UNIVERSITY OF LINCOLN

A role for bovine colostrum in supporting human immune function

Dr Arwel Jones

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Lincoln Institute for Health
arjones@lincoln.ac.uk
@ArwelWynJones

Outline

- What is bovine colostrum?
- What do we know about bovine colostrum and human immune health?
- What are the future research directions of bovine colostrum and immune health?

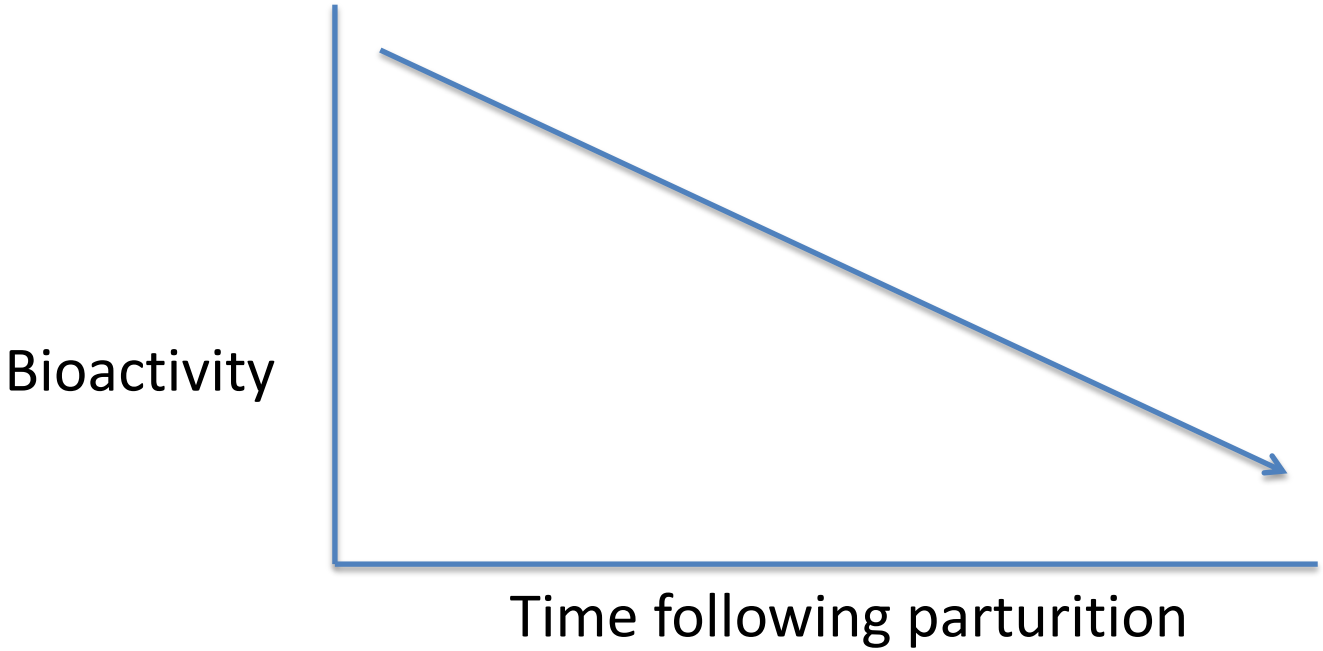
Bovine colostrum

First milk produced by a cow, usually collected in the 48 h following parturition. Contains:

- Antimicrobial / Immune factors
  - Immunoglobulins
  - Antimicrobial peptides (Lysozyme and Lactoferrin)
  - Oligosaccharides
  - Glycoconjugates
- Growth factors
  - Epidermal Growth Factor
  - Insulin-like Growth Factor
  - Transforming Growth Factor

…not an exhaustive list and likely precursor of numerous potential biologically active peptides upon digestion

Bovine colostrum



- Greatest bioactivity and potential as nutriceutical for other species – collection < 6 h post-partum
- Bovine colostrum supplements prepared as powdered, liquid, capsule formulations

Immune health

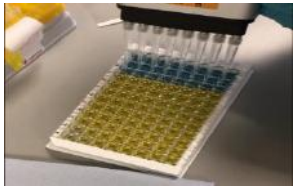
- - Clinical relevance + +

Clinical Symptoms

In vivo integrated immune responses

Ex vivo immune responses

In vitro immune responses



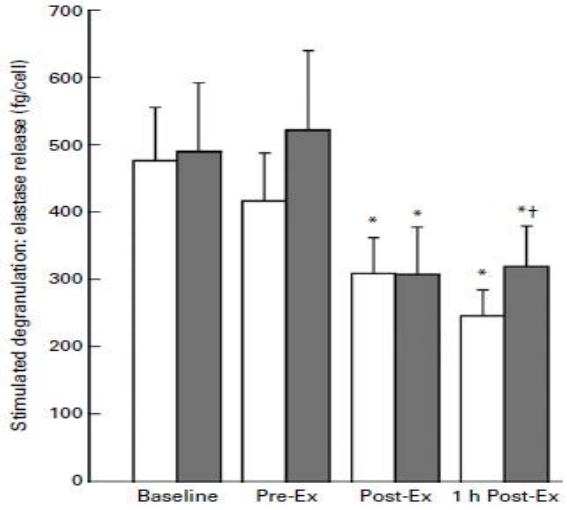
Albers et al.(2005, 2013), Br J Nutr

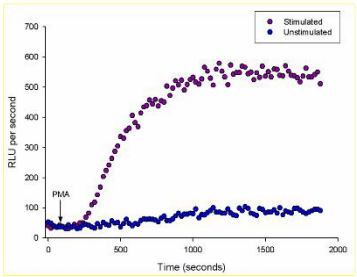
Bovine colostrum - Immunity

***In vitro / ex vivo* immune markers**

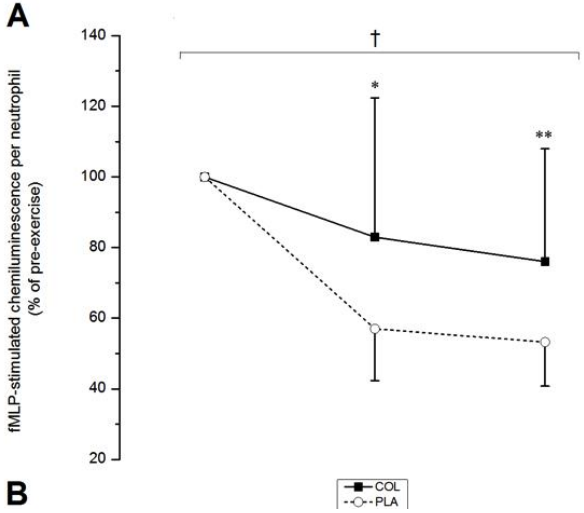
- Exercise is a controllable, experimental model of stress on immune health
- Prolonged exercise induces a transient period ('open window') of immunodepression
- 4 weeks of 20g/day can blunt effects or improve recovery of function of innate blood leukocytes

Davison & Diment (2010), Br J Nut





Jones et al (2015), SJMSS



Bovine colostrum - Immunity

***In vitro* immune markers**

- Salivary/Secretory IgA:
  - Increased (Appukutty et al., 2010; Crooks et al., 2006; Mero et al., 2002)
  - No change (Crooks et al., 2010; Davison and Diment, 2010; Jones et al., 2014, 2015; Patiroglu and Kondolot, 2013; Shing et al., 2007, 2013)

- Salivary Lactoferrin:
  - No change (Jones et al., 2014, 2015)

- Salivary Lysozyme
  - Increased (Davison and Diment, 2010; Jones et al in preparation)
  - No change (Jones et al., 2014; 2015)

Bovine colostrum - Immunity

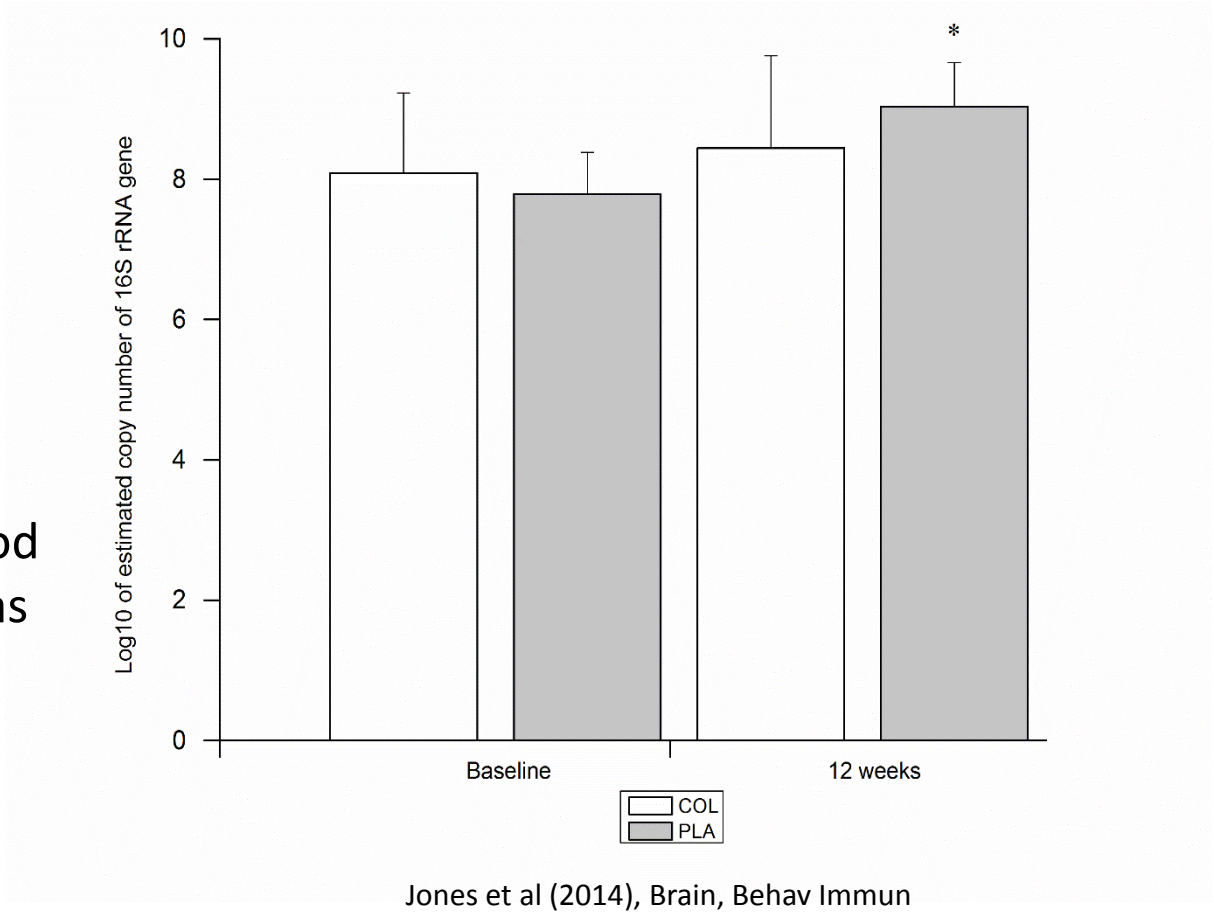
In vitro / in vivo immune marker?

First study on salivary microbiome in athletes - relevant marker of *in vivo* (innate) immune status?

Real-time quantitative PCR, targeting the 16S rRNA gene

Increase in salivary bacterial load over the 12 weeks period with PLA ($p < 0.05$) which was limited by colostrum

No change in saliva bacterial diversity



Jones et al (2014), Brain, Behav Immun

Bovine colostrum - Immunity

In vivo markers

4 weeks supplementation (20 g per day):
Colostrum (COL) (n = 15) vs. isocaloric/isomacronutrient placebo (PLA) (n= 16)

↓

2 h running at 60% maximal oxygen uptake (VO2 max)

↓

20 min post-exercise: Sensitisation with *0.125%* DPCP via patch applied to lower back for 48 h

↓

4 weeks supplementation (20 g per day): COL vs. PLA

↓

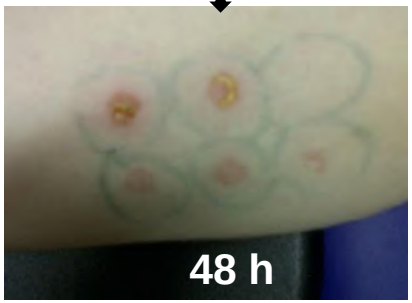
Elicitation (recall) – Dose series of DPCP patches applied to right upper arm for 6 h:
0%, 0.0048%, 0.0076%, 0.0122%, 0.01953% & *0.03125%*

↓

Skin oedema measurements: Modified skinfold calliper

↓

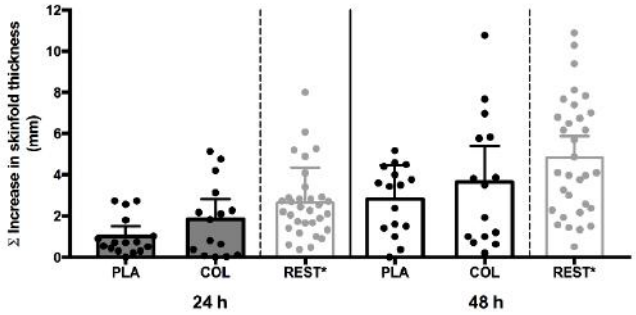
Jones et al
(under review)



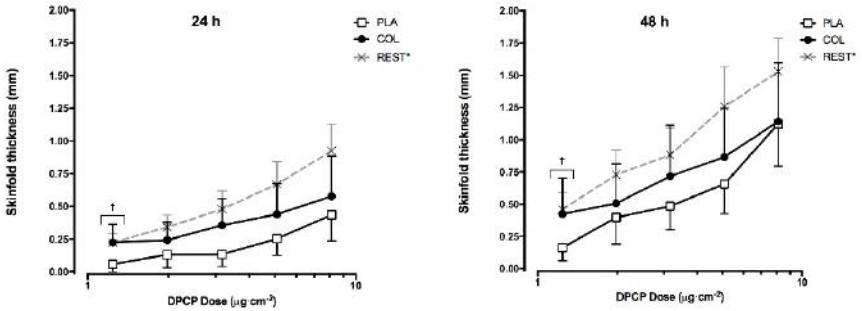
Bovine colostrum - Immunity

In vivo markers

Overall (summed) immune response



Sensitivity of immune response

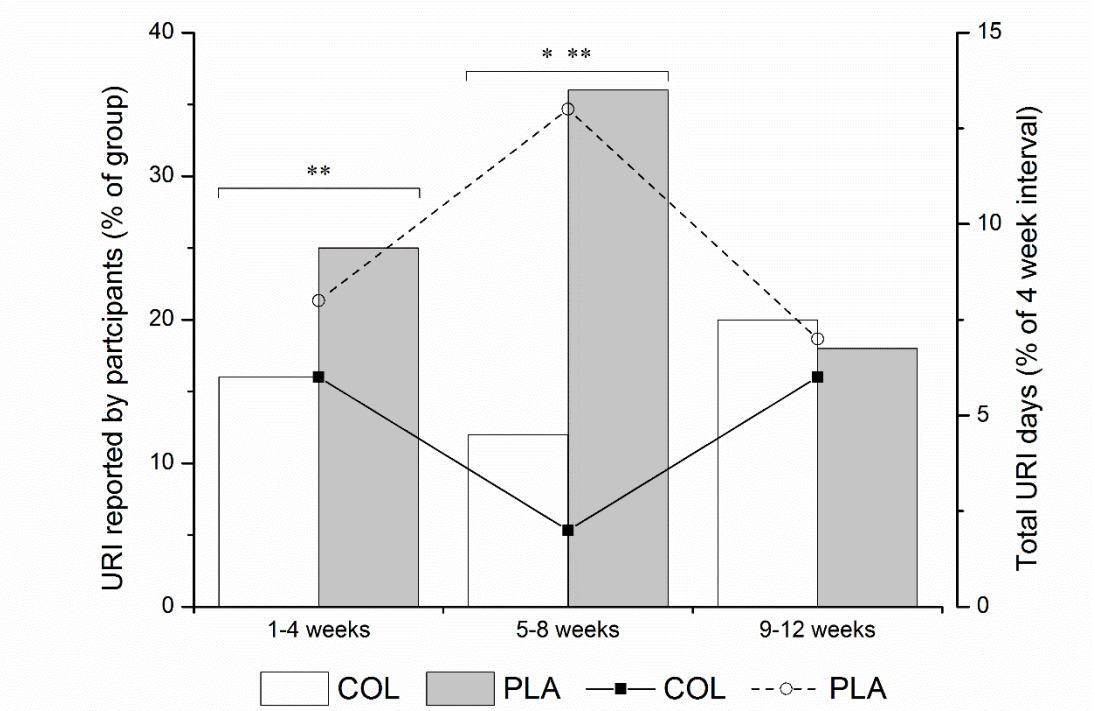


Jones et al (under review)

Bovine colostrum – Respiratory illness

Jones, AW, Cameron, SJS, Thatcher R, Beecroft MS, Mur LAJ, Davison G. (2014). Effects of bovine colostrum supplementation on upper respiratory illness in active males. Brain Behavior and Immun, 39, 194-203.

During winter months, under double-blind procedures, 53 males were randomized to daily supplementation of 20 g of colostrum (n = 25) or an isoenergetic/isomacronutrient placebo (n = 28) for 12 weeks



Bovine colostrum – Respiratory illness

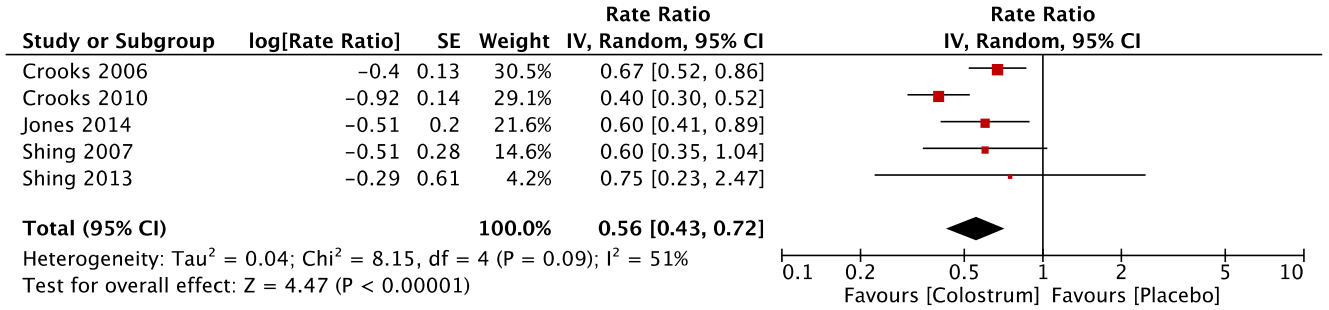
- Supplementation may provide immunological benefits but further studies are warranted before recommendations can be made for clinical applications? (Rathe et al., 2014)

- Level of evidence used in support of its claims falls below that acceptable in the medical and scientific community….

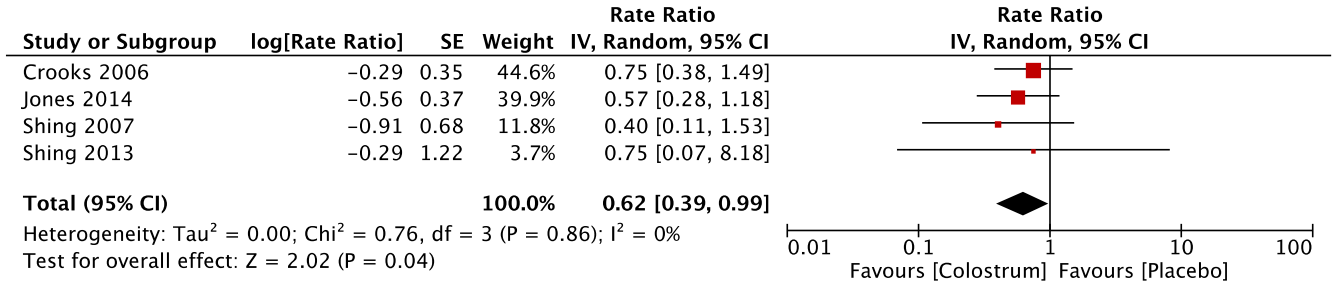
Bovine colostrum – Respiratory illness

Jones AW, March DS, Curtis F, Bridle C. (2016) Bovine colostrum supplementation and upper respiratory tract symptoms during exercise training: a systematic review and meta-analysis of randomised controlled trials. BMC Sports Science, Medicine and Rehabilitation DOI: 10.1186/s13102-016-0047-8

URS days



URS episodes

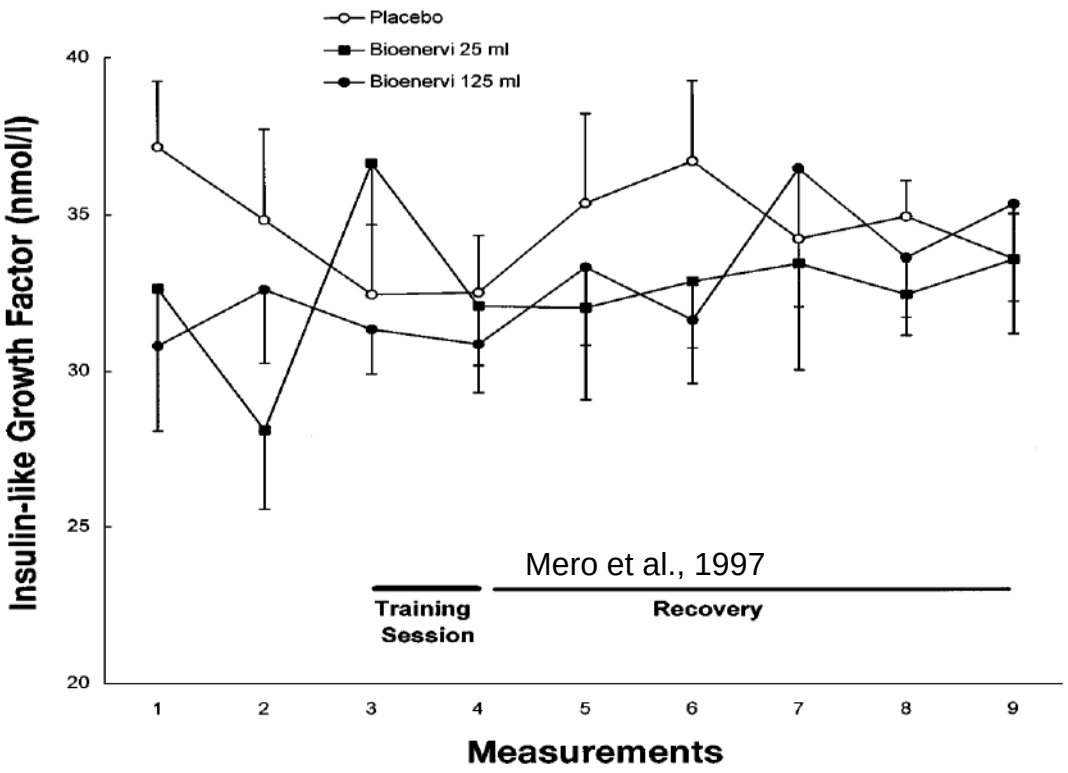


Over an **8-12 week follow-up** period, **bovine colostrum supplementation** when compared to placebo significantly **reduced the incidence rate of URS days** (rate ratio 0.56, 95% confidence intervals 0.43 to 0.72, P value < 0.001) and **URS episodes** (0.62, 0.40 to 0.99, P value = 0.04) by **44%** and **38%** respectively.

Bovine colostrum

- IGF-1 ⇧?

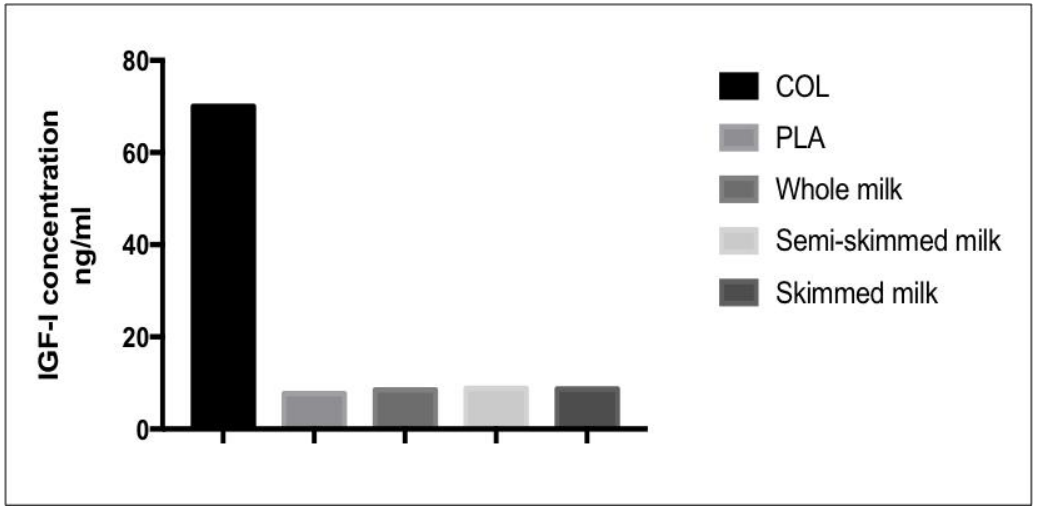
- Refuted in subsequent studies (with higher doses) (e.g. Kuipers et al., 2002; Shing et al., 2009 Duff et al., 2014)

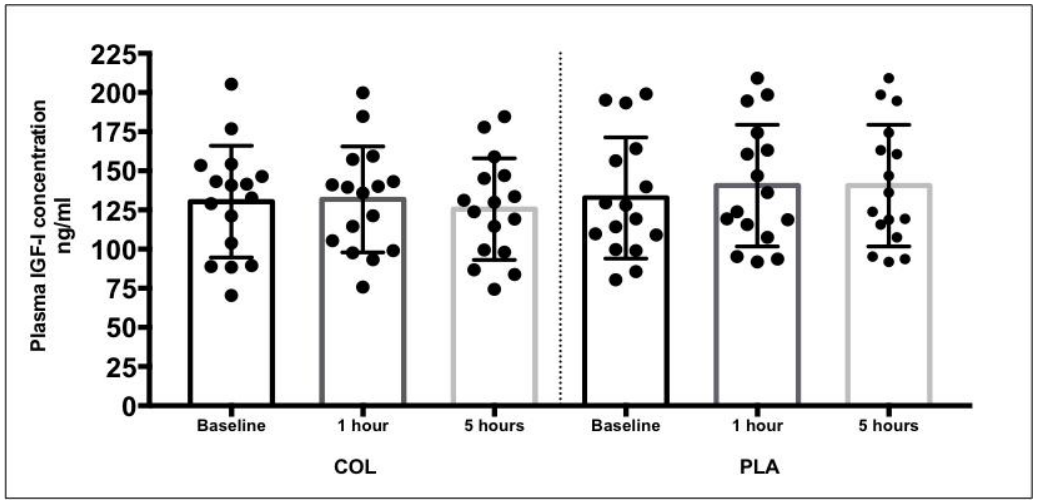


"Colostrum is not specifically prohibited, however it can contain certain quantities of IGF-1 and other growth factors which are prohibited and can influence the outcome of anti-doping tests. Therefore, WADA does not recommend the ingestion of this product."

Bovine colostrum

- IGF-1 ⇧?

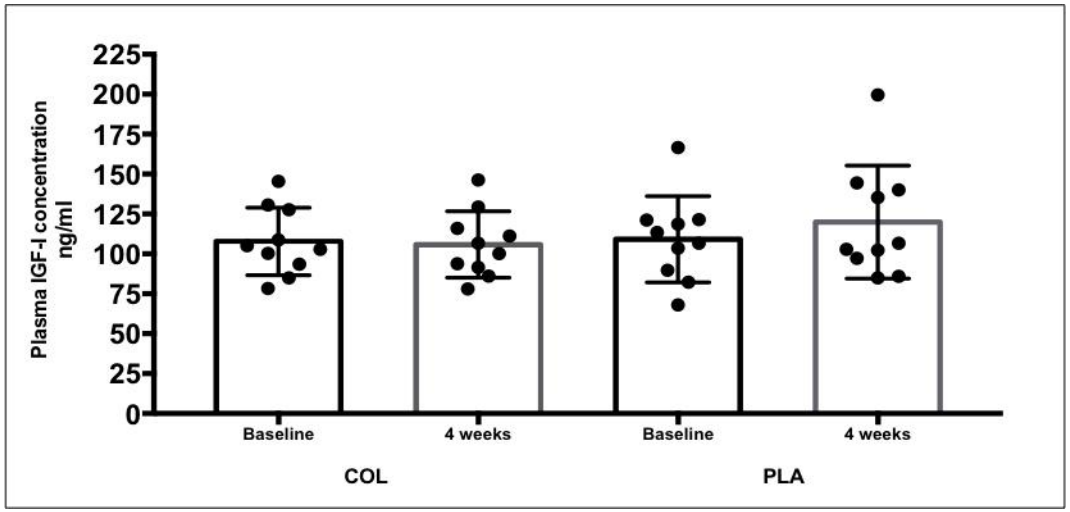


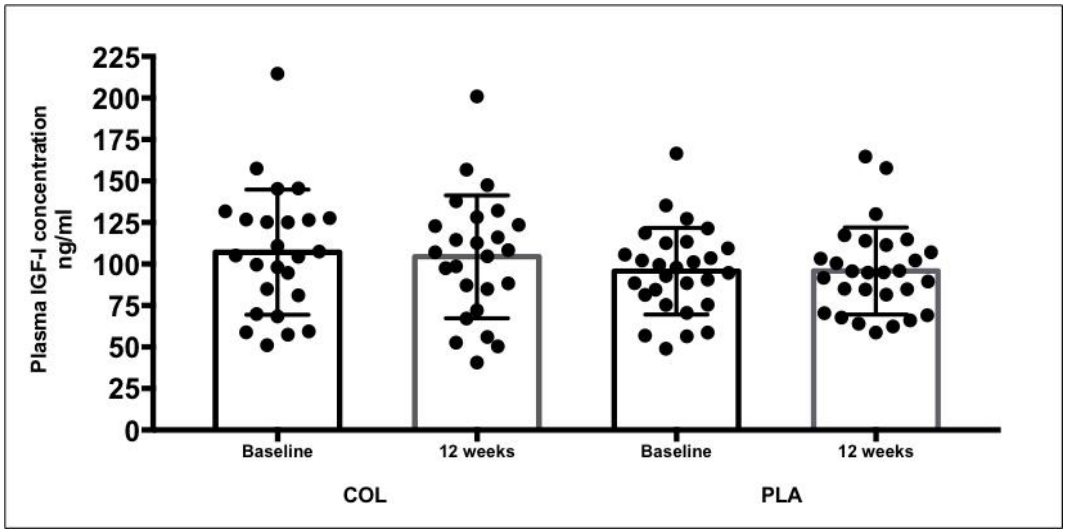


Jones et al
(in preparation)

Bovine colostrum

- IGF-1 ⇧?

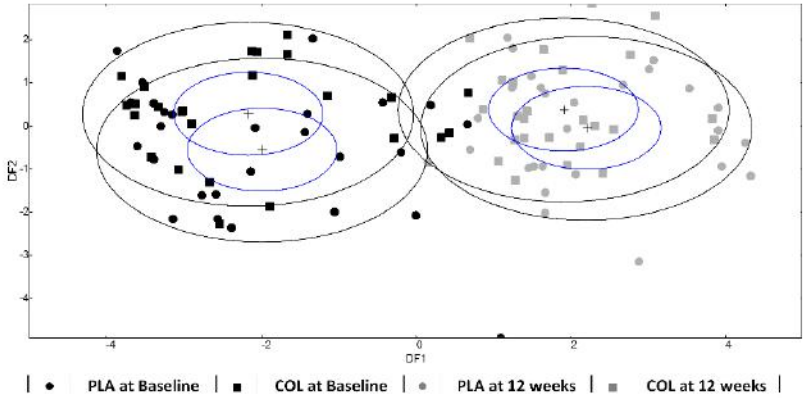




Jones et al
(in preparation)

Bovine colostrum – Future directions

- Confirmation of underlying mechanisms/ “active ingredients”
- Defining minimal and optimal doses
- Follow up on preliminary evidence in other at-risk groups (e.g. immune deficient children, older adults) where colostrum has reduced incidence and severity (e.g. hospitalisation) of respiratory infections



Summary

- Bovine colostrum: rich in antimicrobial, growth and immune factors
- Benefits in immune health observed from in vitro testing to clinically relevant in vivo markers
- Most human data limited to athlete populations, huge potential for other (wider) populations (e.g. immunopcompromised, older adults)

Thank you for listening. Any questions…now or later?

Acknowledgements

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Prof Luis Mur