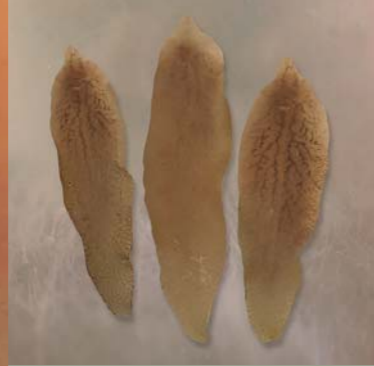


THE LIVER



THE PARASITE



THE EFFECTS



THE IMPACT



DIAGNOSIS



CONTROL



THE PRODUCTS



LIVER FLUKE CONTROL

...geared for optimal liver health

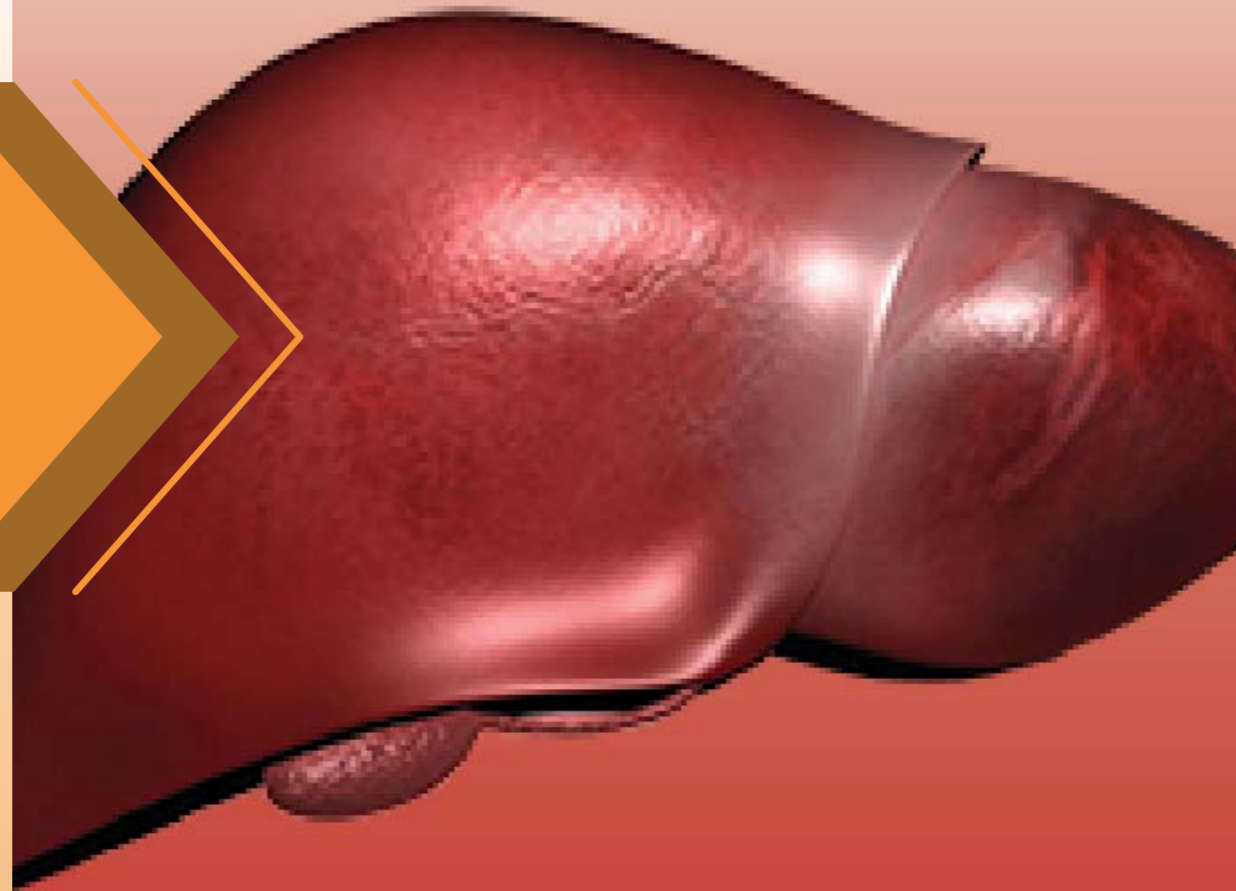


Shaping the future of animal health

THE LIVER: FUNCTIONS OF A HEALTHY LIVER



A HEALTHY
LIVER



The liver is the organ that is central in supporting: general health, vitality, production & reproduction.

It has around 500 different functions essential to the health and production.

- **Supports almost every other organ**
- **Fights infections** (cleans the blood particles of infections, including bacteria etc.)
- **Filters out toxins** (neutralises and destroys toxins that are harmful to the animal)
- **Stores essential elements** eg.: vitamins and minerals (including trace minerals)
- **Responsible for the manufacture, regulation and break down of hormones**



THE LIVER

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Fasciolosis (liver fluke) is one of the most important parasitic diseases throughout the world including South Africa. It is a parasitic flatworm that can live within a wide range of hosts and is of major importance in livestock (cattle, sheep, and goats)

THE PARASITE



THE LIVER

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LIVER FLUKE: TWO IMPORTANT SPECIES IN CATTLE



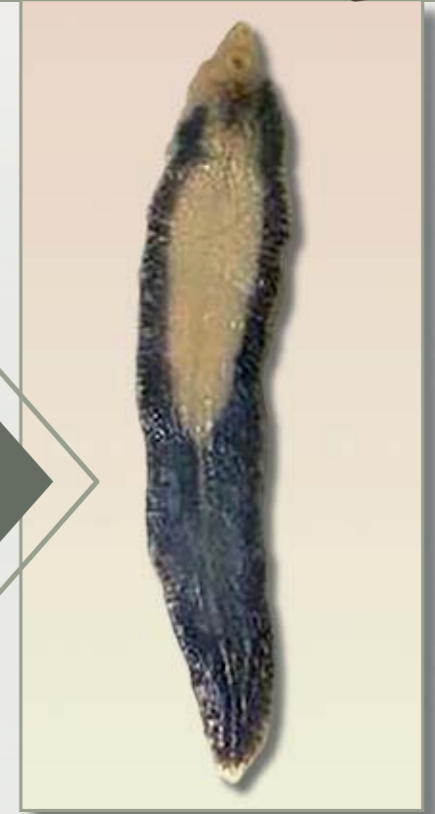
There are 2 species of liver fluke found in South Africa



LIVER FLUKE
(*F. hepatica*)

Common liver fluke (*Fasciola hepatica*)

- Average 2,5 cm long and 1,5 cm wide
- Commonly found all over South Africa, where conditions are favourable



GIANT LIVER FLUKE
(*F. gigantica*)

Giant liver fluke (*Fasciola gigantica*)

- Average 5,5 cm long and 1,5 cm wide
- More commonly found in the northern regions of South Africa



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LIVER FLUKE: THE INTERMEDIATE HOST



Lymnaea truncatula



Lymnaea natalensis

The lifecycle is complex as it requires an intermediate host (freshwater snail) to complete its lifecycle



SNAILS CAN BE HARD TO DETECT



THE LIVER

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LIVER FLUKE: TYPICAL HABITAT



- The typical habitat of liver fluke is wet, marshy areas or ponds. The water must be still or slow moving
- Areas where pastures are irrigated can also be conducive to the survival of the parasite
- In some cases water reservoirs and troughs can also be a source of the infection



THE LIVER

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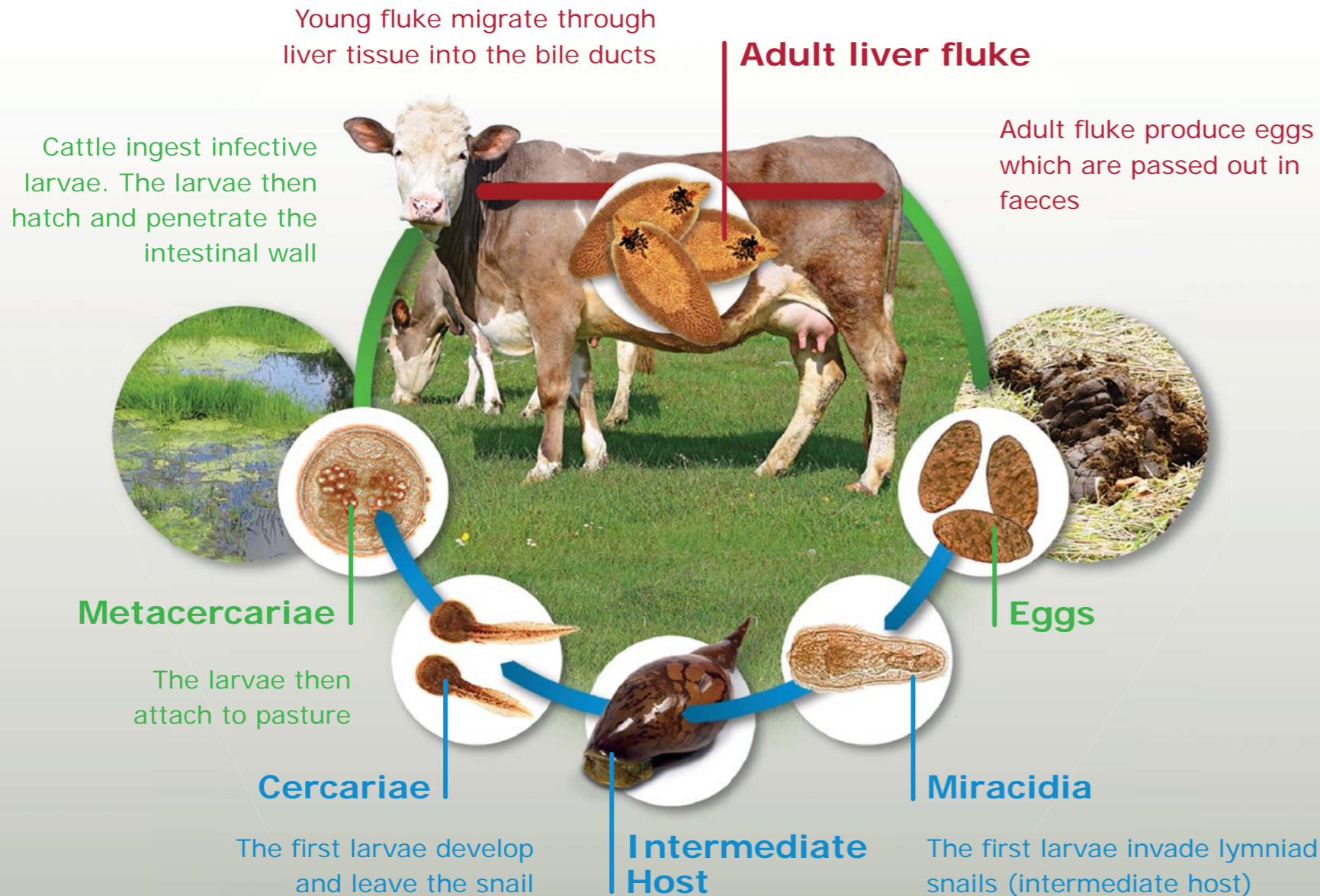
DIAGNOSIS

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LIVER FLUKE: A COMPLEX LIFECYCLE



Liver fluke infections in cattle depend on a number of factors:

- The presence of **freshwater snails** (intermediate host) on the farm
- The presence of **suitable habitat** which includes wet, marshy areas or ponds. The water must be slow moving or still
- **Rainfall** which helps to wash the eggs out of faeces. Rainfall also maintains the water bodies where snails can survive
- **Temperature** also plays a big role in influencing infestations. Both liver fluke and snails thrive in warmer conditions



THE LIVER

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THE IMPACT

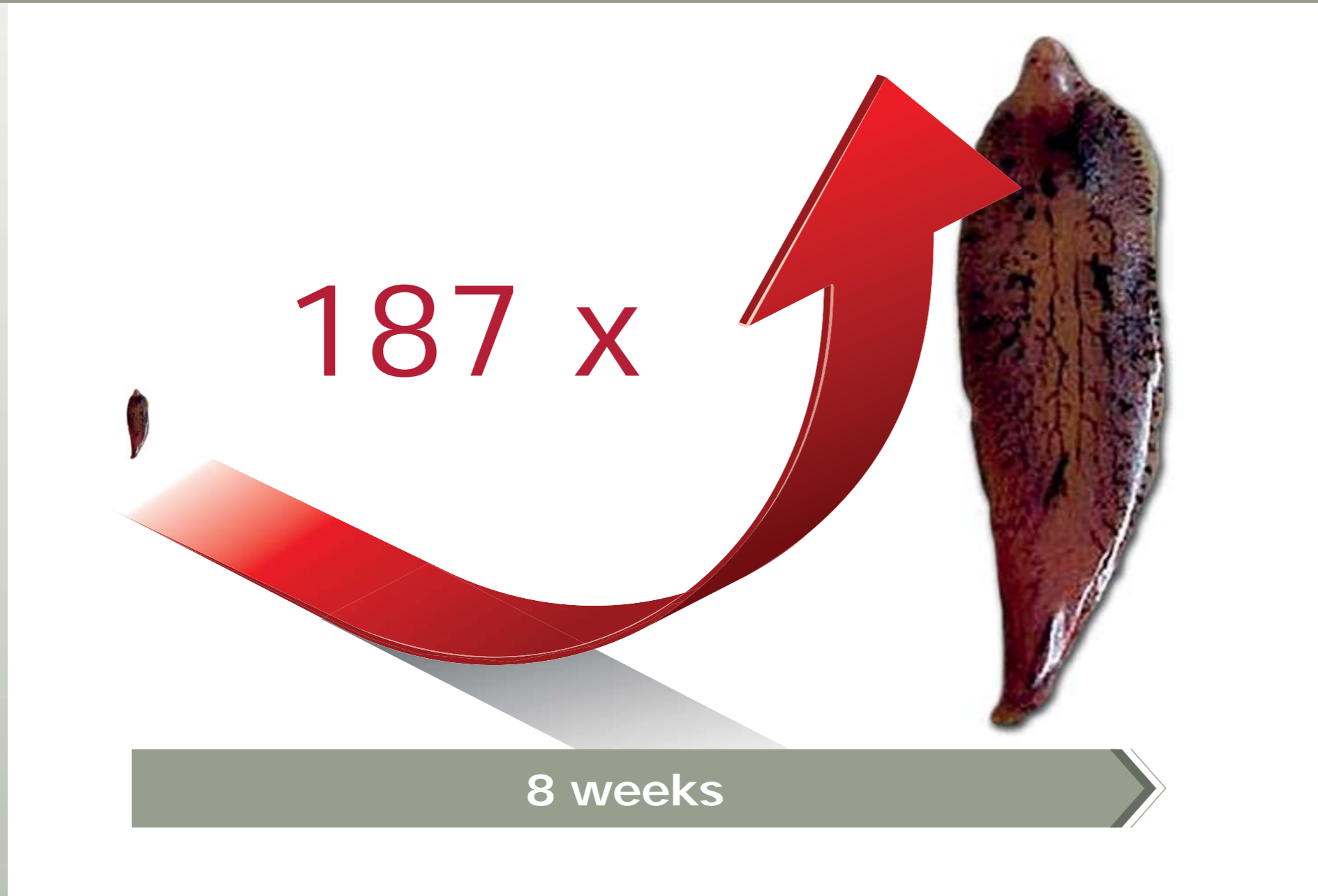
DIAGNOSIS

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LIVER FLUKE: A RAPID GROWING PARASITE



The liver fluke will grow by 187 times its size in a period of 8 weeks



THE LIVER

THE PARASITE

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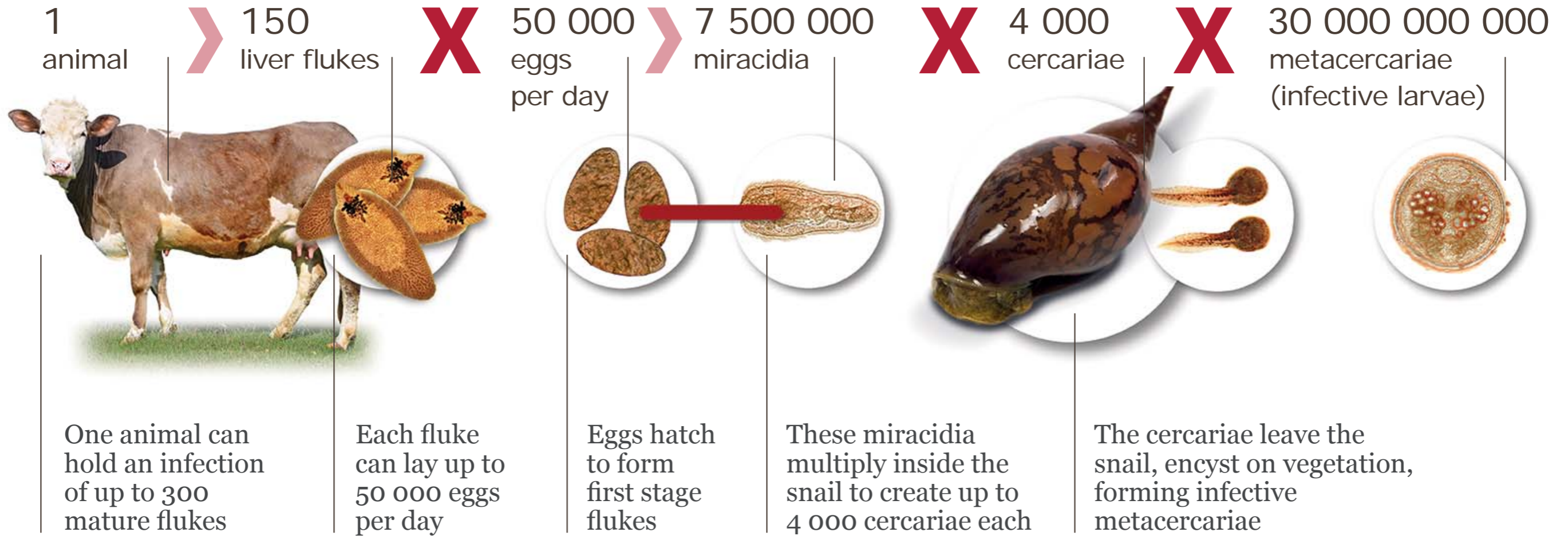
DIAGNOSIS

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THE PRODUCTS



LIVER FLUKE: A RAPIDLY MULTIPLYING PARASITE



THE LIVER

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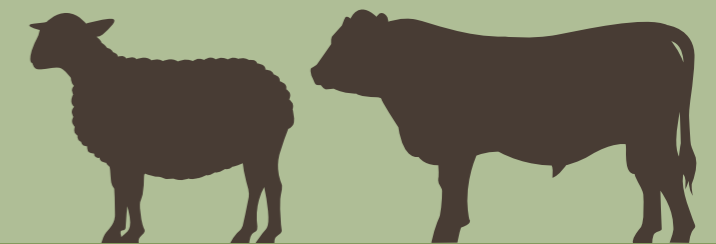
THE PRODUCTS





Liver fluke cause severe damage to the liver, resulting in:

- Haemorrhage and blood loss
- Anaemia
- Liver scaring
- Reduced appetite
- Possible death
- Protein loss
- Loss of liver function
- Reduced immunity
- Reduced reproduction
- Reduced production



EFFECT ON THE ANIMAL



THE LIVER

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LIVER FLUKE INFESTATION: DAMAGE TO BODY ORGANS



**BLEEDING
CAUSED BY
MIGRATING
LIVER FLUKE**

Once ingested, young fluke emerge from cysts in the small intestine, they penetrate the intestinal wall and enter the abdominal cavity. They migrate through the animal to the liver.

In cattle, $\pm 25\%$ of the metacercariae ingested will reach the liver, the rest migrate through the body and cause damage to other organs



THE LIVER

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LIVER FLUKE INFESTATION: DAMAGE CAUSED BY IMMATURE FLUKE



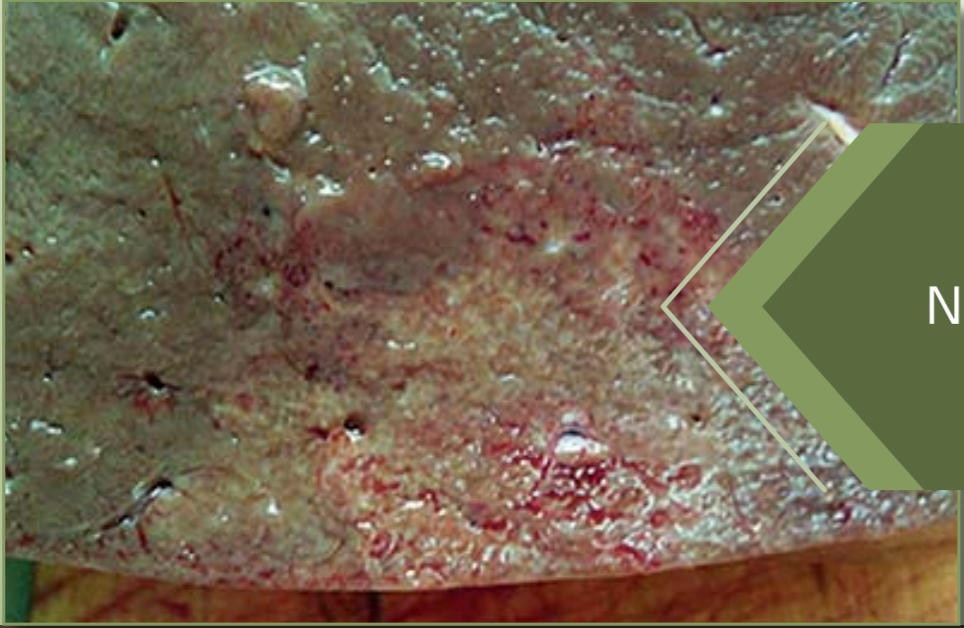
BLEEDING SPOTS



The most significant damage to the liver is caused by the migrating immature stages.

The immature fluke stages will often outnumber the mature stages.

NECROSIS



DAMAGE CAUSED BY MIGRATING LIVER FLUKE

from ± 2 weeks to adult stage



THE LIVER

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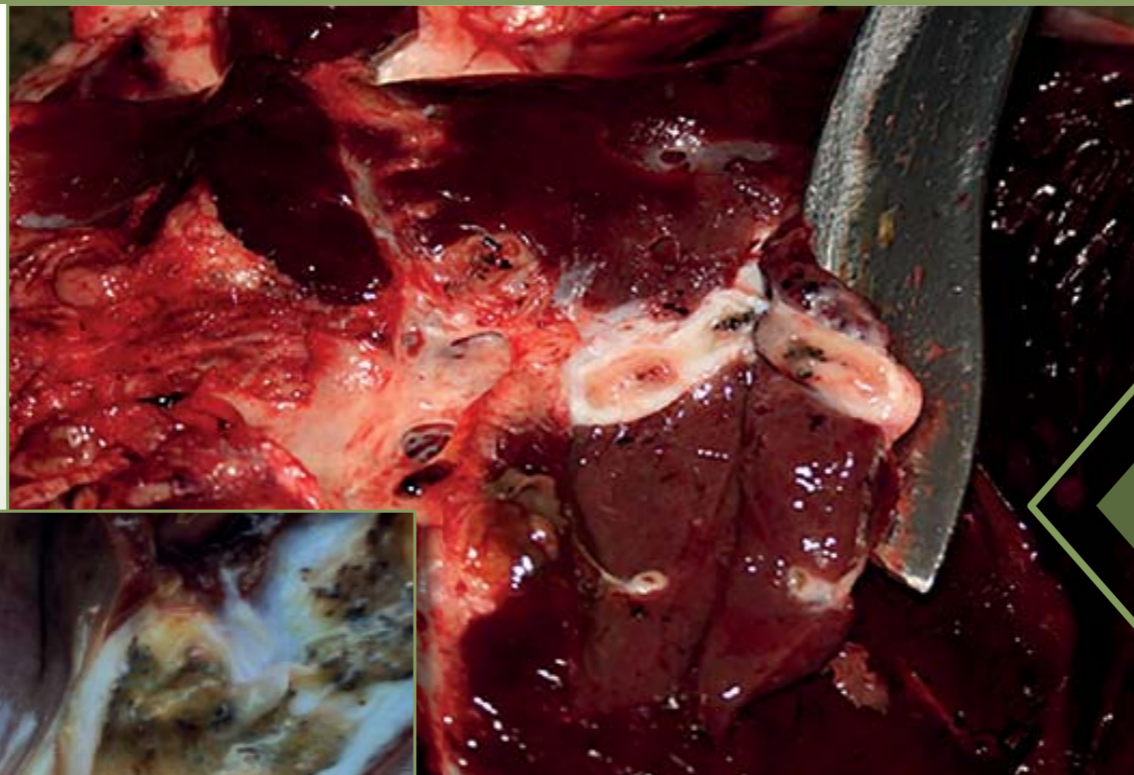
DIAGNOSIS

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LIVER FLUKE INFESTATION: DAMAGE CAUSED BY ADULT FLUKE



**THICKENING
CALCIFICATION
AND
BLOCKING OF
BILE DUCTS**

Adult



THE LIVER

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LIVER FLUKE INFESTATION: EFFECT ON THE ANIMALS HEALTH



**BOTTLE JAW
CAUSED BY
LIVER FLUKE
INFESTATION**



THE LIVER

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LIVER FLUKE INFESTATION: CLINICAL FORMS OF THE DISEASE



ACUTE



- Sudden severe illness/death, soon after infection (animals otherwise look healthy)
- Caused by massive intake of larvae
- Severe liver damage → massive blood loss
- More likely to occur in young animals



THE LIVER

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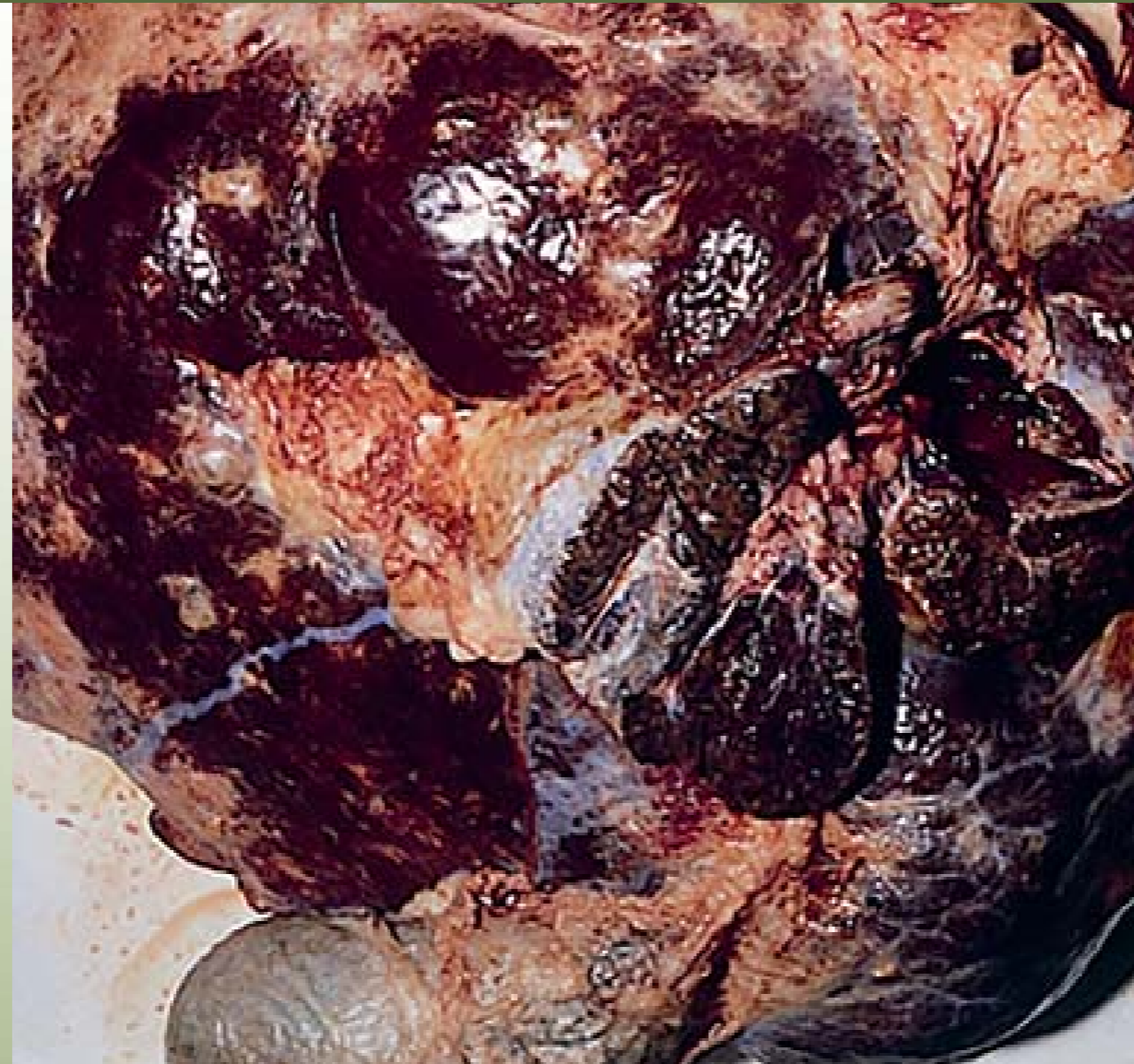
THE PRODUCTS



LIVER FLUKE INFESTATION: CLINICAL FORMS OF THE DISEASE



SUBACUTE



- Severe illness/occasional death
- Caused by moderate intake of larvae
- On going liver damage and blood loss
- Death most likely to occur when immature flukes are largest (~8 weeks post-infection)
- Some clinical signs prior to death
- More likely to occur in young animals



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LIVER FLUKE INFESTATION: CLINICAL FORMS OF THE DISEASE



CHRONIC



- Parasites acquired over time
- Clinical signs include lethargy, anaemia, emaciation, bottle jaw, distended abdomen
- On going low level liver damage and blood loss
- Death unlikely
- Occurs in animals of all ages



THE LIVER

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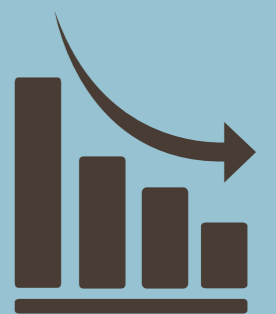
THE PRODUCTS





The economic impacts of liver fluke infection are related to:

- Reduced growth rates and weight gains
- Reduced milk production
- Reduced fertility
- Liver condemnation
- Mortality
- Secondary bacterial infections



ECONOMIC IMPACT



THE LIVER

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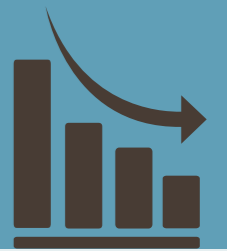
DIAGNOSIS

CONTROL

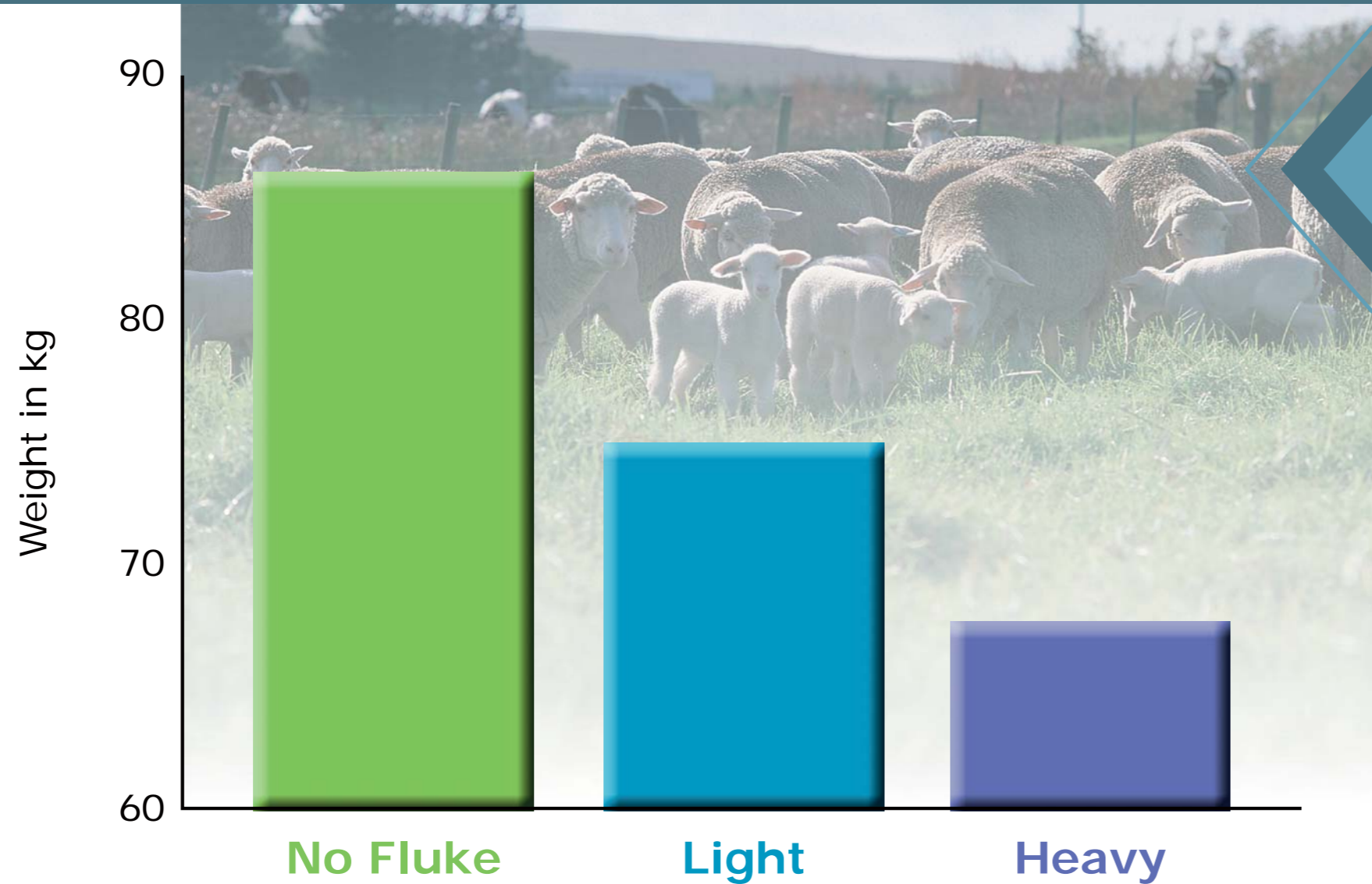
THE PRODUCTS



LIVER FLUKE INFESTATION: IMPACT ON BODYWEIGHT OF SHEEP



BODYWEIGHT OF SHEEP WITH SUBCLINICAL LIVER FLUKE INFECTION AFTER 40 WEEKS¹



LIVER FLUKE INFESTATION HAS A 15 % IMPACT ON FOOD INTAKE THAT RESULTS IN POOR GROWTH IF NOT CONTROLLED

In this trial: Liver fluke free sheep were dosed with *F. hepatica* metacercaria for 5 days each week for a period of 22 weeks, there was a tendency of poorer weight gain in the infected groups from week 20

- Animals with the light infestation were dosed with 8 x *F. hepatica* metacercaria for 5 days each week for 22 weeks
- Animals with the heavy infestation were dosed with 14 x *F. hepatica* metacercaria for 5 days each week for 22 weeks



THE LIVER

THE PARASITE

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THE IMPACT

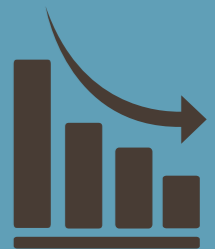
DIAGNOSIS

CONTROL

THE PRODUCTS



LIVER FLUKE INFESTATION: IMPACT ON WOOL PRODUCTION IN SHEEP



REDUCTION OF WOOL GROWTH IN SHEEP AFTER ARTIFICIAL INFECTION
WITH LIVER FLUKE METACERCARIA²



The wool production of 20 Merino sheep, artificially infected with *Fasciola hepatica*, was compared with that of 20 uninfected controls. Sheep of two different ages, 6 months and 4 years, were fed in pens ad lib on two different diets giving high and low planes of nutrition. The mid side tattooed patch technique was used to measure the wool production over periods of 6 weeks prior to the infection date, and 0 - 6, 6 - 12, 12 - 18 and 18 - 24 weeks after this date. Infection with *F. hepatica* caused significant reduction of 20 - 39 % in wool production from 6 weeks after infection, irrespective of age of the sheep or the plane of nutrition.

It was found that a reduction in wool production may occur without symptoms of fasciolosis being apparent.



THE LIVER

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LIVER FLUKE INFESTATION: EFFECT ON THE LIVER



ADULT
LIVER FLUKE
IN
SHEEP LIVER



THE LIVER

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LIVER FLUKE INFESTATION: EFFECT ON MILK PRODUCTION IN CATTLE



REDUCTION OF MILK PRODUCTION IN COWS INFECTED WITH LIVER FLUKE³



In high risk fluke areas liver fluke is a significant threat to milk production. The effect of liver fluke on milk production is well documented⁴

- Milk loss due to liver fluke infections are up to 1 kg/day over a lactation⁵
- A heavy infection can cost around 300 litres in lost milk production per cow per year
- A high incidence of liver fluke infestation can reduce milk butterfat concentration³



THE LIVER

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THE IMPACT

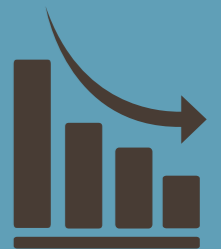
DIAGNOSIS

CONTROL

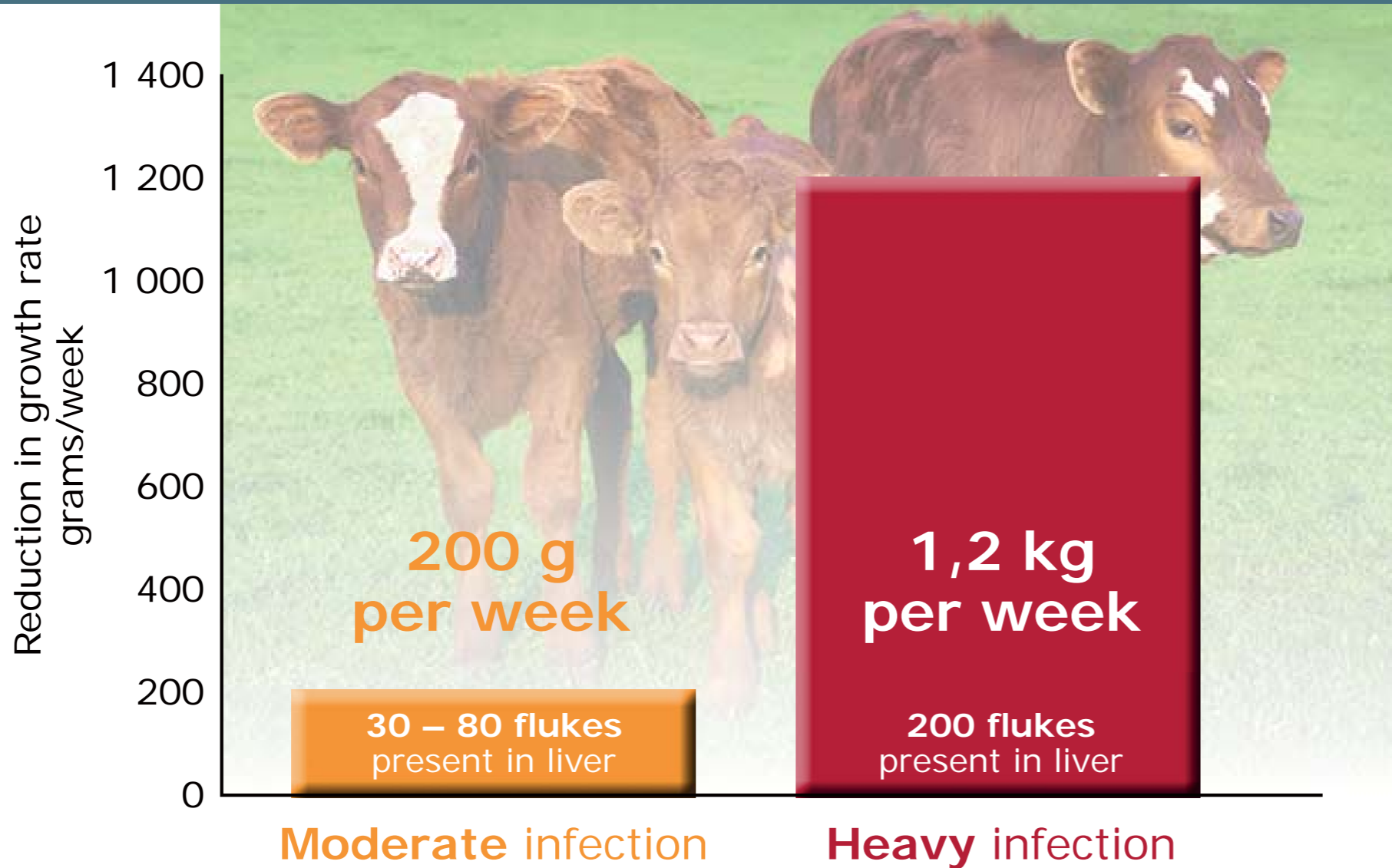
THE PRODUCTS



LIVER FLUKE INFESTATION: IMPACT ON GROWTH RATE IN CATTLE



REDUCTION OF BODY WEIGHT IN CALVES INFECTED WITH LIVER FLUKE⁶



- Liver fluke infection in growing cattle has been shown to depress live weight gain by between 0,07 kg/week and 1,2 kg/week, depending on the size of the fluke burden⁵
- A heavy infection can cost up to 28,5 % in reduced weight gain.^{6,7} Liver fluke can affect weight gains in young growing cattle – having a direct effect on your income
- The graph charts the reduction in body weight expressed as weight loss on calves in differing severity of liver fluke infection⁶



THE LIVER

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THE EFFECTS

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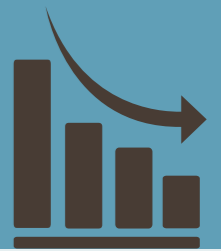
DIAGNOSIS

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THE PRODUCTS



LIVER FLUKE INFESTATION: EFFECT ON THE LIVER



The loss of income due to the condemnation could exceed R100 per animal slaughtered

**CONDEMNATION
OF LIVERS
AT ABATTOIR**



THE LIVER

THE PARASITE

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THE IMPACT

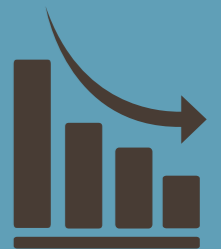
DIAGNOSIS

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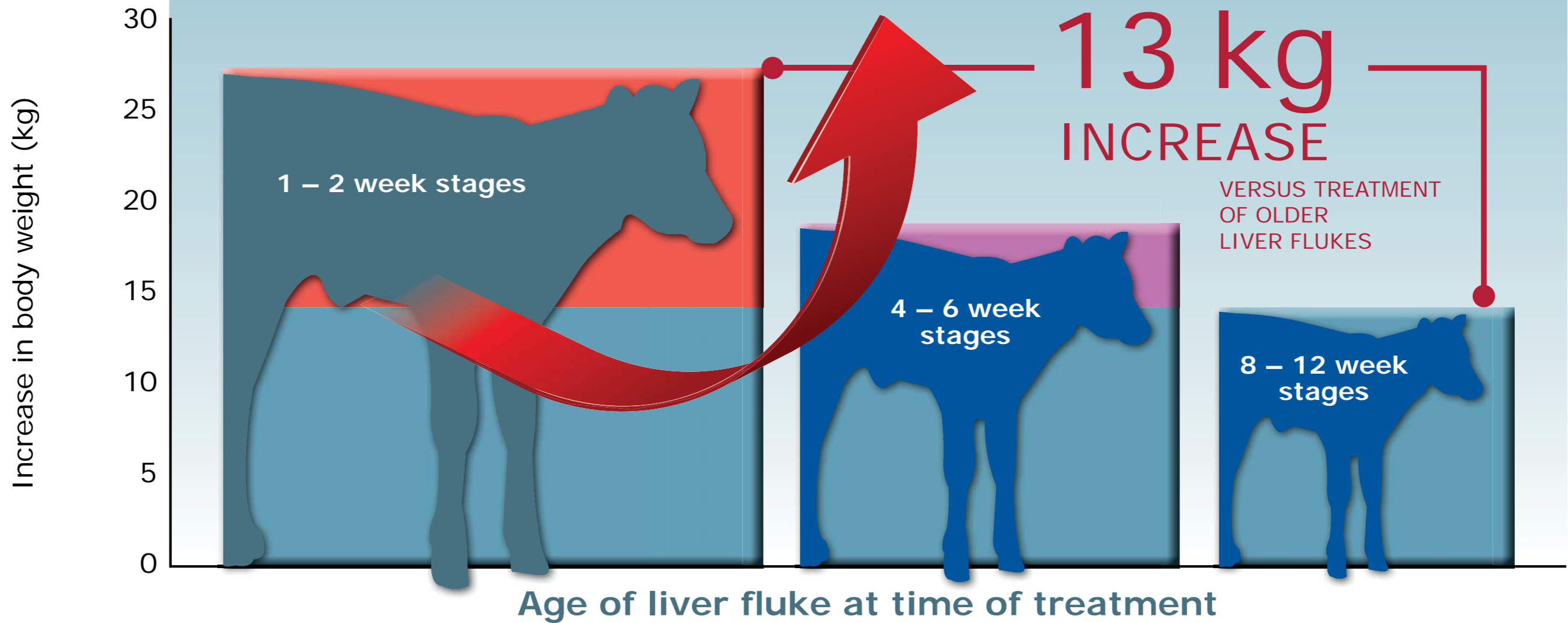
THE PRODUCTS



LIVER FLUKE INFESTATION: TREATING IMMATURE LIVER FLUKE PAYS



INCREASE IN BODY WEIGHT 20 WEEKS AFTER INFECTION⁸



THE LIVER

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There are a wide range of tests and methods available to detect liver fluke infections and prevalence



DIAGNOSIS



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DIAGNOSTIC METHODS: FAECAL EGG COUNT



Testing for liver fluke infection has traditionally been done by microscopic detection of fluke eggs in the faeces.

This test is not reliable in cattle and will only detect adult flukes.

In cattle, liver flukes are irregular and intermittent egg layers.

FAECAL
SAMPLE
COLLECTION



THE LIVER

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THE IMPACT

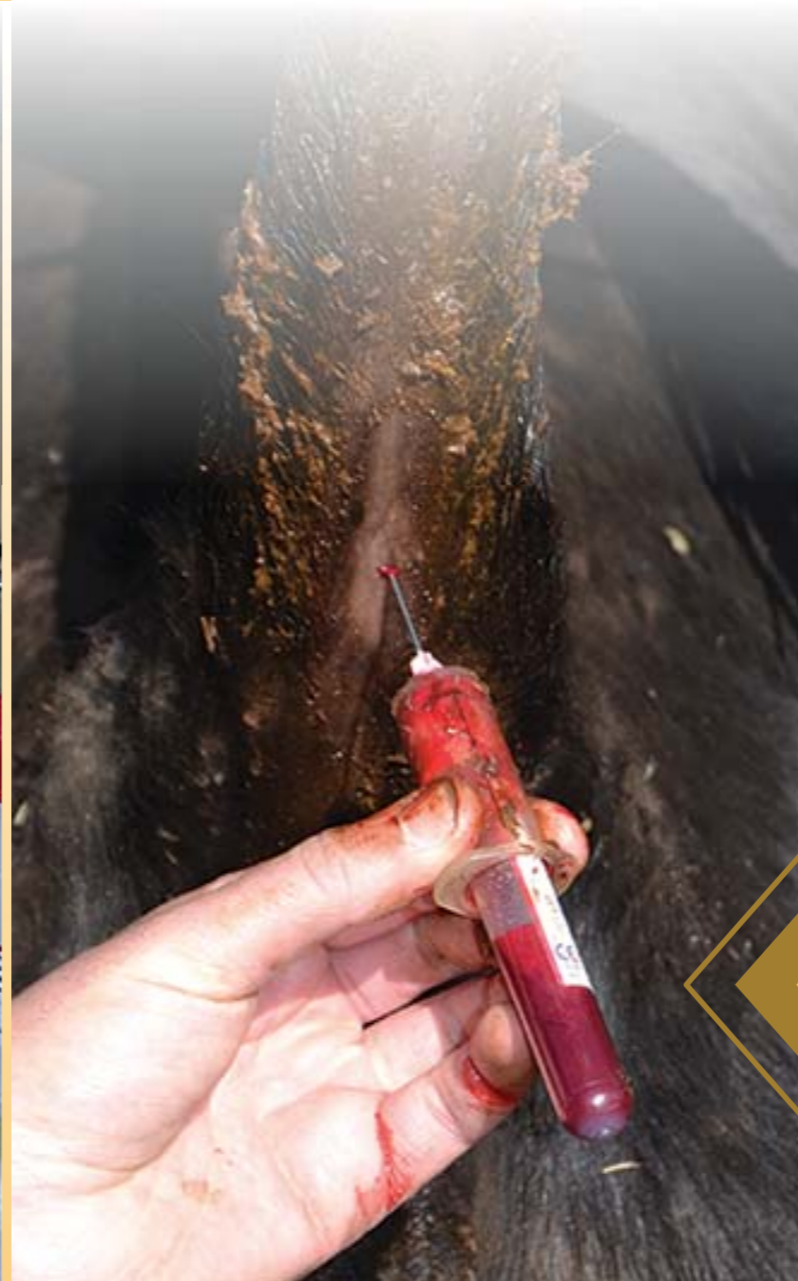
DIAGNOSIS

CONTROL

THE PRODUCTS



DIAGNOSTIC METHODS: BLOOD AND MILK ELISA ANTIBODY TEST



The Elisa test is a test that detects the antibodies that cattle produce in response to liver fluke infections.

The test is highly accurate (98 %) and antibodies can be detected 2 - 3 weeks after infection.

BLOOD
SAMPLE
COLLECTION



THE LIVER

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Liver fluke control can be challenging. The number of parasites in the host must be reduced as well as the fluke population present in the environment.

Effective, sustainable control must be based on an integrated parasite management program that includes:

- Chemical treatment
- Pasture/grazing management
- Fencing of contaminated areas (if practical)
- Repairing of leaking troughs



CONTROL PROGRAM



THE LIVER

THE PARASITE

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LIVER FLUKE CONTROL: THE ACTIVE INGREDIENTS



Fluke eggs in gall bladder

Ready for release into the digestive tract

Adult fluke in bile duct

Eggs layed ±10 to 12 weeks after infection

8 week old immature fluke

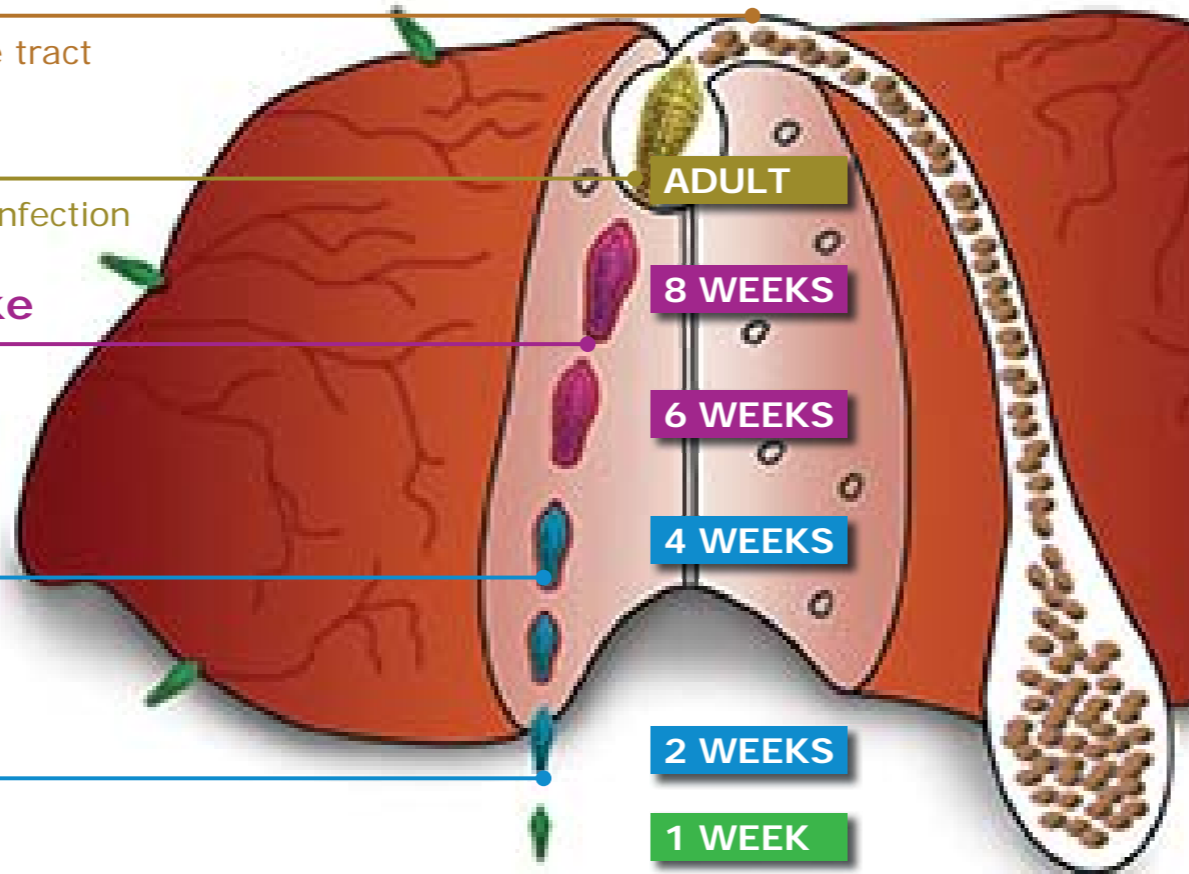
End of migratory phase, ready to enter bile duct

4 week old early immature fluke

Migratory phase, causing haemorrhage and scarring

2 week old fluke

Newly arrived from the gut



Level of control

Adult stage only
CLORSULON
OXYCLOZANIDE
NITROXYNIL

From 4 weeks to adult
(dose dependant)
CLOSANTEL

All stages
from 2 weeks to adult
TRICLABENDAZOLE

KEY:



ADULT



IMMATURE



**EARLY
IMMATURE**



**MIGRATING
STAGE**



**EGGS INSIDE THE
GALL BLADDER**



THE LIVER

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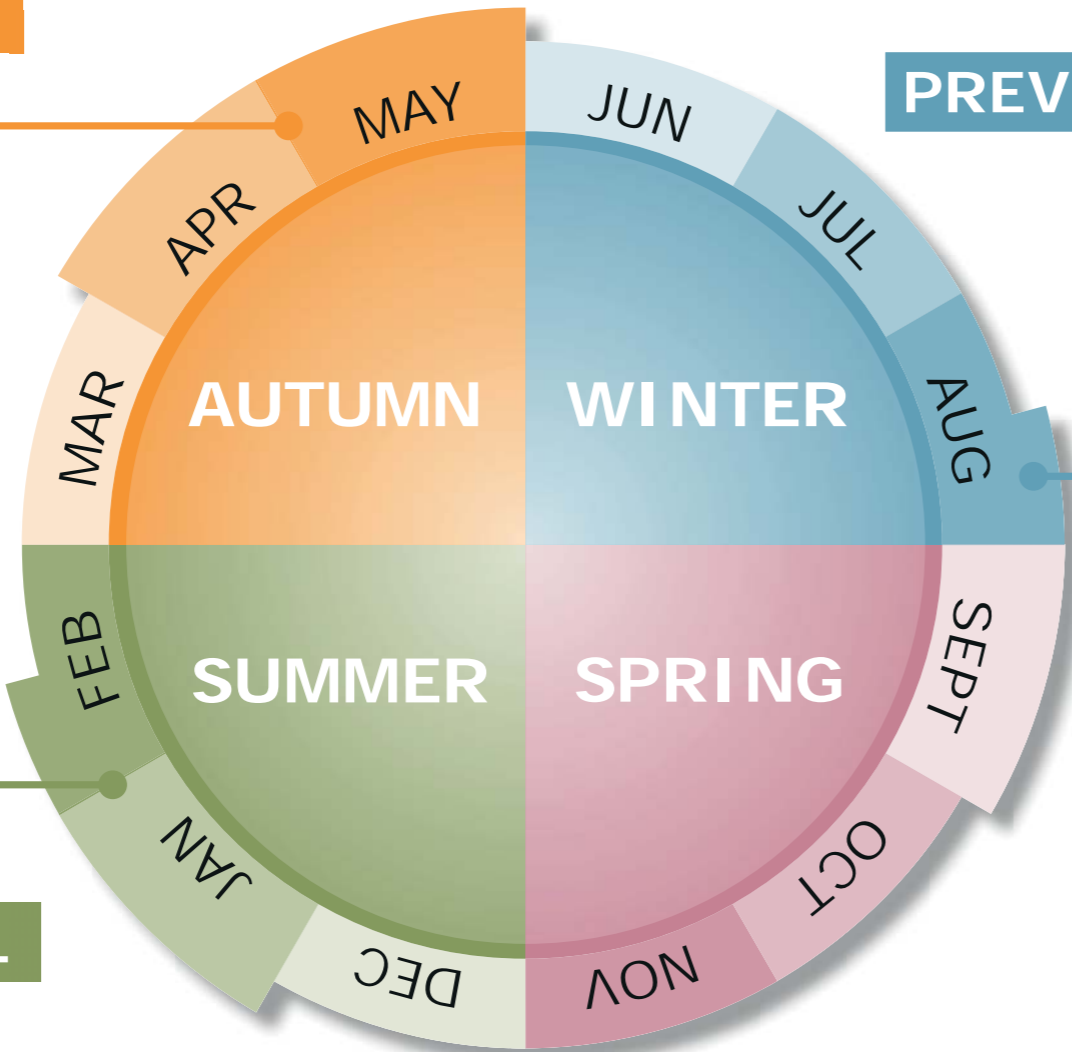
LIVER FLUKE CONTROL: A STRATEGY GEARED FOR OPTIMAL LIVER HEALTH



CURATIVE

PREVENTATIVE

OPTIONAL



Use a strategic control strategy throughout the year to **limit the production losses** caused by liver fluke, based on 3 options:

Curative treatment

Preventative treatment

Optional treatment



THE LIVER

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LIVER FLUKE CONTROL: A STRATEGY GEARED FOR OPTIMAL LIVER HEALTH





SHEEP



**USE
FLUKAZOLE C**

**COLD WINTER – USE
VIRBAMEC L**

**WARM WINTER – USE
FLUKAZOLE C**



USE ANY ONE OF THESE

PRODOSE ORANGE

PRODOSE YELLOW LA

WIRECIDE F



AUTUMN

Optimal time for an autumn treatment is
April/May

The autumn treatment is to control early immature, immature and adult flukes to reduce liver damage

**LATE WINTER
EARLY SPRING**

Optimal time for the late winter/spring treatment is **August/September**

This is important to remove remaining flukes and stop pasture contamination with fluke eggs

SUMMER

An optional **mid summer** treatment may be required for heavily infested areas



CATTLE



**USE
FLUKAZOLE C**

**COLD WINTER – USE
VIRBAMEC L**

**WARM WINTER – USE
FLUKAZOLE C**



USE ANY ONE OF THESE

FLUKAZOLE C

VIRBAMEC L

PRO-INJECT YELLOW

WIRECIDE F





THE LIVER

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Effective control of liver fluke relies on two key factors:

- Choice of product
- Timing of treatment

Maximum effect will be achieved by using the right product at the right time



THE PRODUCTS



THE LIVER

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FLUKAZOLE C



COMBINATION OF ACTIVES WITH SYNERGISTIC ACTION



TRICLABENDAZOLE 12 % m/v

OXFENDAZOLE 4,53 % m/v

LIVER FLUKE

from early immature
(2 weeks) to adult

TAPEWORM

MILK TAPEWORM
(class 1)

ROUNDWORM

SHEEP

WIREWORM
BROWN STOMACHWORM
LARGE-MOUTHED BOWELWORM
LONG-NECKED BANKRUPTWORM
LUNGWORM
BANKRUPTWORM
HOOKWORM
WHITE BANKRUPTWORM

CATTLE

WIREWORM
BROWN STOMACHWORM
CATTLE BANKRUPTWORM
HOOKWORM
NODULAR WORM
LUNGWORM

Ovicidal (kills parasite eggs present in animal at treatment)



THE LIVER

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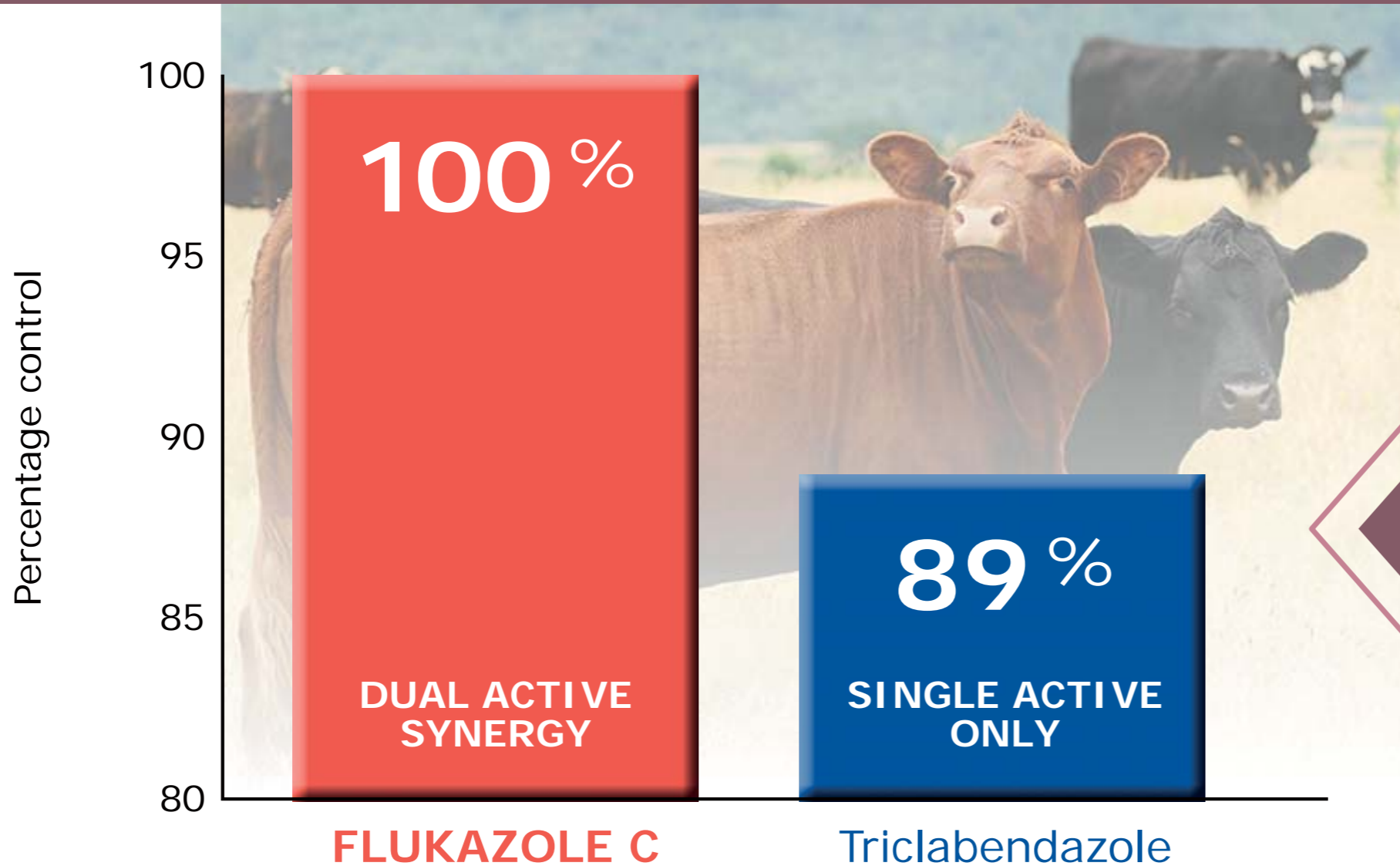


FLUKAZOLE C

BENEFITS OF A SYNERGISTIC COMBINATION



LIVER FLUKE CONTROL – DUAL ACTIVE vs SINGLE ACTIVE ALONE



Flukazole C contains two actives (Triclabendazole & Oxfendazole) that act synergistically to give superior liver fluke control

SYNERGY

$1 + 1 = 3$

The sum of 2 parts combined is greater than the individual components

Boray, 1998



THE LIVER

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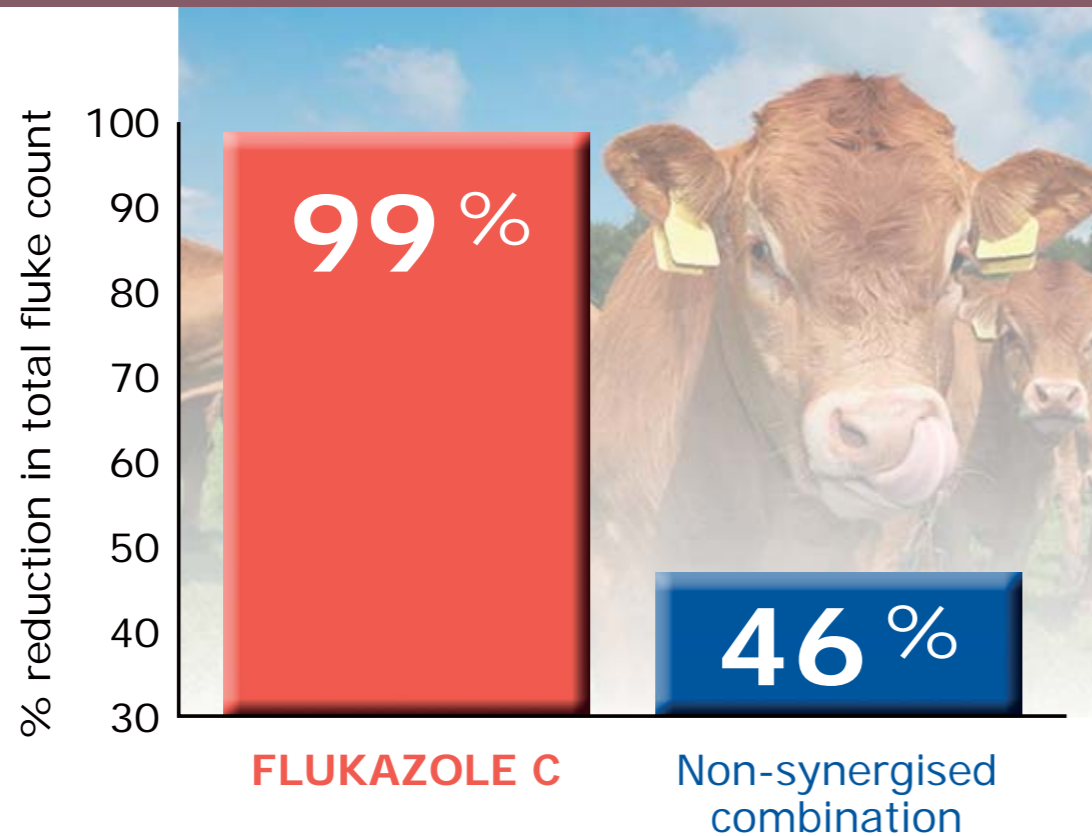
FLUKAZOLE C

BENEFITS OF A SYNERGISTIC COMBINATION



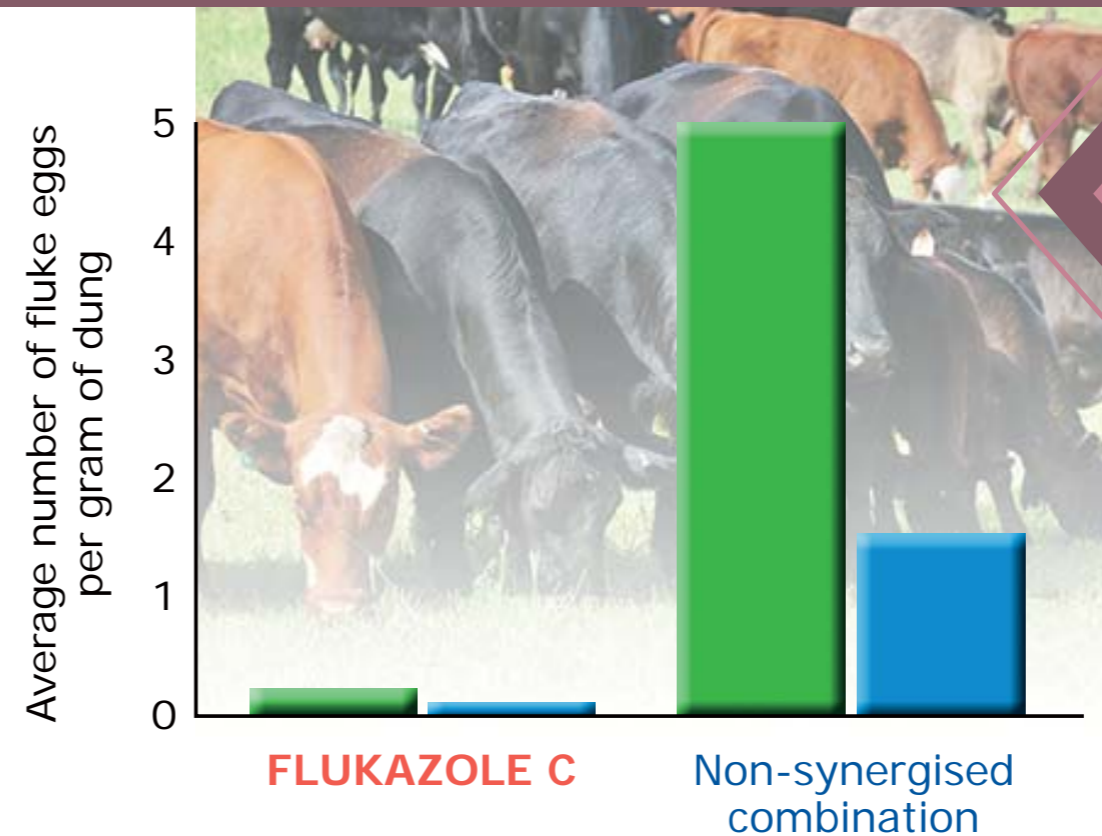
Study of comparative efficacy of two oral formulations against 2 week old stages of liver fluke, showed obvious benefits of treating with FLUKAZOLE C

CONTROL OF FLUKE AGED 2 WEEKS



NSW DPI study, 2006

FLUKE EGG COUNT DATA



NSW DPI study, 2006

LIVER FLUKE
TREATMENT
THAT COUNTS

Age of fluke at time of treatment

- 2 weeks
- 4 weeks



THE LIVER

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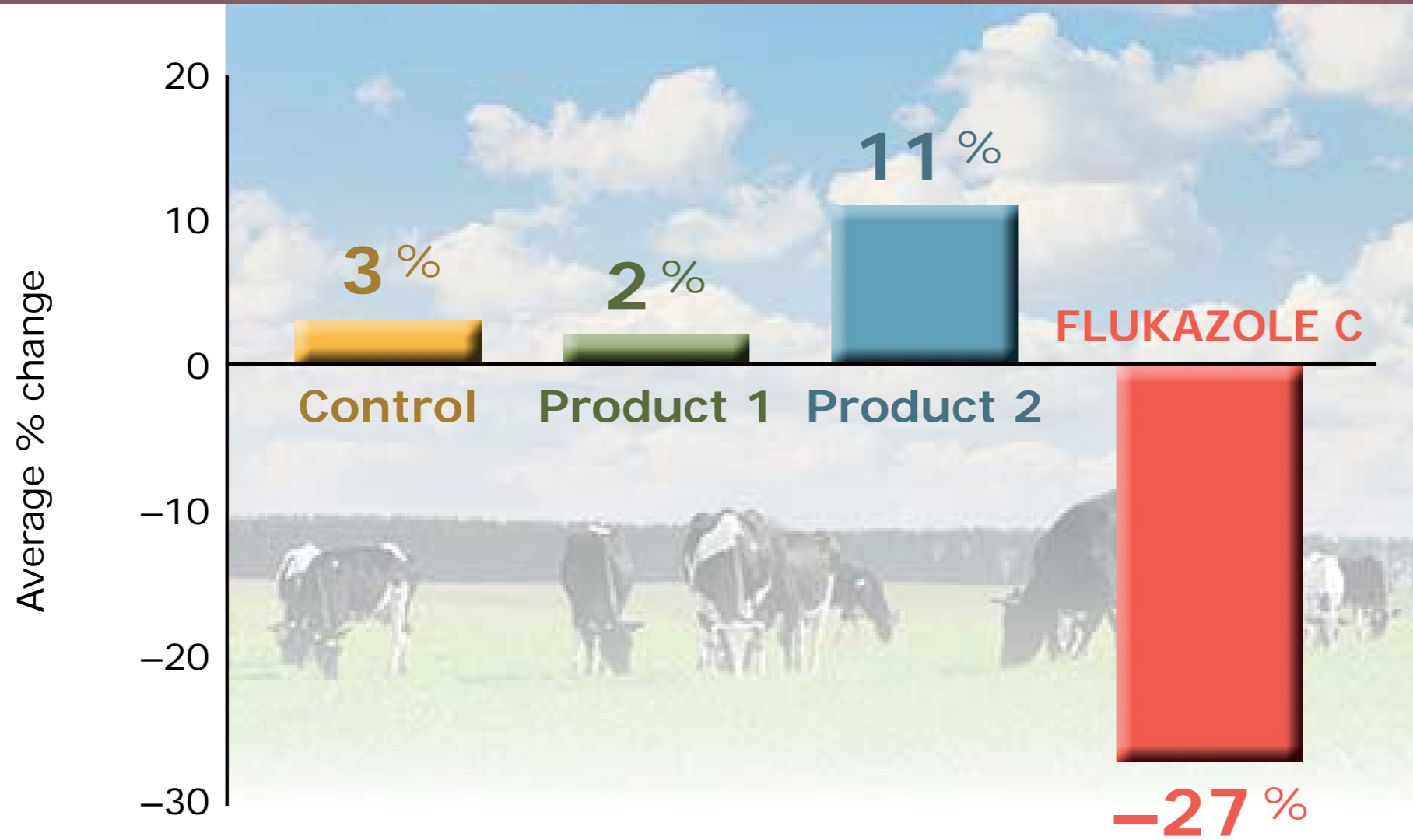
THE PRODUCTS



FLUKAZOLE C SOUTH AFRICAN TRIAL



CHANGE IN ANTIBODY TITRE – 12 WEEKS AFTER TREATMENT



Data on file

Although antibody titres were still present 12 weeks after treatment (re-infestation after treatment), **FLUKAZOLE C** reduced the antibody titre the most. This is indicative of FLUKAZOLE C's efficacy in eliminating fluke (all stages) present at treatment

Product 1

Oral product, non-synergistic, triclabendazole combination

Product 2

Pour-on product, non-synergistic, triclabendazole combination



THE LIVER

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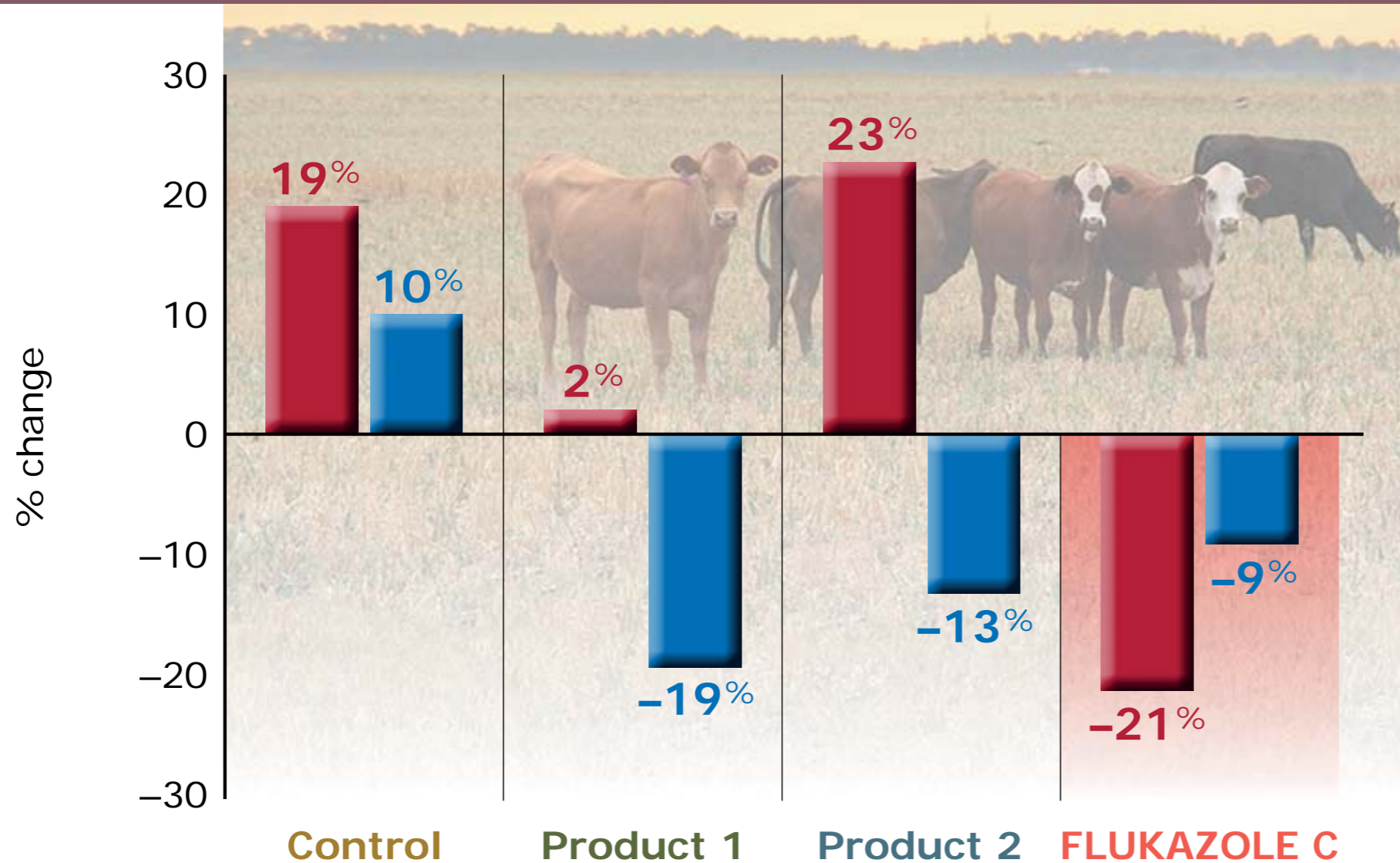
THE PRODUCTS



FLUKAZOLE C SOUTH AFRICAN TRIALS



CHANGE IN AST AND GGT – 15 DAYS AFTER TREATMENT



Data on file

A summary of the South African trials confirmed the results obtained in the Australian trials:

TRIAL 1

FLUKAZOLE C was the **only** product to reduce both the AST and GGT levels, 15 days after treatment

Product 1

Oral product, non-synergistic, triclabendazole combination

Product 2

Pour-on product, non-synergistic, triclabendazole combination

■ % **AST** change

■ % **GGT** change



THE LIVER

THE PARASITE

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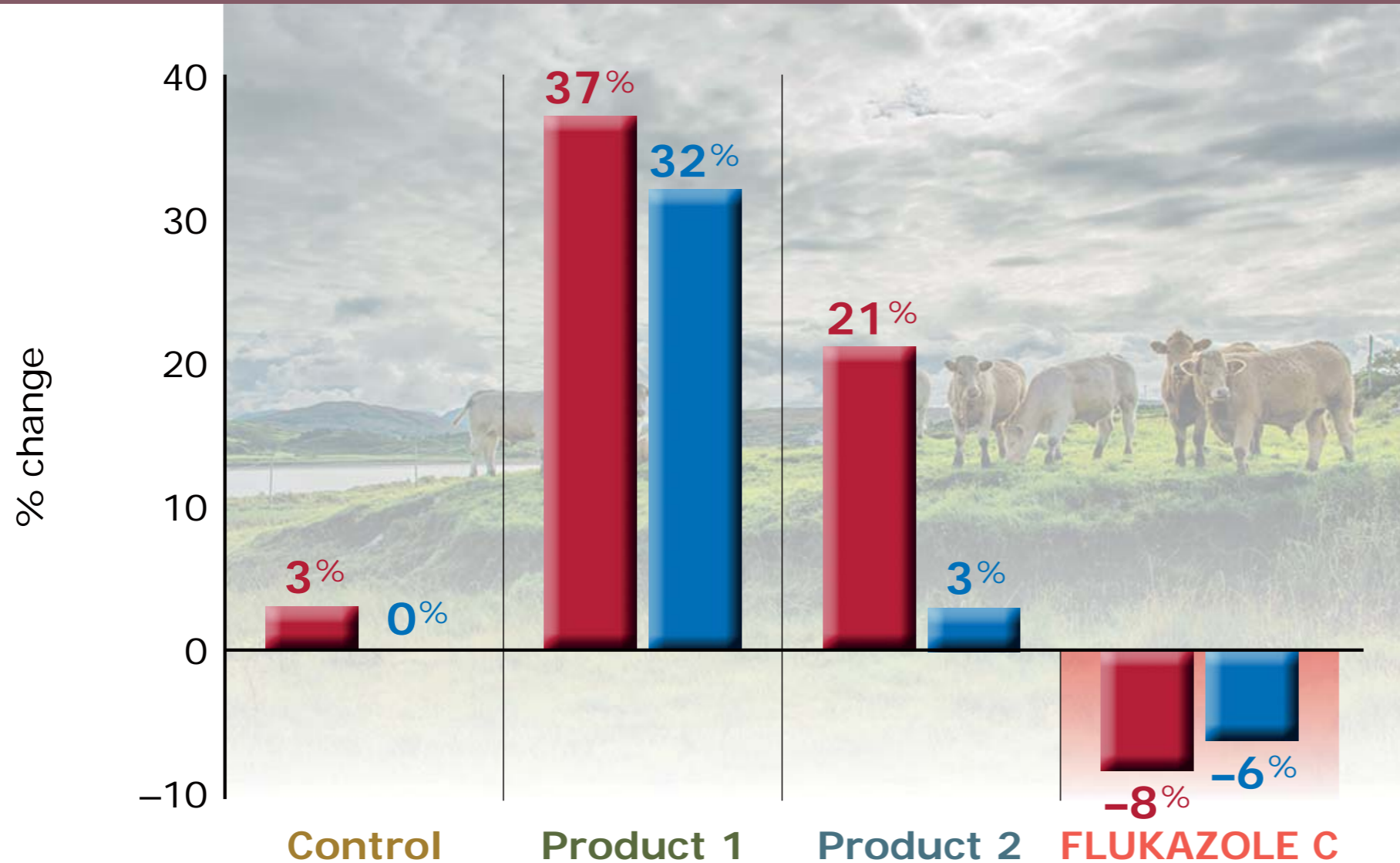
THE PRODUCTS



FLUKAZOLE C SOUTH AFRICAN TRIALS



CHANGE IN AST AND GGT – FROM DAY 10 TO 15 AFTER TREATMENT



Data on file

TRIAL 2

In a heavily infested herd, **FLUKAZOLE C** was the **only** product to reduce both the AST and GGT levels from 10 to 15 days

Product 1

Oral product, non-synergistic, triclabendazole combination

Product 2

Pour-on product, non-synergistic, triclabendazole combination

■ % **AST** change

■ % **GGT** change



THE LIVER

THE PARASITE

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VIRBAMEC® L



COMPREHENSIVE INTERNAL & EXTERNAL PARASITE CONTROL



IVERMECTIN

1 % m/v

CLORSULON

10 % m/v

LIVER FLUKE

LIVER FLUKE (adults)

GIANT LIVER FLUKE (adults)

PARAFILARIA

IN CATTLE

(aids in the control)

EXTERNAL PARASITES

BROAD SPECTRUM

ROUNDWORM

SHEEP

WIREWORM

BROWN STOMACHWORM

BANKRUPTWORM

HOOKWORM

NODULAR WORM

LARGE-MOUTHED
BOWELWORM

LUNGWORM

LONG-NECKED

BANKRUPTWORM

CATTLE

WIREWORM

BROWN STOMACHWORM

BANKRUPTWORM

HOOKWORM

NODULAR WORM

LUNGWORM

EYEWORM



THE LIVER

THE PARASITE

THE EFFECTS

THE IMPACT

DIAGNOSIS

CONTROL

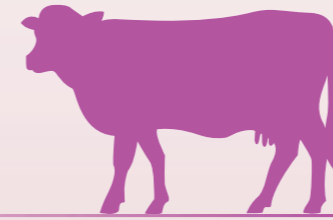
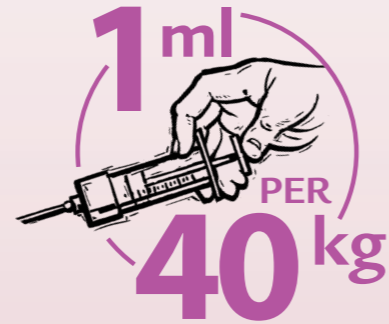
THE PRODUCTS



PRO-INJECT® YELLOW



LOW DOSE INJECTABLE SOLUTION



INJECTABLE

LIVER FLUKE

LIVER FLUKE (adults)

GIANT LIVER FLUKE (adults)

CLOSANTEL

10 % m/v

ROUNDWORM

PERSISTENCY

WIREWORM

3 WEEKS

HOOKWORM

NODULAR WORM



THE LIVER

THE PARASITE

THE EFFECTS

THE IMPACT

DIAGNOSIS

CONTROL

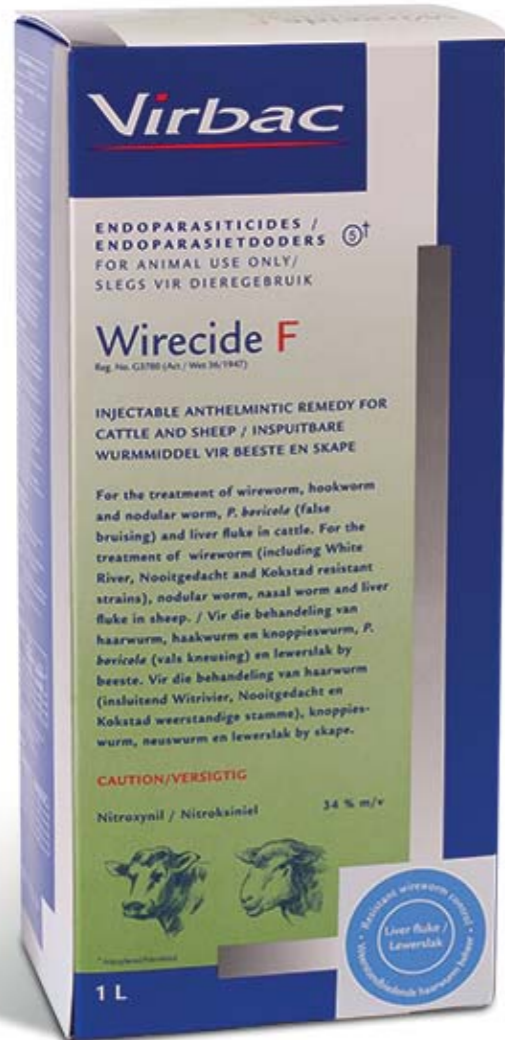
THE PRODUCTS



WI RECID E F



ALTERNATIVE ACTIVE IN PARASITE CONTROL



NITROXYNIL

34 % m/v

LIVER FLUKE

LIVER FLUKE (adults)
GIANT LIVER FLUKE (adults)

PARAFILARIA

IN CATTLE
DOUBLE DOSE: 3 ml per 50 kg

NASAL BOT

IN SHEEP

ROUNDWORM

SHEEP
WIREWORM
NOOITGEDACHT-RESISTANT WIREWORM STRAIN *f*
KOKSTAD-RESISTANT WIREWORM STRAIN *f*
WHITERIVER-RESISTANT WIREWORM STRAIN *f*
NODULAR WORM

CATTLE
WIREWORM
HOOKWORM
NODULAR WORM

f Resistant strains



THE LIVER

THE PARASITE

THE EFFECTS

THE IMPACT

DIAGNOSIS

CONTROL

THE PRODUCTS



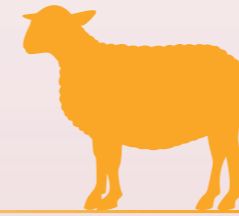
PRODOSE® YELLOW LA



INTERNAL PARASITE CONTROL WITH RESIDUAL EFFICACY



1 ml
PER
10 kg



ORAL DRENCH

LIVER FLUKE

LIVER FLUKE

from 6 weeks to adult

GIANT LIVER FLUKE

from 6 weeks to adult

CONICAL FLUKE

DOSE: 1,3 ml per 10 kg

CLOSANTEL

7,5 % m/v

ROUNDWORM

PERSISTENCY

WIREWORM

5 WEEKS

HOOKWORM

2 WEEKS

NASAL BOT

Highly effective against
1st, 2nd and 3rd instar larvae



THE LIVER

THE PARASITE

THE EFFECTS

THE IMPACT

DIAGNOSIS

CONTROL

THE PRODUCTS



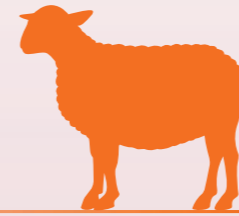
PRODOSE® ORANGE



INTERNAL PARASITE CONTROL WITH RESIDUAL EFFICACY



2 ml
PER
10 kg



ORAL DRENCH

ALBENDAZOLE

1,90 % m/v

CLOSANTEL (as sodium)

3,94 % m/v

LIVER FLUKE

LIVER FLUKE

from 6 weeks to adult

GIANT LIVER FLUKE

from 8 weeks to adult

TAPEWORM

MILK TAPEWORM (class 1)

NASALBOT

Controls all stages

ROUNDWORM

WIREWORM

BROWN STOMACHWORM

BANKRUPTWORM

LONG-NECKED BANKRUPTWORM

HOOKWORM

NODULAR WORM

LARGE-MOUTHED BOWELWORM

Ovicidal (kills parasite eggs present in animal at treatment)

PERSISTENCY

5 WEEKS

2 WEEKS



THE LIVER

THE PARASITE

THE EFFECTS

THE IMPACT

DIAGNOSIS

CONTROL

THE PRODUCTS



REFERENCES



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FLUKAZOLE C – Triclabendazole 12 % m/v, Oxfendazole 4,53 % m/v, Reg. No: G3533 (Act 36/947), Namibia Reg. No: V06/18.1.8/76 [NSO](#), Zimbabwe Reg. No: 2017/80.12.10/9773 and Zambia Reg. No: 359/713V **P-V**

VIRBAMEC® L – Ivermectin 1 % m/v, Clorsulon 10 % m/v, Reg. No: G3269 (Act 36/1947), Namibia Reg. No: V06/18.1.8/72 [NSO](#) and Zambia Reg. No: 359/739V **POM-V**

PRO-INJECT® YELLOW – Closantel 10 % m/v, Reg. No: G2048 (Act 36/1947), Namibia Reg. No: V02/18.1.3/7 [NSO](#) and Zambia Reg. No: 359/728V **POM-V**

WIRECIDE F – Nitroxynil 34 % m/v, Reg. No. G3780 (Act 36/1947), Namibia Reg. No. V08/18.1.3/130 [NSO](#)

PRODOSE® YELLOW LA – Closantel 7,5 % m/v, Reg. No. G1959 (Act 36/1947), Namibia Reg. No. V03/18.1.3/104 [NSO](#)

PRODOSE® ORANGE – Albendazole 1,90 % m/v, Closantel (as sodium) 3,94 % m/v, Reg. No: G2101 (Act 36/1947), Namibia Reg. No: V95/18.1.8/43 [NSO](#) and Zimbabwe Reg. No: 2017/80.12.10/9772

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THE LIVER

THE PARASITE

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