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Do healthy people absorb cow-derived microRNAs from drinks?

Submission date
01/02/2019

Recruitment status
No longer recruiting

Registration date
07/02/2019

Overall study status
Completed

Last Edited
11/03/2026

Condition category
Other

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[X] Results
[ ] Individual participant data

Plain English summary of protocol

Background and study aims
Recent research has identified a new type of substance naturally found in foods that may play a role in nutrition and health. This substance is called microRNA and is naturally occurring in both plants and animals. microRNAs are thought be be involved in controlling the levels of substances produced by cells. Along with other foods, milk contains microRNAs within exosomes (bubbles released by cells). This study aimed to investigate whether people absorb immune-relevant microRNAs from cow's milk into the blood and whether these affect human immune responses.

Who can participate?
Health adults who are not pregnant, smokers or intolerant to cow's milk.

What does the study involve?
Participants drank five different drinks based on 1 litre of cow's milk or soy-based infant formula with a period of at least a week between each one. Some of the drinks contained extra cow's milk exosomes and some had the exosomes destroyed. Blood samples were taken immediately before the drink and at 3, 6 and 9 hours afterwards.

What are the possible benefits and risks of participating?
There were no direct benefits to research participants. Minimal risks were anticipated for the participants. However, potential risks included intolerance to milk, fatigue due to blood draws, and risk of bruising. No other physical, psychological, financial, etc., risks were expected. Blood draws may make someone become anxious, light-headed, nauseous, or generally uneasy. All blood draws were performed by University of Nebraska-Lincoln Health Center phlebotomists (experts in taking blood samples) who have been trained and are experienced in dealing with subjects who may become anxious during blood draw procedures.

Where is the study run from?
University of Nebraska-Lincoln (USA)

When is the study starting and how long is it expected to run for?
October 2013 to June 2019

Who is funding the study?
The Gerber Foundation (USA)

Who is the main contact?
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Contact information

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Public

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Additional identifiers

Protocol serial number
13755

Study information

Scientific Title
Bioavailability of immunomodulatory microRNAs from bovine milk exosomes and cytokine secretion by peripheral blood mononuclear cells ex vivo in humans

Study objectives
Immune-related miRNAs in bovine milk exosomes are bioavailable and modulate immune responses in humans. Immunomodulatory microRNAs depend on co-stimulation with concanavalin A to elicit cytokine secretion by peripheral blood mononuclear cells ex vivo in humans

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 10/10/2013, University of Nebraska-Lincoln Institutional Review Board (IRB) (301 Canfield, PO Box 880433, Lincoln, NE 68588-0433, USA; +1 (402) 472-3123; unlresearch@unl.edu), ref: 20131013755FB

Primary study design
Interventional

Study design
Randomized crossover trial

Study type(s)
Other

Health condition(s) or problem(s) studied
Relevance of bovine milk exosomes as bioactive food compounds and use of exosomes for drug delivery.

Interventions
12 healthy adults received 5 different milk meals in a randomized cross-over design, with a washout period of at least 1 week between each meal. The milk meals were 1 l of 1% fat bovine milk, 1 l of 1% fat sonicated bovine milk (exosomes depleted), 1 l of soy infant formula, 1 l of soy infant formula fortified with bovine milk exosomes, and 1 l of 1% fat sonicated bovine milk and fortified with bovine milk exosomes (exosomes containing microRNAs depleted by ultrasonication and then exosomes isolated from 1 l of bovine milk added back to the sonicated milk). Blood samples were collected before and at timed intervals after consumption of the various milk meals for analysis of bioavailability of six immune-relevant microRNAs in plasma and secretion of cytokines by peripheral blood mononuclear cells ex vivo.

Intervention Type
Other

Primary outcome(s)

Levels of six immune-relevant microRNA found in bovine milk exosomes in plasma using real-time quantitative polymerase chain reaction (RT-qPCR) before (0 h) and at timed intervals (3, 6, and 9 h) after a milk meal

Key secondary outcome(s)
1. Secretion of inflammation-related cytokines by cultured human peripheral blood mononuclear cells (PBMCs) collected before and 6 h after milk consumption and stimulated with or without Concanavalin A (Con A) was assessed using a customized Milliplex Map Human Cytokine /Chemokine Magnetic Bead Panel Immunoassay
2. Secretion of cytokines by PBMCs treated ex vivo with microRNA-loaded exosomes assessed using a customized Milliplex Map Human Cytokine/Chemokine Magnetic Bead Panel Immunoassay

Completion date
06/06/2019

Eligibility

Key inclusion criteria
Healthy adults

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Total final enrolment
0

Key exclusion criteria
1. Pregnant women
2. Smokers
3. Persons with lactose and milk protein intolerance or gastrointestinal disorders

Date of first enrolment
09/04/2015

Date of final enrolment
30/11/2017

Locations

Countries of recruitment
United States of America

Study participating centre
University of Nebraska-Lincoln
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Sponsor information

Organisation
The Gerber Foundation

ROR
https://ror.org/03ggcx620

Funder(s)

Funder type
Charity

Funder Name
Gerber Foundation

Alternative Name(s)
The Gerber Foundation, GerberFdnWMI, The Gerber Companies Foundation, GF

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
United States of America

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated and/or analysed during the current study during this study will be included in the subsequent results publication.

IPD sharing plan summary

Other

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	01/12/2020	10/06/2020	Yes	No
Results article		21/01/2022	24/01/2022	Yes	No
Results article		28/05/2025	11/03/2026	Yes	No