval
Lungworm *(Metastrongylus apri):*	4 weeks	every 3-4 weeks
Nodular worm *(Oesophagostomum dentatum):*	3 weeks	
Red stomach worm *(Hyostrongylus rubidus):*	3 weeks	
Large roundworm *(Ascaris suum):*	6 weeks	every 5 weeks

For large roundworm *(Ascaris suum)* **infestation:**

Sows and boars: treat the whole breeding herd at least twice a year e.g. before farrowing

Replacement stock: treat on arrival and before mixing with other animals

Finishing stock: a course of Flubenol Oral Wormer for every 5 weeks has been shown to be effective in controlling Ascaris suum and the incidence of milk spots[15,16]



DOSAGE AND ADMINISTRATION *Ascaris suum, Hyostrongylus rubidus, Oesophagostomum dentatum* and *Metastrongylus apri*

	Dosage	Administration Period
Pigs	600 g Flubenol Oral Wormer per tonne of feed (30 g flubendazole (30 ppm))	10 consecutive days
Individual and single administration to breeding pigs	Mix Flubenol Oral Wormer into the feed at a dose of 5 mg flubendazole per kg body weight. This corresponds to one supplied measuring spoon (13 g) of Flubenol per 130 kg of body weight.	Single administration

Flubenol should be thoroughly mixed into the feed to ensure even distribution of the medication. Feed can be administered as either a mash, crumble or pellet.

Always read and follow the label directions. Stringent housing hygiene management is essential for optimal worm control. Resistance may develop to any chemical. Withholding period (Pigs): Remove all medicated feed 7 days before slaughter for human consumption. For full product details, contact Elanco on 1800 995 709 or by email productsupportau@elancoah.com

References:
1. Rodriguez-Gonzalo E et al. 2017. Anthelmintic benzimidazoles in eggs. Chapter 44 in Egg Inovations and Strategies for Improvements (ed. P. Hester). Elsevier.
2. Lacey E. et al. 1988. The role of the cytoskeletal protein, tubulin, in the mode of action and mechanism of drug resistance to benzimidazoles. Int J Parasit 18(7):885-936.
3. Chassaing C et al. 2008. Highly water-soluble prodrugs of anthelmintic benzimidazole carbamates: synthesis, pharmacodynamics, and pharmacokinetics. J Med Chem 52:1111-1114.
4. A strategy to beat worms. Janssen Animal Health. Data on file.
5. Kipper M et al. 2011. Meta-analysis of the effects of endoparasites on pig performance. Vet Parasitol 27(181):316-320.
6. Steenhard NR et al. 2009. Ascaris suum infection negatively affects the response to a Mycoplasma hyopneumoniae vaccination and subsequent challenge infection in pigs. Vaccine 27:5161-5169.
7. Roepstorf A et al. 2011. Helminth parasites in pigs: New challenges in pig production and current research highlights. Vet Parasit 180:72-81.
8. Stewart TB, Hale O. 1988. Losses to internal parasites in swine production. J Anim Sci 66:1548-1554.
9. Hale O, et al. 1985. Influence of an experimental Infection of Ascaris suum on performance of pigs. J Anim Sci 60:220-225.
10. Ózsvári L. 2018. Production impact of parasitisms and coccidiosis in swine. J Dairy Vet Anim Res 7(5):217-222.
11. Stewart TB, Hoyt PG. 2006. Internal parasites. In: Straw, B.E., Zimmerman, J.J., D'Allaire, S., Taylor, D.J. (Eds.), Diseases of Swine, 9th ed. Blackwell Publishing, pp. 901–914.
12. Bradley RE et al. 1983. Flubendazole: dose range and efficacy studies against common internal parasites of swine. Am J Vet Res 44(7):1329-1333.
13. Zhao J et al. 2017. Effects of in vivo and in vitro treatment of Ascaris suum eggs with anthelmintic agents on embryonation and infectivity for mice. J Parasit 103(5):17-21.
14. Talvik H et al. 1997. Prepatent periods of different Oesophagostomum spp. isolates in experimentally infected pigs. Parasitol Res 83:563-568.
15. Kanora A. 2009. Effect on productivity of treating fattening pigs every 5 weeks with flubendazole in feed. Vlaams Diergeneeskundig Tijdschrift, 78, p 170-175.
16. Kanora A et al. 2004. Economic appraisal of the treatment regime with Flubenol® 5% medicated feed every 5 weeks on fattening pigs. IPVS 2004, Proceedings, Vol. II, p 582.

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