THE LIVER

THE PARASITE

THE EFFECTS

THE IMPACT

DIAGNOSIS

CONTROL

THE PRODUCTS

LIVER FLUKE CONTROL

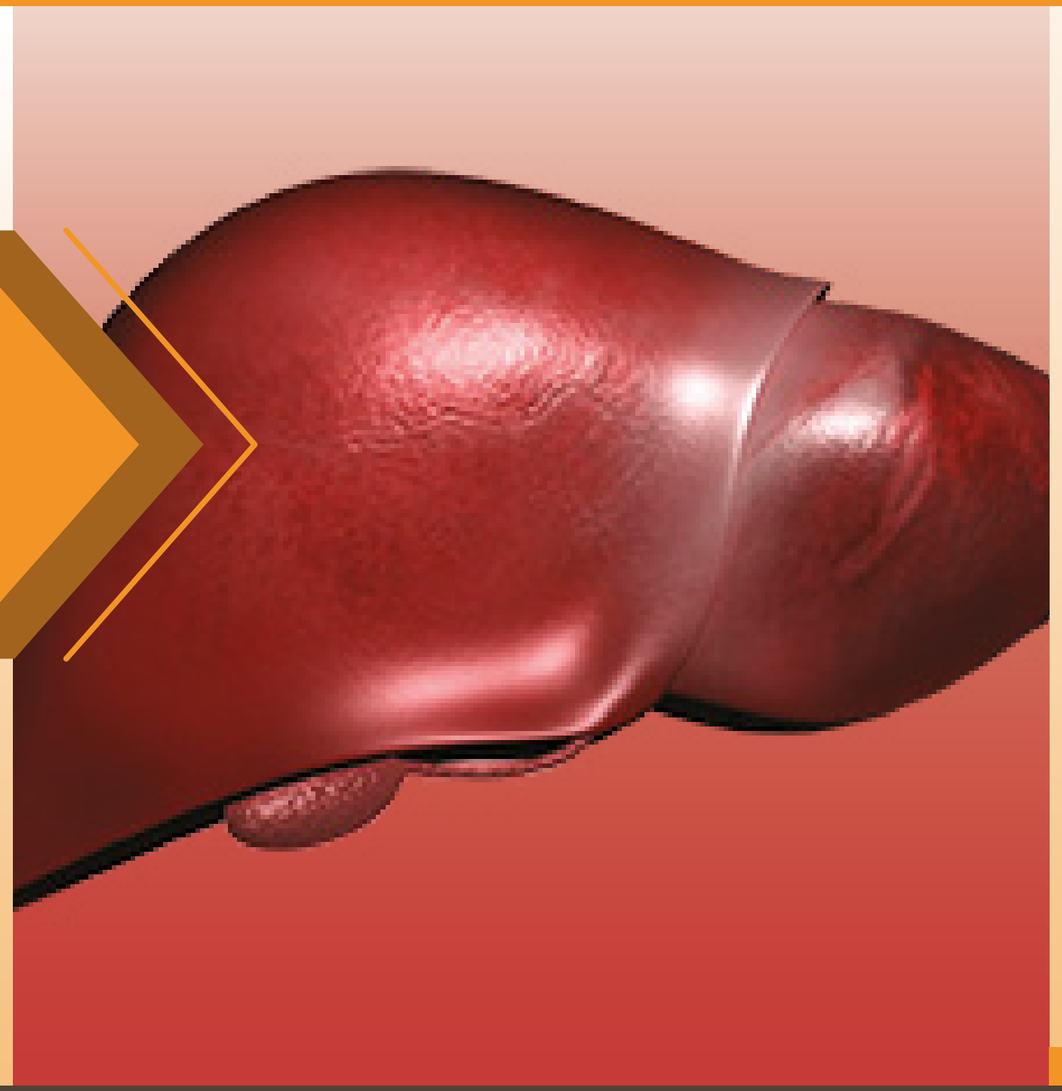
...geared for optimal liver health

Virbac

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**

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

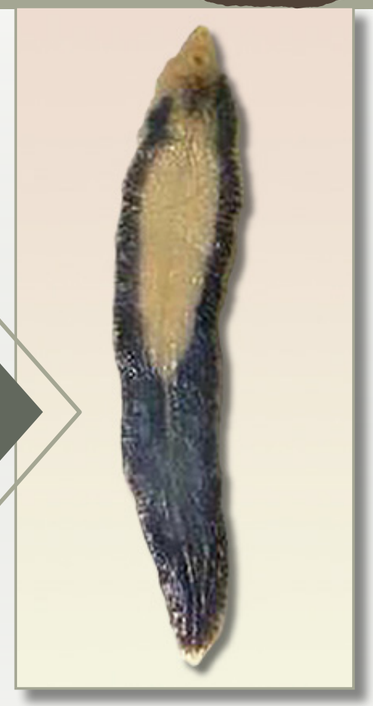
LIVER FLUKE:
TWO IMPORTANT SPECIES IN CATTLE

There are 2 species of liver fluke
found in South Africa

LIVER FLUKE

(F. hepatica)

GIANT
LIVER FLUKE
(F. gigantica)



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 *(Fasciola gigantica)*

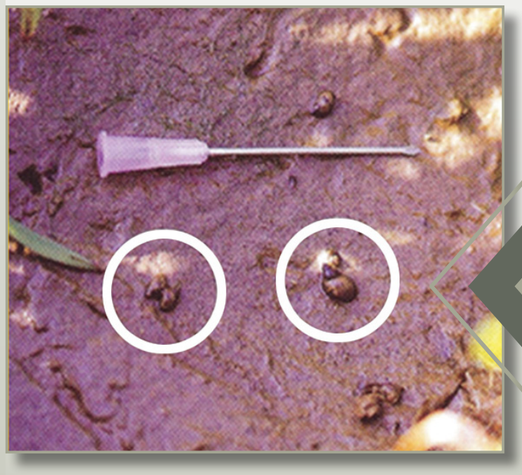
- Average 5,5 cm long and 1,5 cm wide
- More commonly found in the northern regions of South Africa

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**

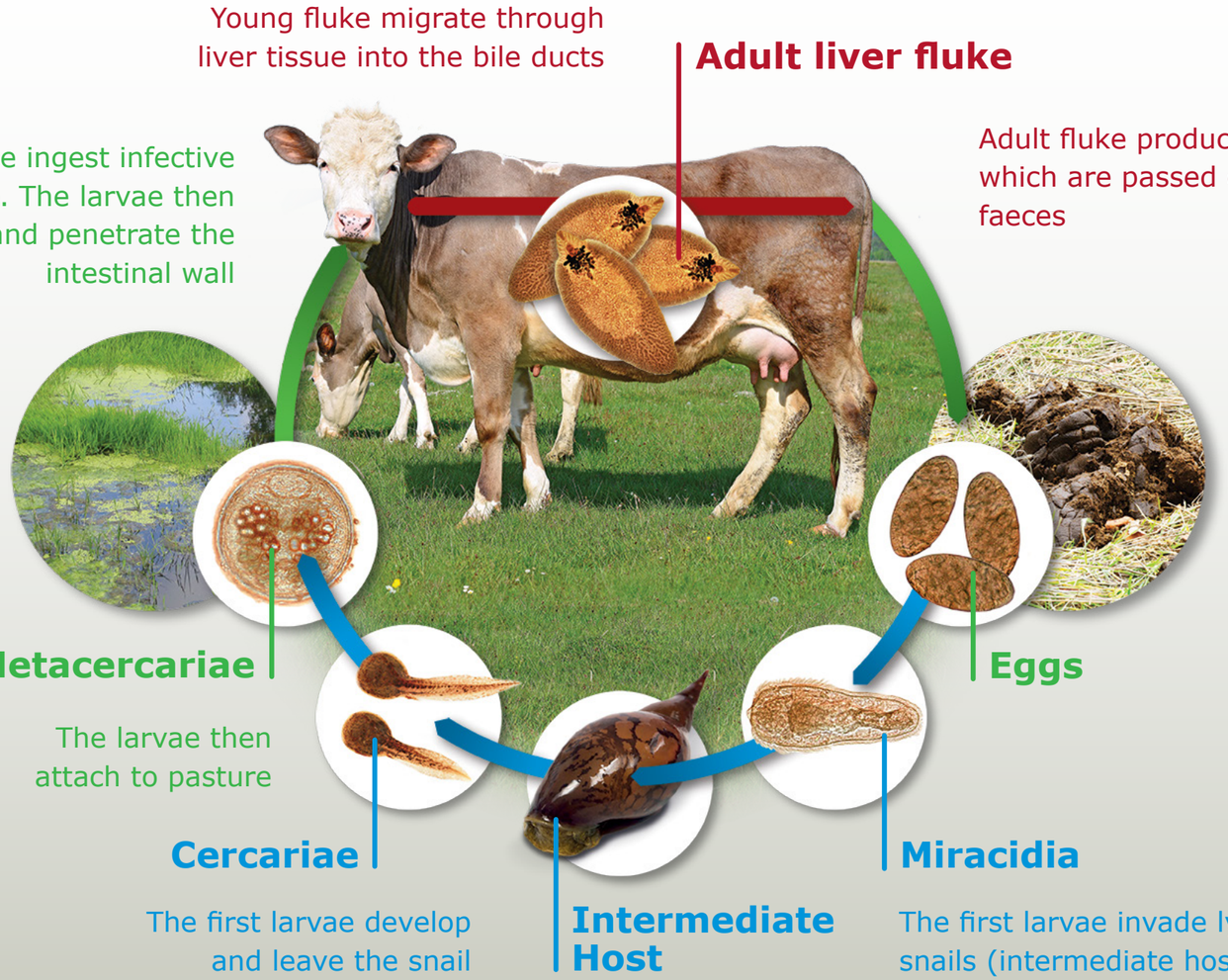


SNAILS CAN BE HARD TO DETECT

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

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

LIVER FLUKE:
A RAPID GROWING PARASITE

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

LIVER FLUKE:
A RAPIDLY MULTIPLYING PARASITE

1
animal

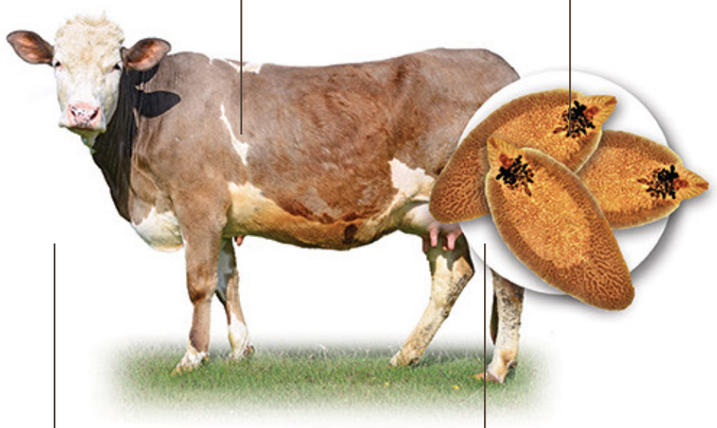
› 150
liver flukes

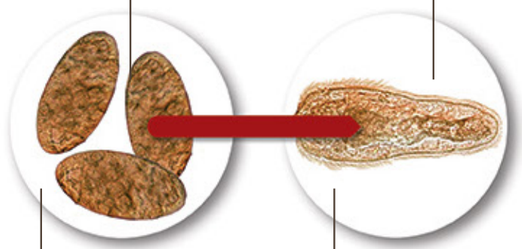
X 50 000
eggs
per day

› 7 500 000
miracidia

X 4 000
cercariae

X 30 000 000 000
metacercariae
(infective larvae)





One animal can hold an infection of up to 300 mature flukes

Each fluke can lay up to 50 000 eggs per day

Eggs hatch to form first stage flukes

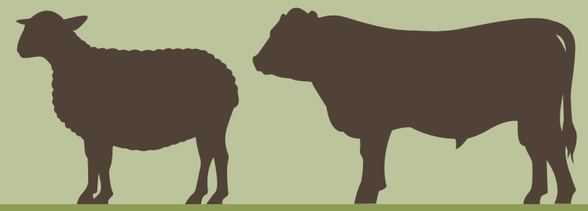
These miracidia multiply inside the snail to create up to 4 000 cercariae each

The cercariae leave the snail, encyst on vegetation, forming infective metacercariae

EFFECT ON THE ANIMAL

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



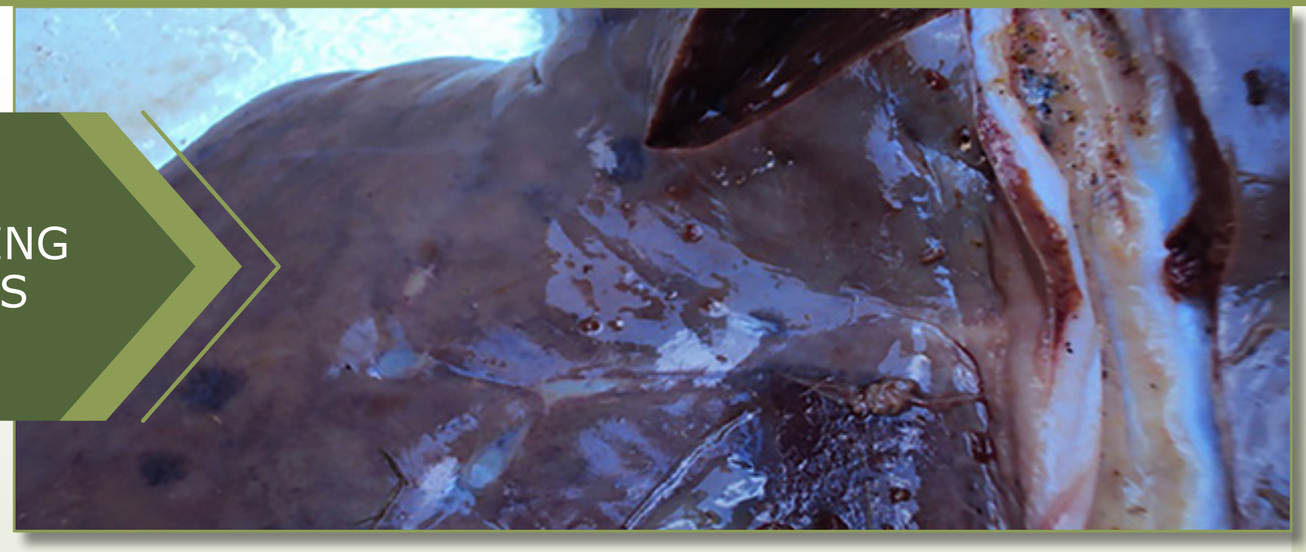
LIVER FLUKE INFESTATION:
DAMAGE TO BODY ORGANS

BLEEDING
CAUSED BY
MIGRATING
LIVER FLUKE

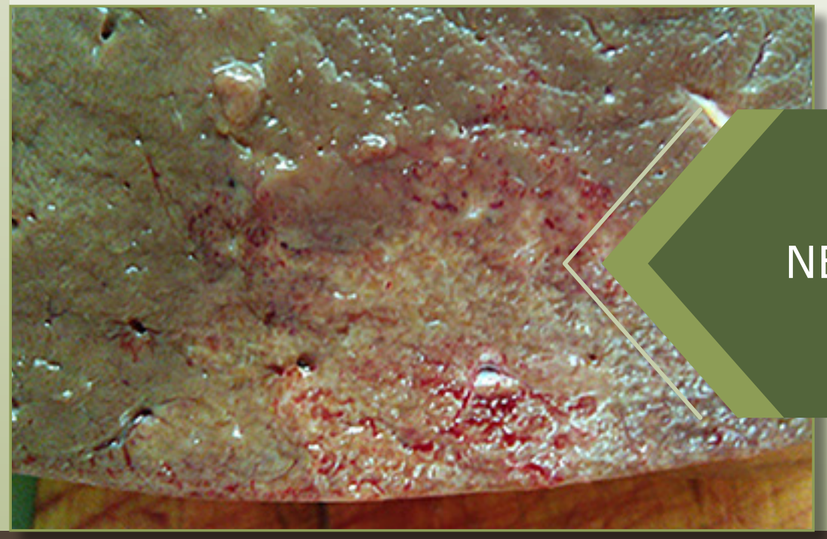
Once ingested, young fluke emerge from cysts in the small intestine, they penetrate the intestinal wall and enter the abdominal cavity. They migrate through the animal to the liver.

In cattle, ± 25 % of the metacercaria ingested will reach the liver, the rest migrate through the body and cause damage to other organs

LIVER FLUKE INFESTATION:
DAMAGE CAUSED BY IMMATURE FLUKE



BLEEDING SPOTS



NECROSIS

DAMAGE CAUSED BY **MIGRATING** LIVER FLUKE

from ± 2 weeks to adult stage

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

The immature fluke stages will often out number the mature stages.

LIVER FLUKE INFESTATION:
DAMAGE CAUSED BY ADULT FLUKE

THICKENING
CALCIFICATION
AND
BLOCKING OF
BILE DUCTS

Adult

LIVER FLUKE INFESTATION:
EFFECT ON THE ANIMALS HEALTH

BOTTLE JAW
CAUSED BY
LIVER FLUKE
INFESTATION

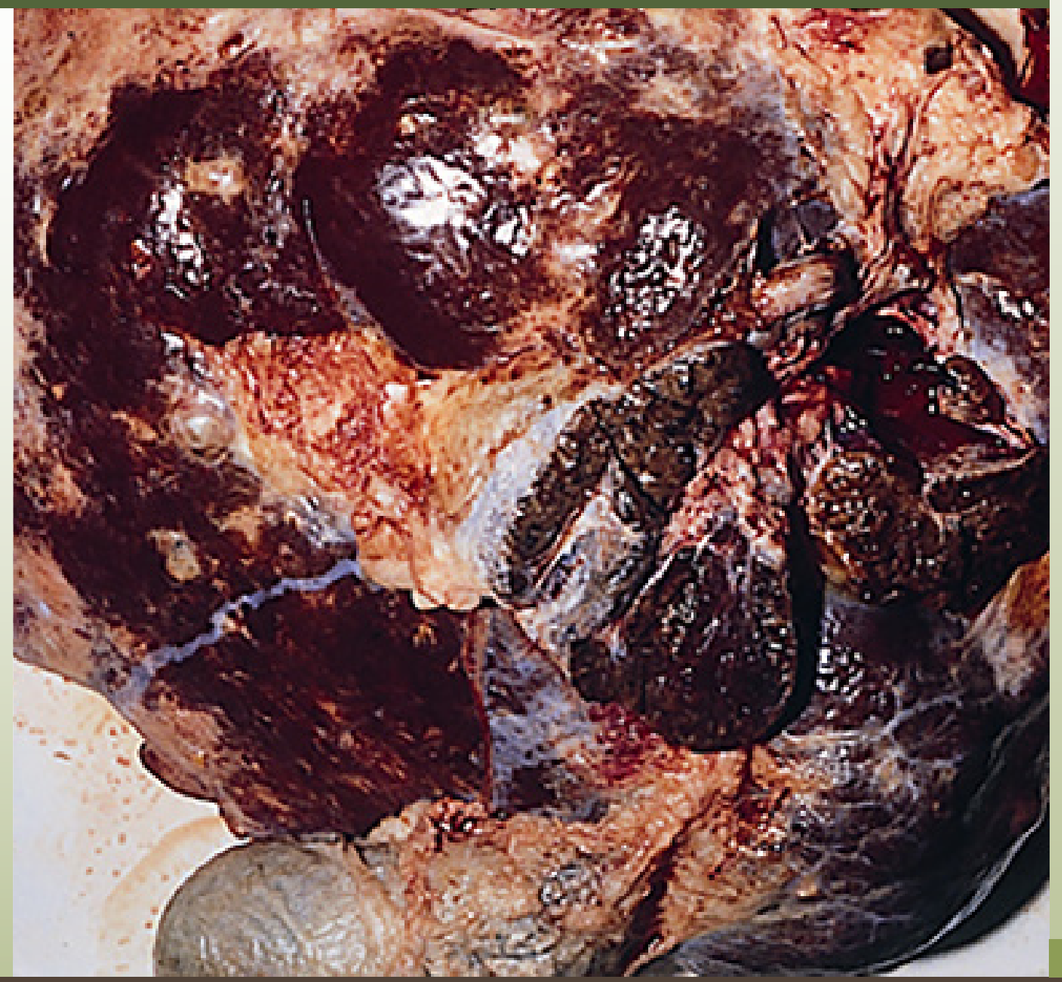
LIVER FLUKE INFESTATION:
CLINICAL FORMS OF THE DISEASE

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**

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**

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**

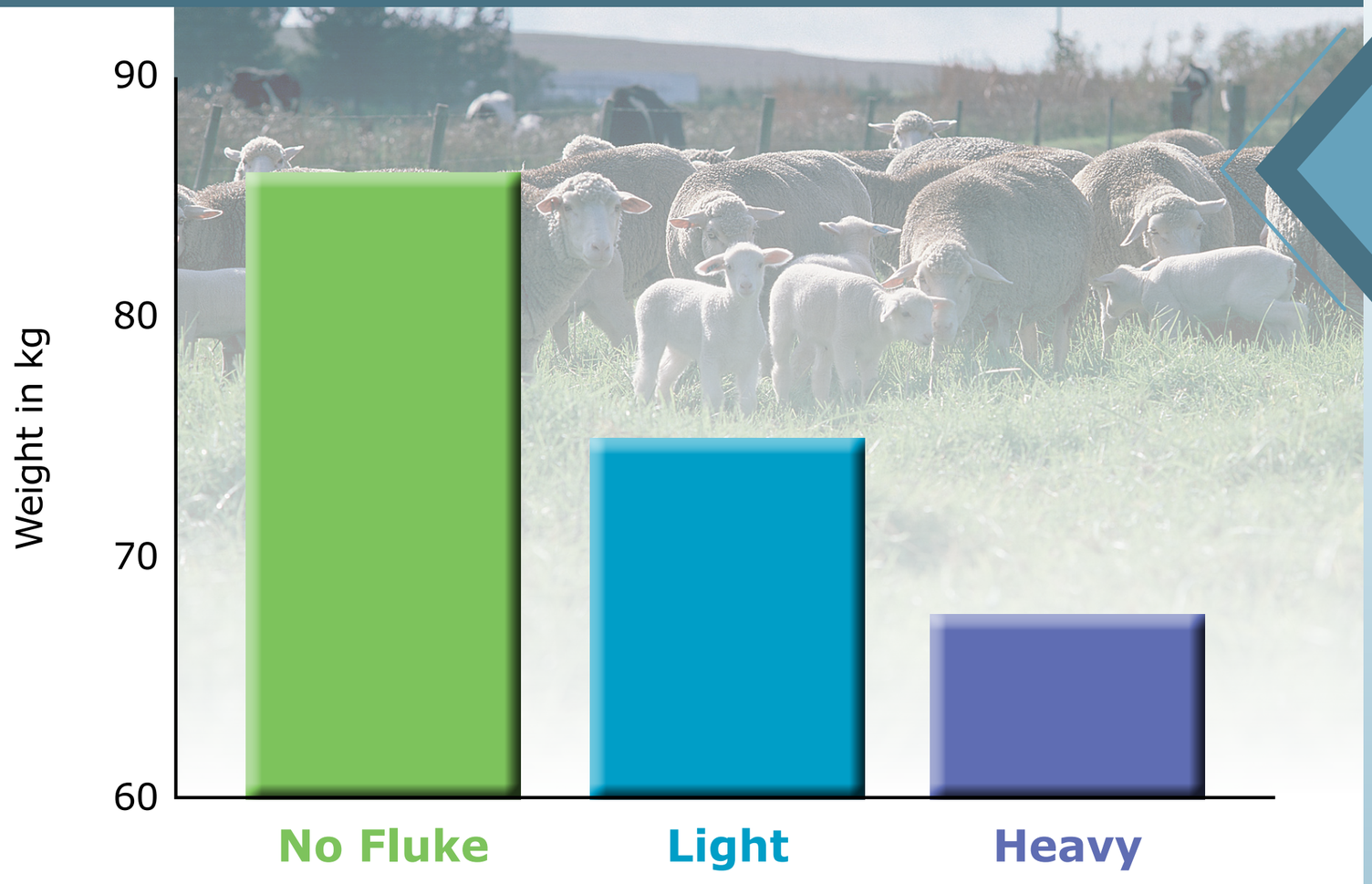
The economic impacts of liver fluke infection are related to:

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

ECONOMIC IMPACT

LIVER FLUKE INFESTATION:
IMPACT ON BODYWEIGHT OF SHEEP

BODYWEIGHT OF SHEEP WITH SUBCLINICAL LIVER FLUKE INFECTION AFTER 40 WEEKS[1]



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

LIVER FLUKE INFESTATION:
IMPACT ON WOOL PRODUCTION IN SHEEP

REDUCTION OF WOOL GROWTH IN SHEEP AFTER ARTIFICIAL INFECTION WITH LIVER FLUKE METACERCARIA[2]

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.

LIVER FLUKE INFESTATION:
EFFECT ON THE LIVER

ADULT LIVER FLUKE IN SHEEP LIVER

LIVER FLUKE INFESTATION:
EFFECT ON MILK PRODUCTION IN CATTLE

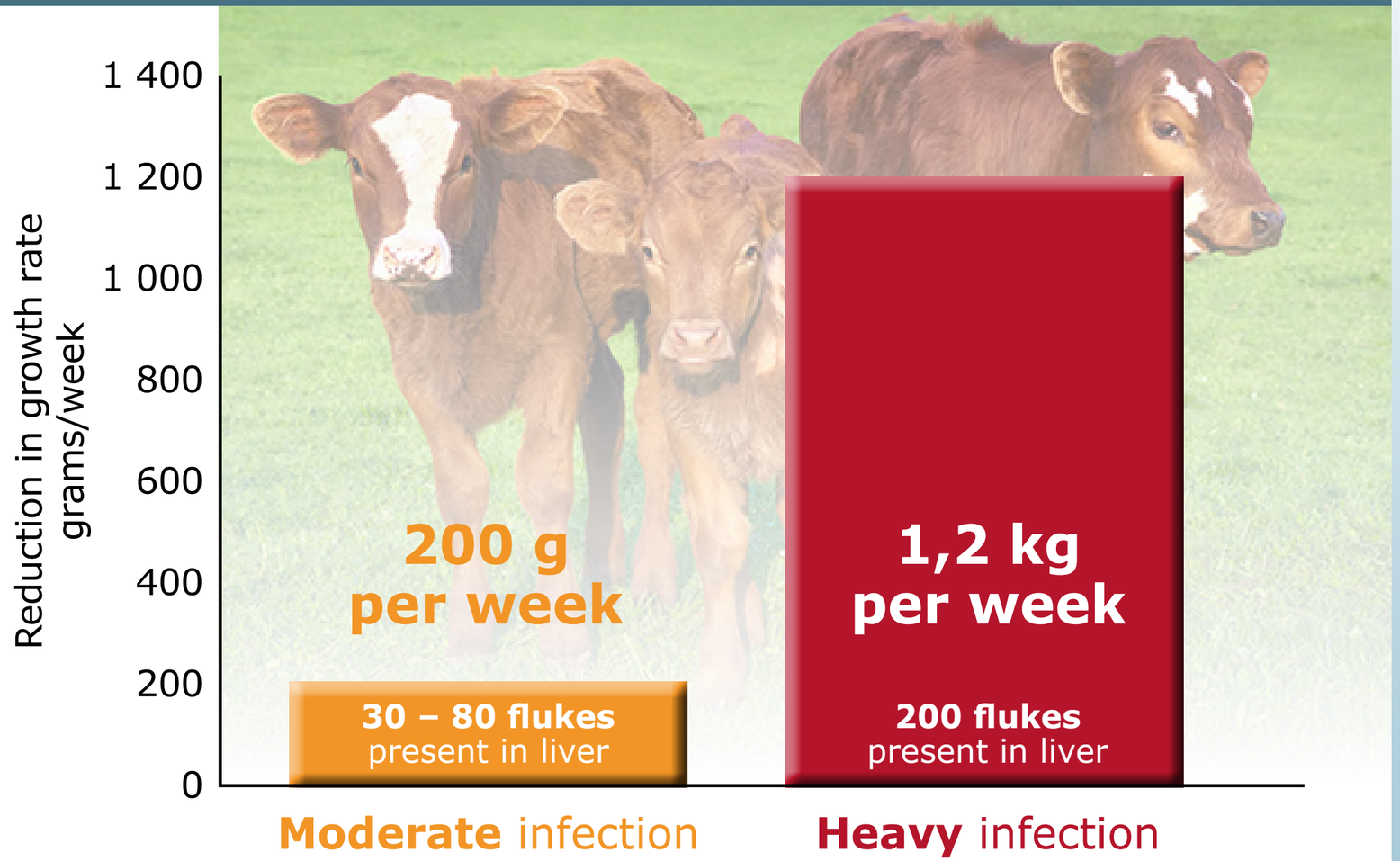
REDUCTION OF MILK PRODUCTION IN COWS INFECTED WITH LIVER FLUKE[3]

In high risk fluke areas liver fluke is a significant threat to milk production. The effect of liver fluke on milk production is well documented[4]

- Milk loss due to liver fluke infections are up to 1 kg/day over a lactation[5]
- 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 concentration[3]

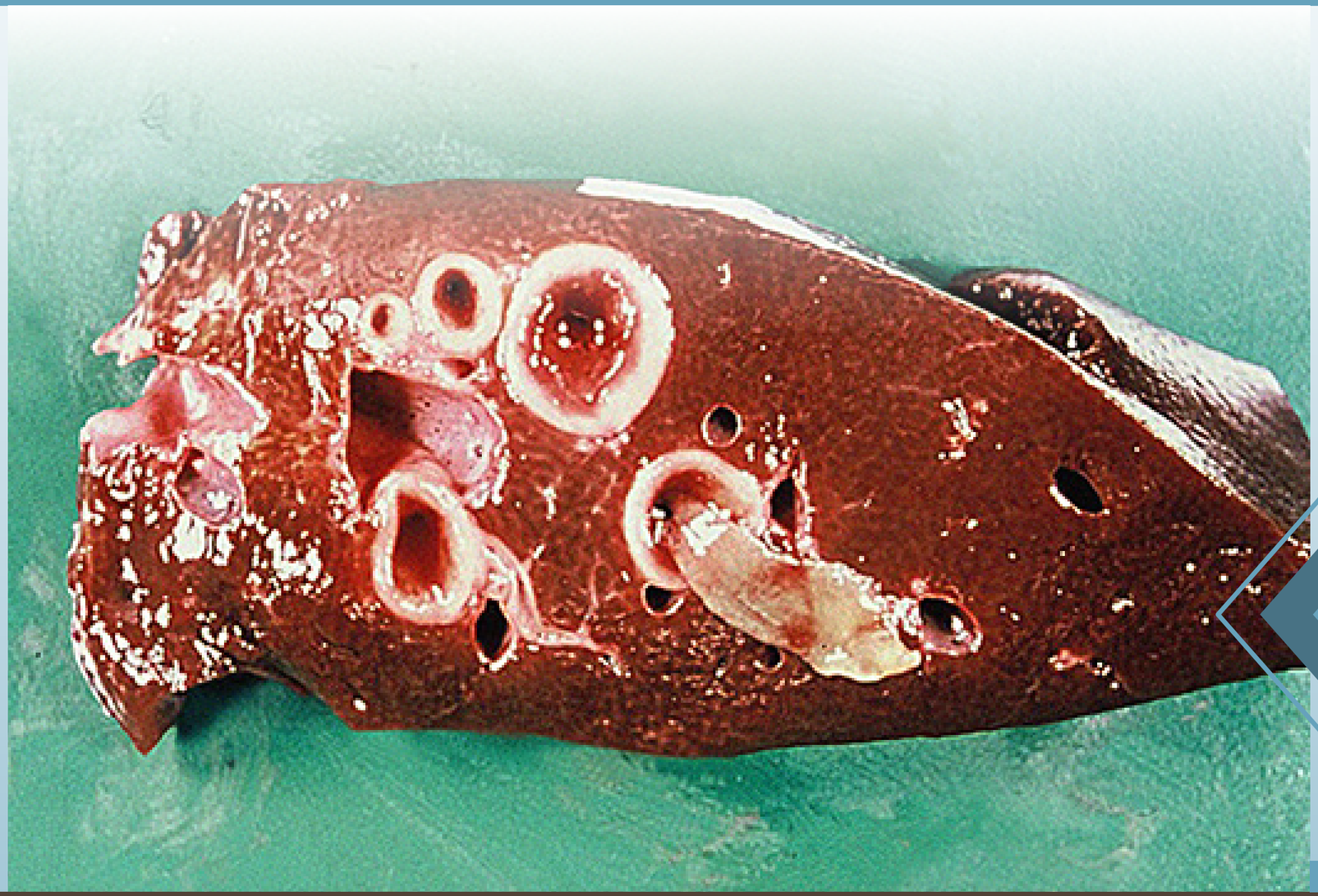
LIVER FLUKE INFESTATION:
IMPACT ON GROWTH RATE IN CATTLE

REDUCTION OF BODY WEIGHT IN CALVES INFECTED WITH LIVER FLUKE[6]



- 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 burden[5]
- 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 infection[6]

LIVER FLUKE INFESTATION:
EFFECT ON THE LIVER

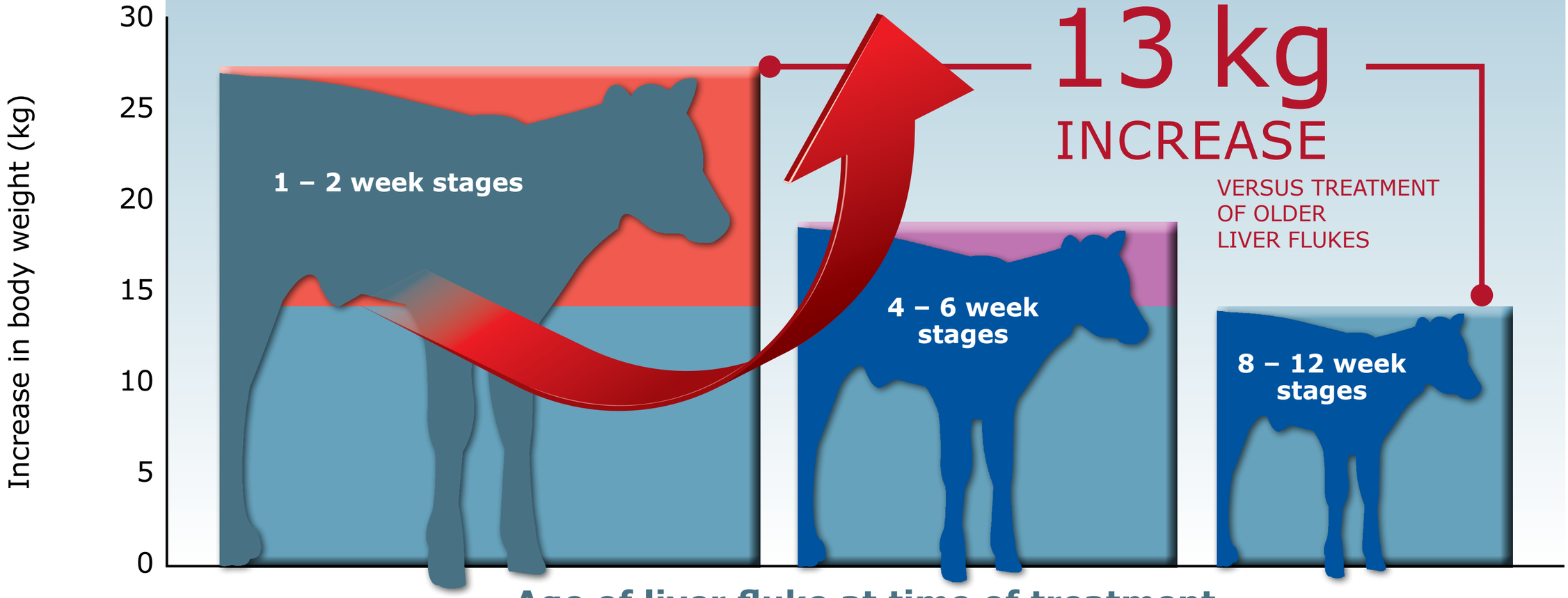


The loss of income due to the condemnation could exceed **R100** per animal slaughtered

CONDEMNATION
OF LIVERS
AT ABATTOIR

LIVER FLUKE INFESTATION:
TREATING IMMATURE LIVER FLUKE PAYS

INCREASE IN BODY WEIGHT 20 WEEKS AFTER INFECTION[8]



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

DIAGNOSIS

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

DIAGNOSTIC METHODS:
BLOOD AND MILK ELISA ANTIBODY TEST

BLOOD SAMPLE COLLECTION

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.

CONTROL PROGRAM

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

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

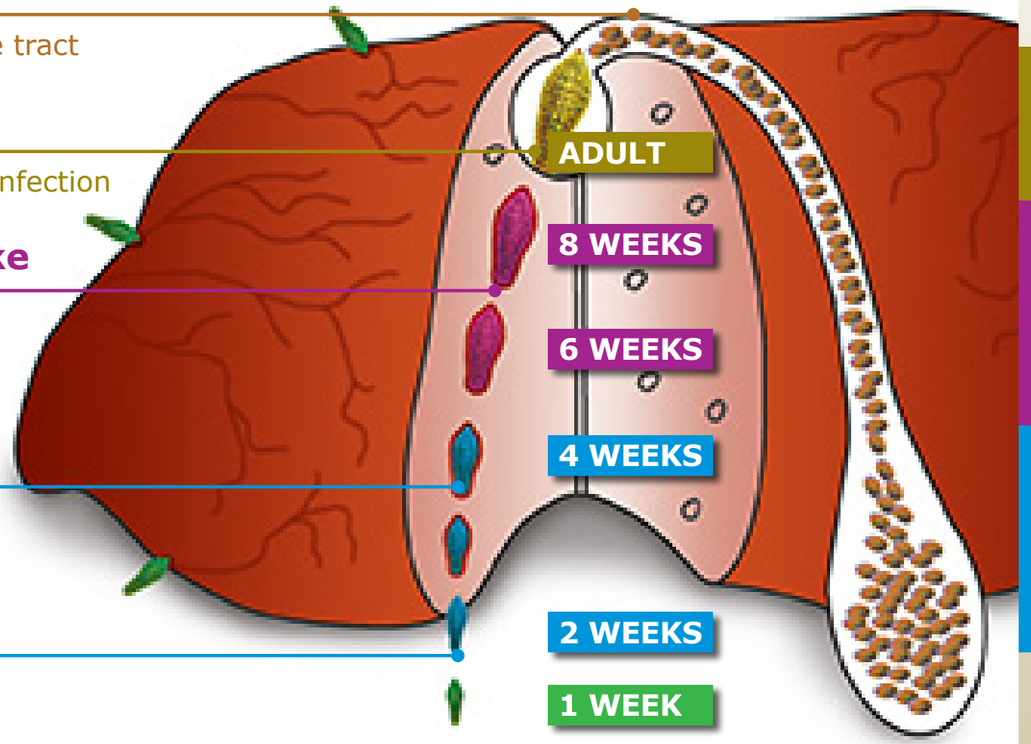
End of migratory phase, ready to enter bile duct

4 week old early immature fluke

Migratory phase, causing haemorrhage and scarring

2 week old fluke

Newly arrived from the gut



KEY:


ADULT


IMMATURE


EARLY IMMATURE


MIGRATING STAGE


EGGS INSIDE THE GALL BLADDER

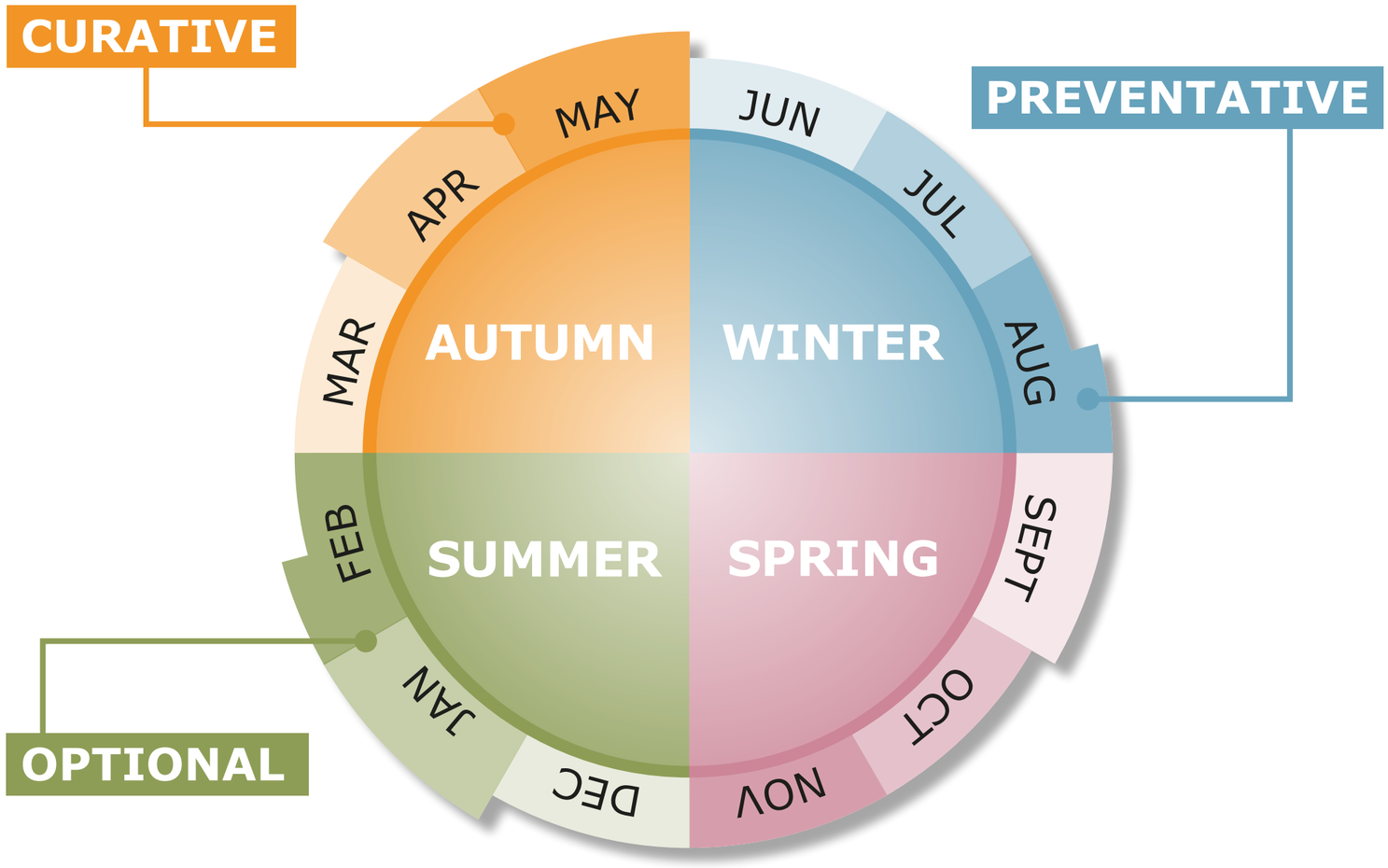
Level of control

Adult stage only
CLORSULON
OXYCLOZANIDE
NITROXYNIL

From 4 weeks to adult (dose dependant)
CLOSANTEL

All stages from 2 weeks to adult
TRICLABENDAZOLE

LIVER FLUKE CONTROL:
A STRATEGY GEARED FOR OPTIMAL LIVER HEALTH



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

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

WIRECIDE F

Effective control of liver fluke relies on two key factors:

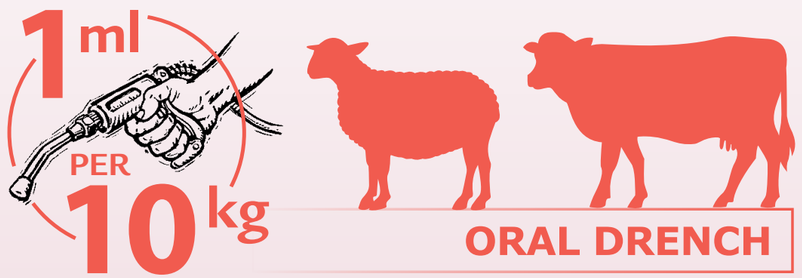
- Choice of product
- Timing of treatment

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

THE PRODUCTS

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

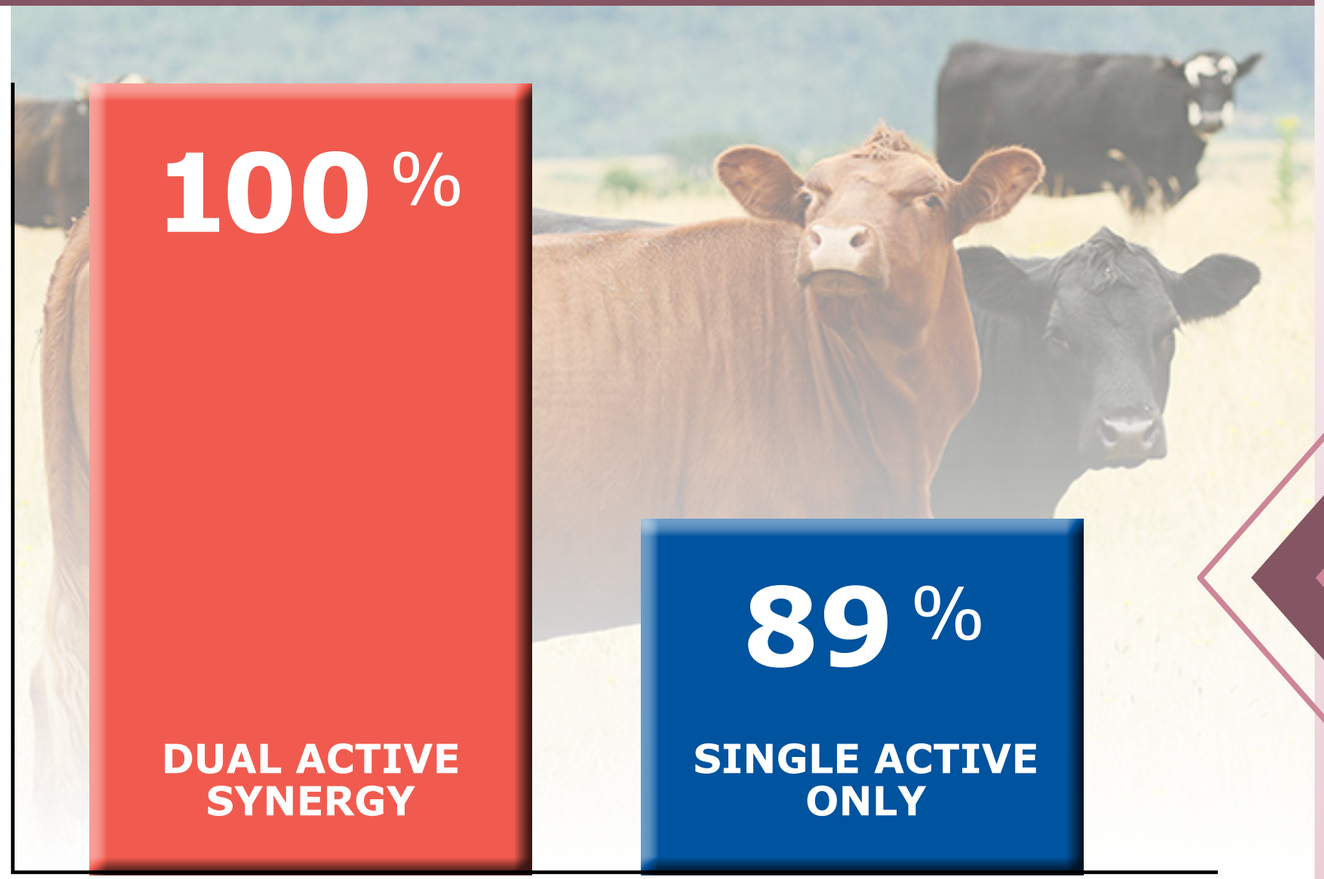
SHEEP
WIREWORM
BROWN STOMACHWORM
LARGE-MOUTHED BOWELWORM
LONG-NECKED BANKRUPTWORM
LUNGWORM
BANKRUPTWORM
HOOKWORM
WHITE BANKRUPTWORM

CATTLE
WIREWORM
BROWN STOMACHWORM
CATTLE BANKRUPTWORM
HOOKWORM
NODULAR WORM
LUNGWORM

Ovicidal (kills parasite eggs present in animal at treatment)

FLUKAZOLE C
BENEFITS OF A SYNERGISTIC COMBINATION

LIVER FLUKE CONTROL – DUAL ACTIVE vs SINGLE ACTIVE ALONE



Boray, 1998

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

SYNERGY

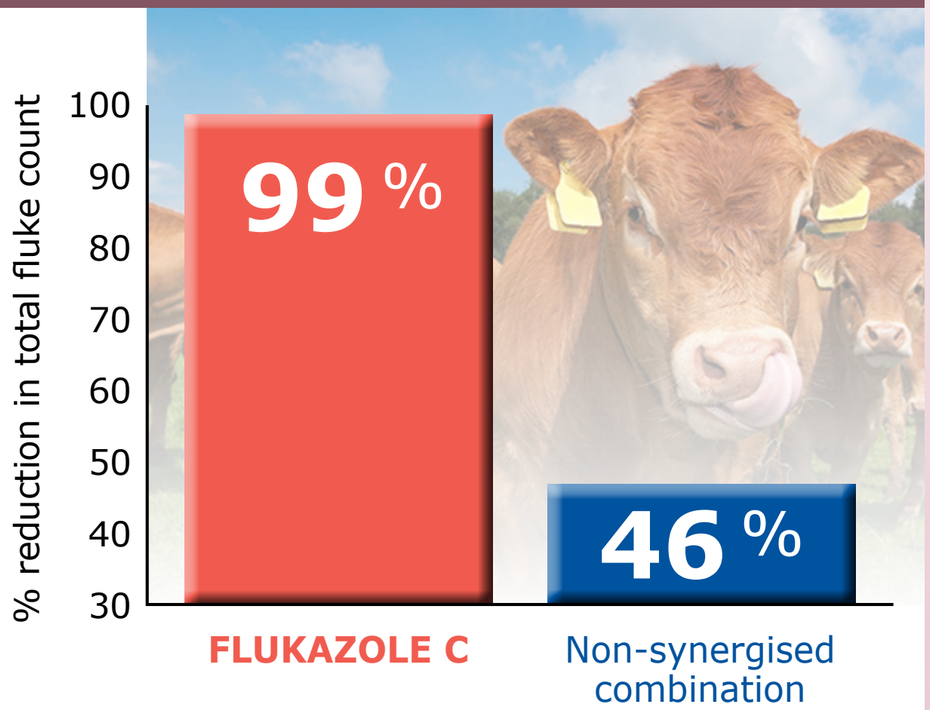
1+1=3

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

FLUKAZOLE C
BENEFITS OF A SYNERGISTIC COMBINATION

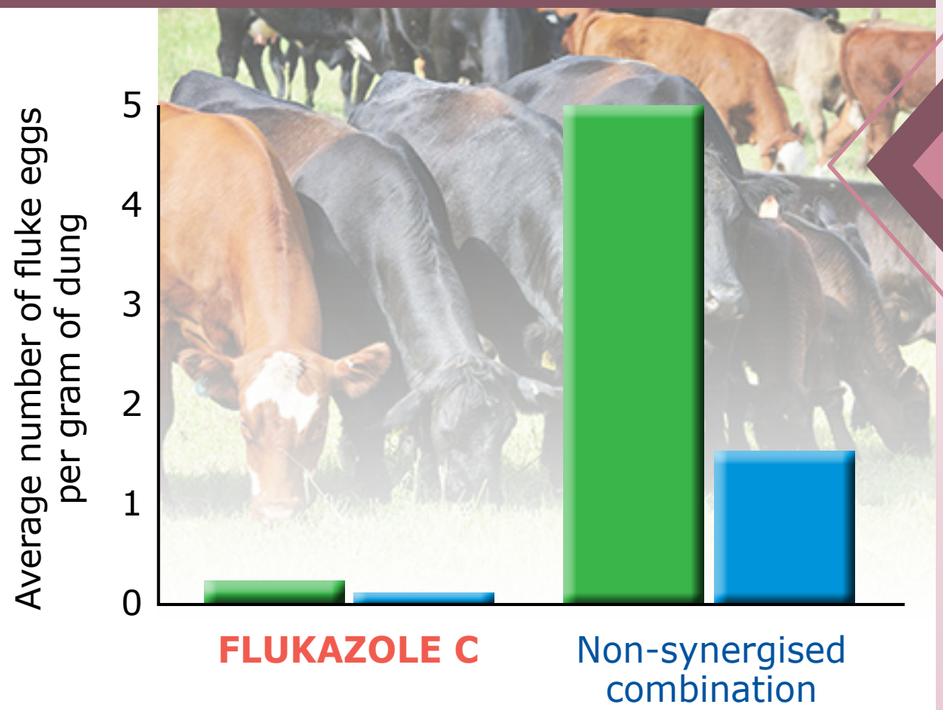
Study of comparative efficacy of two oral formulations against 2 week old stages of liver fluke,
showed obvious benefits of treating with FLUKAZOLE C

CONTROL OF FLUKE AGED 2 WEEKS



NSW DPI study, 2006

FLUKE EGG COUNT DATA



NSW DPI study, 2006

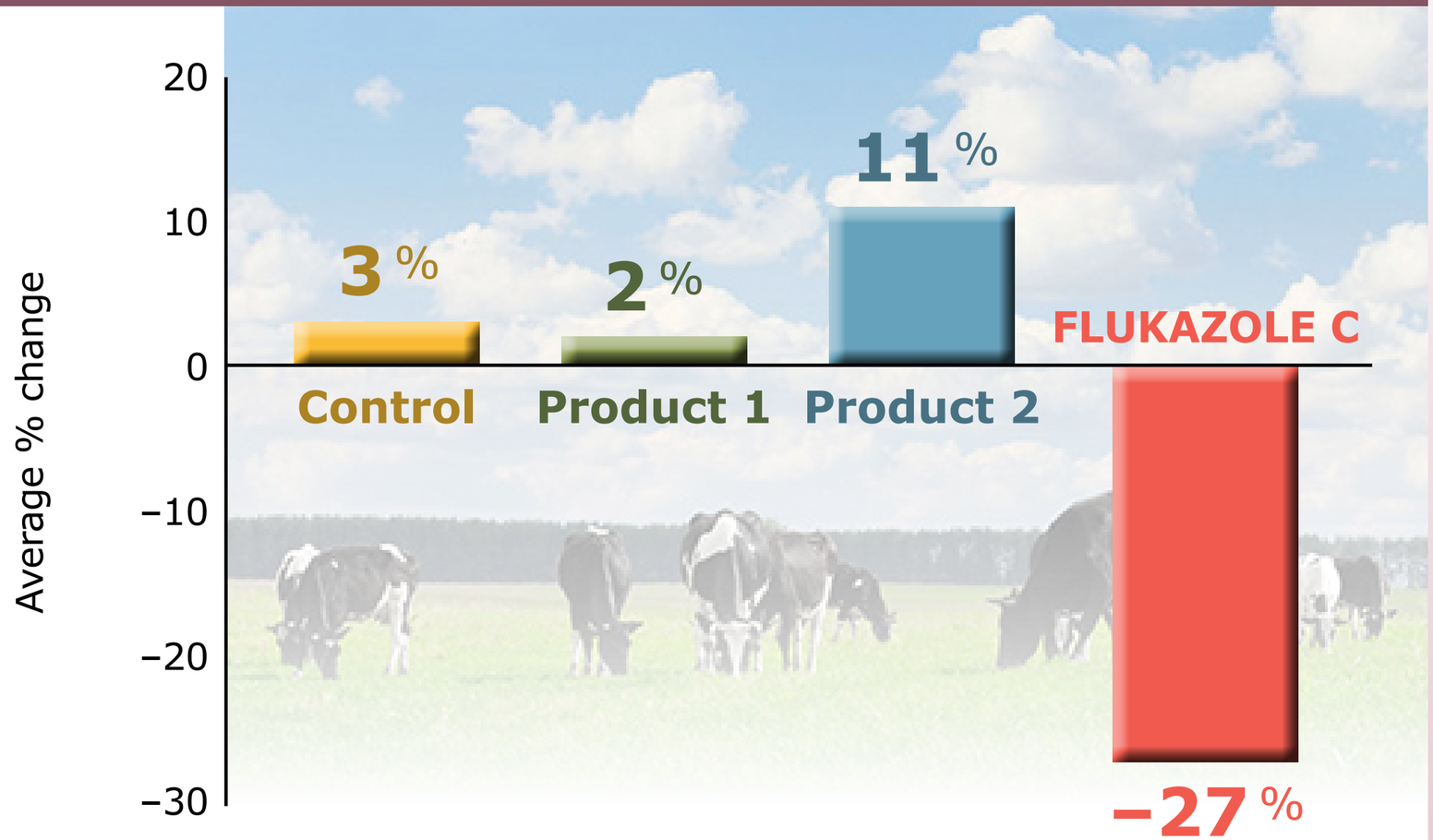
LIVER FLUKE TREATMENT **THAT COUNTS**

Age of fluke at time of treatment

- **2 weeks**
- **4 weeks**

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

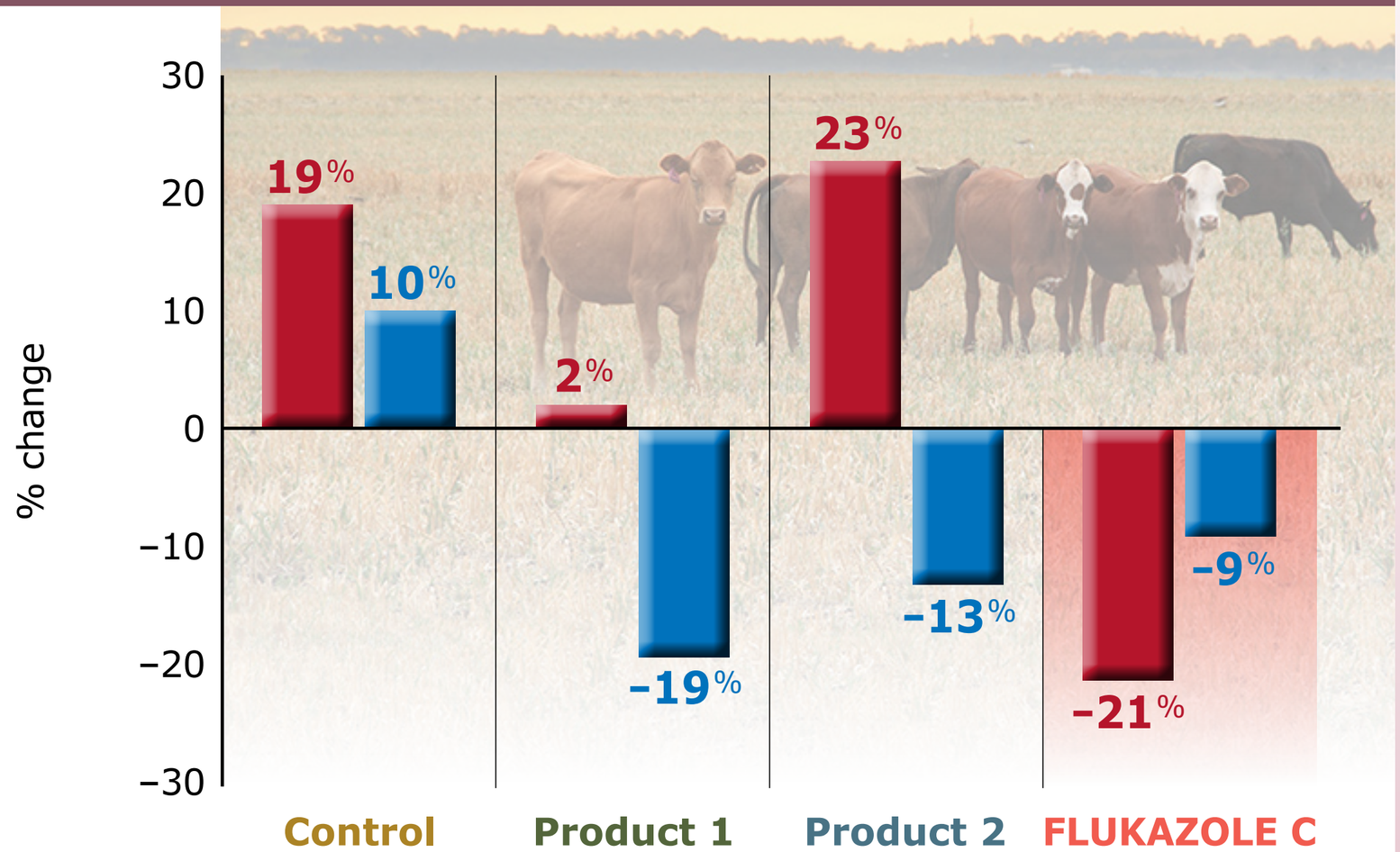
Oral product, non-synergistic, triclabendazole combination

Product 2

Pour-on product, non-synergistic, triclabendazole combination

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

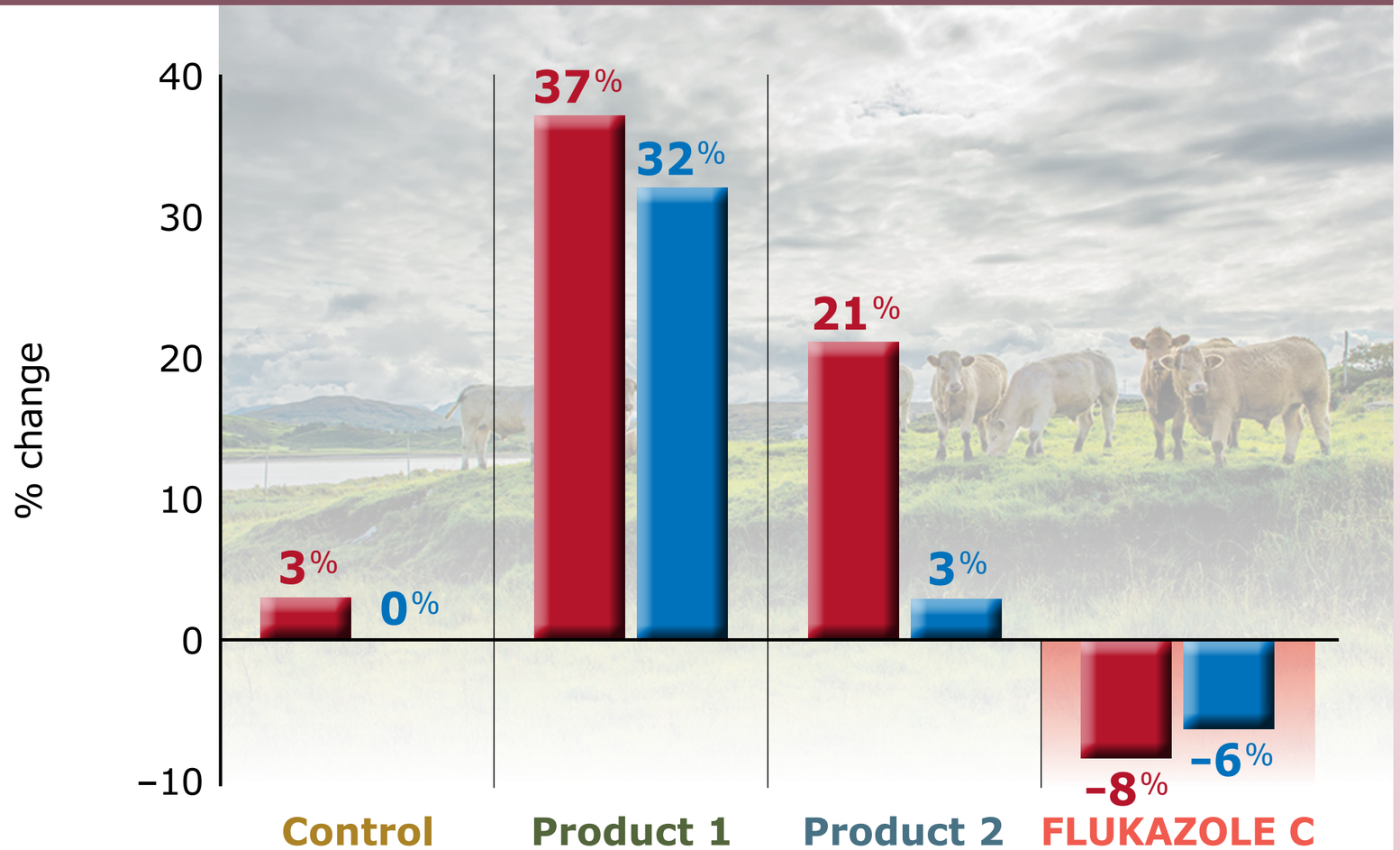
Pour-on product, non-synergistic, triclabendazole combination

% **AST** change

% **GGT** change

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

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

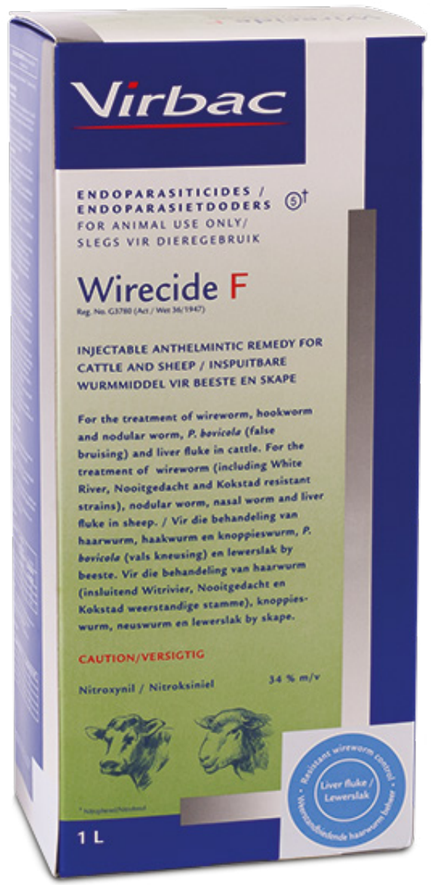
WIREWORM
BROWN STOMACHWORM
BANKRUPTWORM
HOOKWORM
NODULAR WORM
LARGE-MOUTHED BOWELWORM
LUNGWORM
LONG-NECKED BANKRUPTWORM

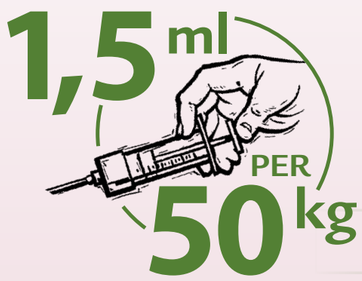
CATTLE

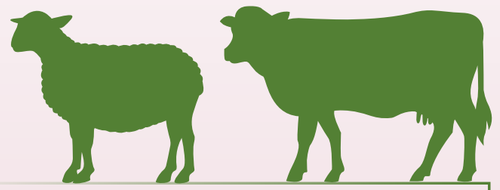
WIREWORM
BROWN STOMACHWORM
BANKRUPTWORM
HOOKWORM
NODULAR WORM
LUNGWORM
EYEWORM

WIRECIDE F

ALTERNATIVE ACTIVE IN PARASITE CONTROL







INJECTABLE

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

PRODOSE® YELLOW LA

INTERNAL PARASITE CONTROL WITH RESIDUAL EFFICACY

1 ml PER 10 kg

ORAL DRENCH

CLOSANTEL	7,5 % m/v

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

ROUNDWORM — PERSISTENCY

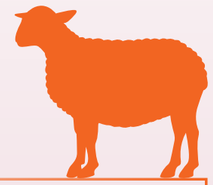
WIREWORM	5 WEEKS
HOOKWORM	2 WEEKS

NASAL BOT

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

PRODOSE® ORANGE

INTERNAL PARASITE CONTROL WITH RESIDUAL EFFICACY



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	PERSISTENCY
WIREWORM	5 WEEKS
BROWN STOMACHWORM	
BANKRUPTWORM	
LONG-NECKED BANKRUPTWORM	
HOOKWORM	2 WEEKS
NODULAR WORM	
LARGE-MOUTHED BOWELWORM	

Ovicidal (kills parasite eggs present in animal at treatment)

REFERENCES

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4. Ross JG (1970) British Veterinary Journal, 126; xiii - xx.
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8. Borray 1982, Chemotherapy of fasciolosis, NSW Veterinary proceedings. pp. 42-47.

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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 NS0, 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 NS0 and Zambia Reg. No:359/739V **POM-V**

WIRECIDE F – Nitroxynil 34 % m/v, Reg. No. G3780 (Act 36/1947), Namibia Reg. No. V08/18.1.3/130 NS0

PRODOSE® YELLOW LA – Closantel 7,5 % m/v, Reg. No. G1959 (Act 36/1947), Namibia Reg. No. V03/18.1.3/104 NS0

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 NS0 and Zimbabwe Reg. No: 2017/80.12.10/9772