



# ENHANCED PROBIOTICS SURVIVAL

1. Protection in an acidic drink and through the acidic stomach and release in the intestine.
2. In development: gel-type product with >100 billion cfu and 6 months chilled shelf life.
3. Excellent survival in yoghurt, protein-based drinks, dairy/nut milks, and fruit juices.

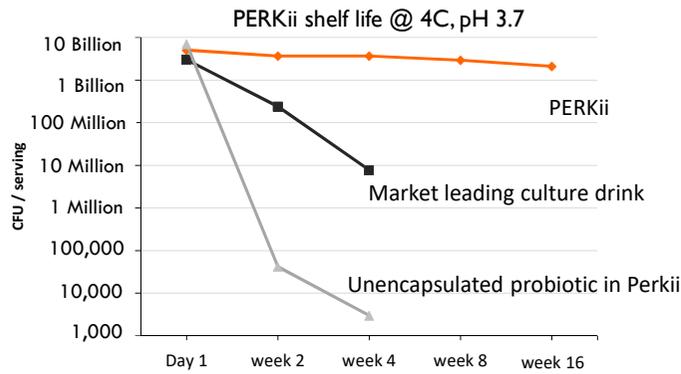


Fig 1. Viability of the probiotics in PERKii compared to the market leading probiotic drink product and unencapsulated probiotic over 4 months.

Launched in 2016, PERKii probiotic beverage is a truly unique product containing:

- > 1 billion cfu *Lactobacillus caseii* per 350mL serve at 4 months
- Non-dairy based
- Lactose and gluten-free
- Low calorie, 37 calorie per 350mL
- Fruit flavoured
- No added sugar
- All natural flavours and colours

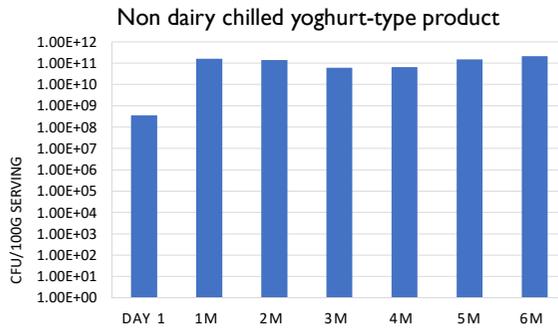


Fig 2. Viability of the probiotics in a non-dairy chilled yoghurt-type product with >100 billion cfu per 100g serve



# CONTROLLED RELEASE

1. Bioactive release in the intestine.
2. Release can be modulated by adjusting  $Ca^{2+}$  concentration.

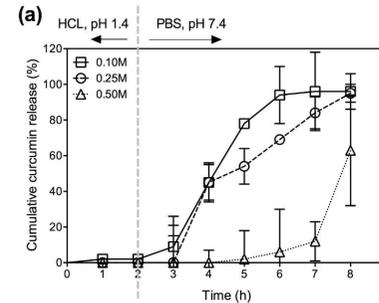


Fig 3(a). Controlled release of curcumin emulsion from microgels under simulated gut (HCL) and intestinal (PBS) conditions. How quickly the content is released is determined by the concentration of calcium that was used (0.1, 0.25 or 0.5M)

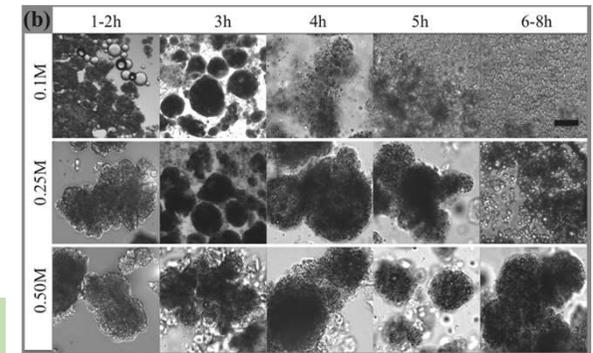


Fig 3(b). Microgels under the microscope. Microgels swells when exposed to SIF. Swelling is followed by disintegration and content release.

# STABILIZATION & ABSORPTION

1. Increased bioavailability of encapsulated emulsion
2. Chemical and physical stabilisation of omega-3.

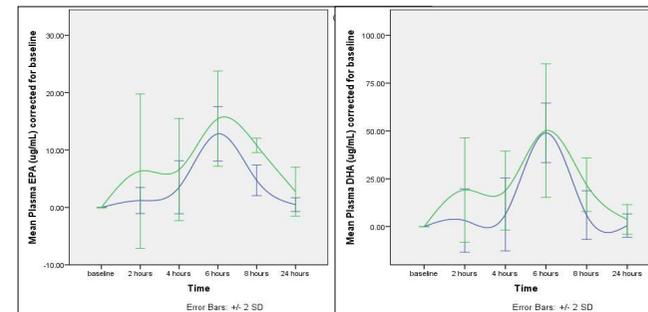


Fig 4. Comparison of plasma EPA and DHA over 24 hours in healthy adults fed encapsulated (green) and unencapsulated (blue) omega-3 nanoemulsion.

## Outcome.

- Crossover clinical trial to determine release and absorption of Omega-3 in healthy adults.
- Individuals fed encapsulated Omega-3 had faster and greater (50%) DHA and EPA absorption as measured in blood plasma.
- This suggests encapsulated lipids are able to bypass the stomach.
- The mucoadhesive microgels adheres to the mucosa in the intestines and releases the lipid droplets for fast absorption.

# GASTRIC PROTECTION

1. Protects enzymes and proteins from acid and digestive enzymes.
2. Delivers proteins and enzymes intact to the intestine

**Background.** Enzyme X is used to treat gastrointestinal ailments in young farm animals. In adult farm animals, Enzyme X is not as effective due to the fully developed stomach. Enzyme X is deactivated at the low pH environment of the stomach.

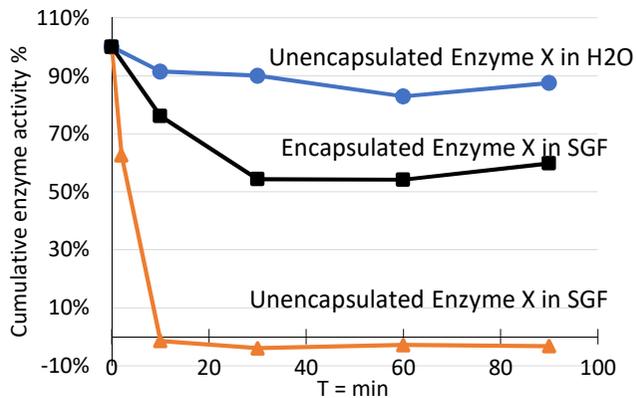


Fig 4. Cumulative enzyme activity of encapsulated vs. unencapsulated Enzyme X exposed to SGF for 90 min.

**Outcome.**

- Enzyme X retains activity during transition through the stomach.
- Potential treatment for gastrointestinal ailments in adult animals and humans.

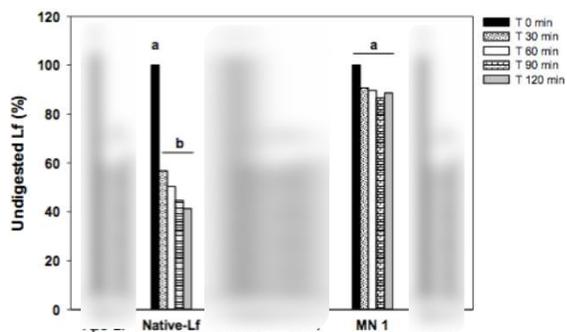


Fig 5. Unencapsulated (Native-Lf) vs. Encapsulated (MN1) lactoferrin exposed to SGF (pH 1.5, pepsin, 37°C) for 120 min. Unencapsulated Lf is quickly digested by pepsin. High retention of Lf in encapsulated version.



**Outcome.**

- Lactoferrin is delivered intact into the intestine.
- Bioavailability is enhanced and maximum health benefit is achieved.
- Human trials showed that Inferrin™ (Encapsulated Lactoferrin) supports a healthy immune and digestive system.
- Launched in Vitafoods 2018, Geneva.

# TASTE MASKING

1. Taste masking of bitter actives and drugs.
2. Increased palatability and uptake

**Background.** Anthelmintic A is a very bitter compound used to treat parasites in farm animals. It is usually administered with the animal feed. However uptake can vary between species due to the bitter taste. Anthelmintic A was encapsulated in alginate microgels. Farm trials were conducted across 2 continents with different animal species.

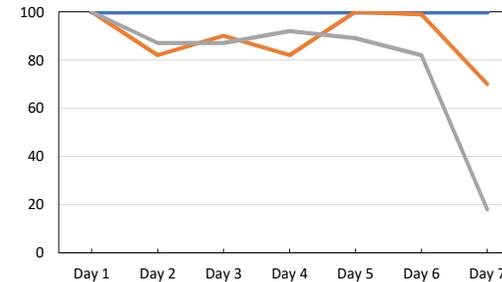
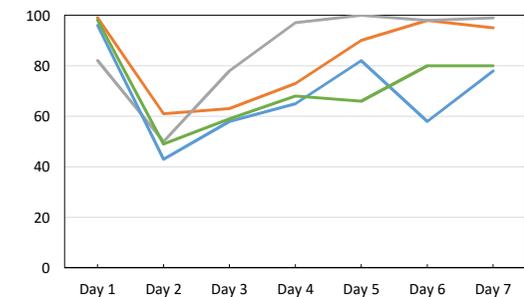


Fig 6. Percentage of feed eaten in Species A over 7 days. Species A was fed either encapsulated (blue and orange lines) or unencapsulated (grey line) Anthelmintic A

Fig 7. Percentage of feed eaten in Species B over 7 days. Species B was fed either encapsulated (grey and orange lines) or unencapsulated (blue and green lines) Anthelmintic A.



**Outcome.**

- Encapsulated Anthelmintic A was preferred by both species of farm animals.
- Sera analysis showed that Anthelmintic A was detected in the tissue of the animals fed the encapsulated active.
- Suggests that the encapsulated Anthelmintic A is released after ingestion and able to be absorbed by the animal.