

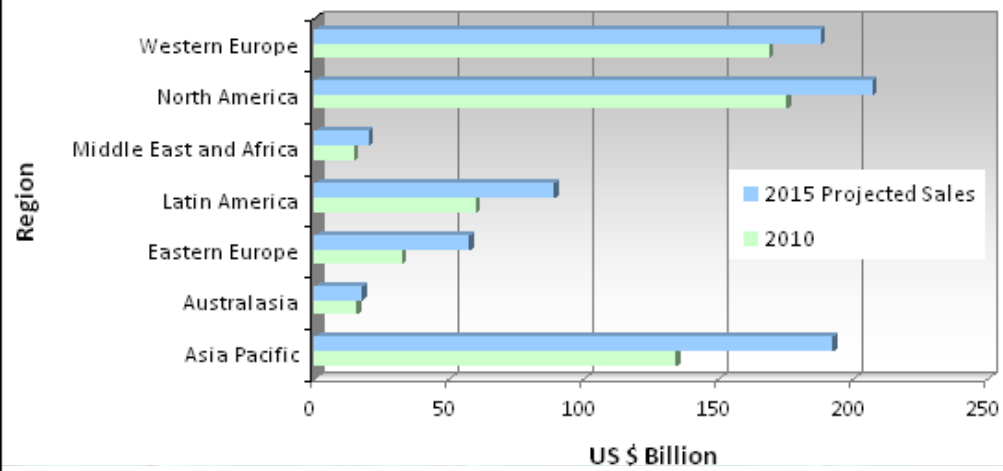


IMPROVEMENT OF FUNCTIONAL PROPERTIES OF AYRAN USING SYNBIOTIC MICROPARTICLES

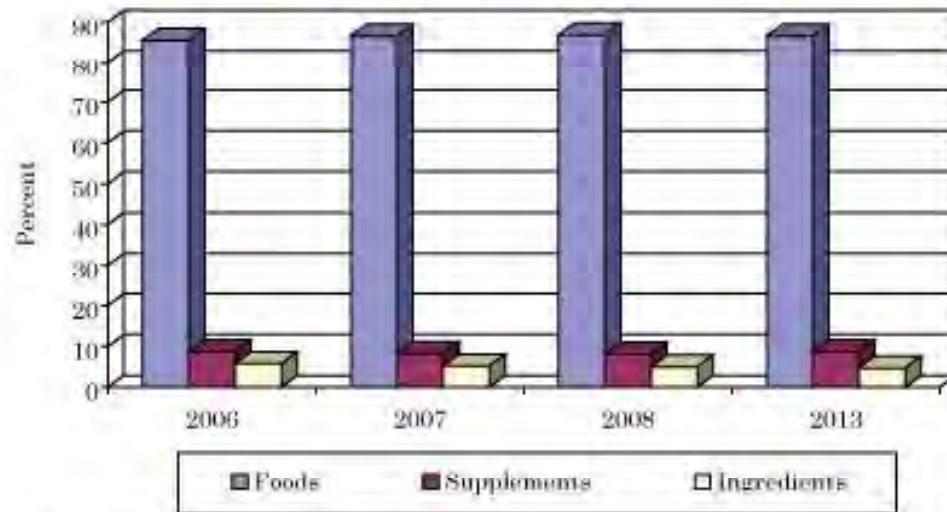
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Global Sales of Health and Wellness Products by Region



SHARES OF GLOBAL SALES OF PROBIOTICS, BY TYPE, 2006-2013 (%)



Source: BCC Research

WHAT ARE PROBIOTICS ?

“Live microorganisms which, when administered in adequate amounts confer a health benefit to the host”

FAO/WHO, 2002

+ prebiotics

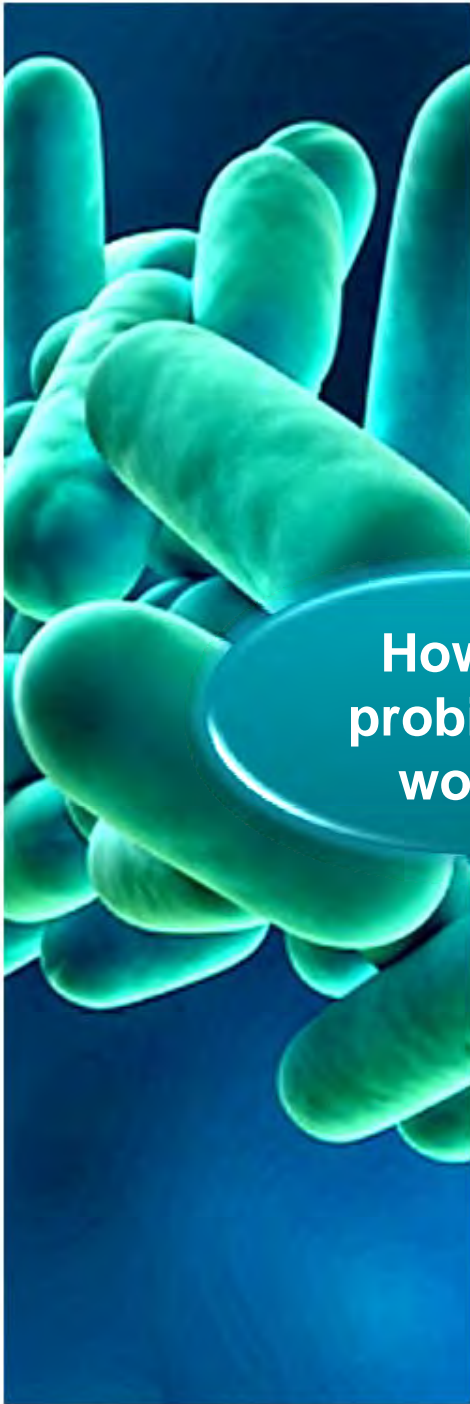


= synbiotics

Functional Foods

“A food product that is a part of the usual diet, but has beneficial effects that go beyond what are known as traditional nutritional effects”

Roberfroid, 2002)

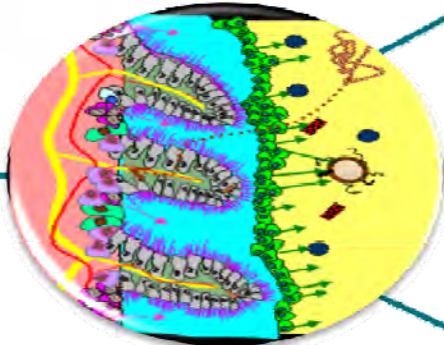


How do probiotics work?



Competitive exclusion (receptors and nutrients)

Secretion of bacteriocins and short-chain fatty acids



Production of mucin

Activation of epithelial binding pathways

Enhanced barrier function



Enhanced IgA secretion

Modulation of immune cell function

IMPROVEMENT OF FUNCTIONAL PROPERTIES OF AYRAN



MICROENCAPSULATED PROBIOTICS/SYNBIOTICS



“THE FUTURE OF FUNCTIONAL FOODS”

Probiotic cells enrobed into polymer coatings will provide:

- prolonged shelf-life of the food product
- targeted release of sufficient number of microorganism in the colon and ileum ($> 10^7$ CFU)

Microencapsulation techniques: **spray drying**, emulsion, extrusion, phase separation.....

Starter cultures:

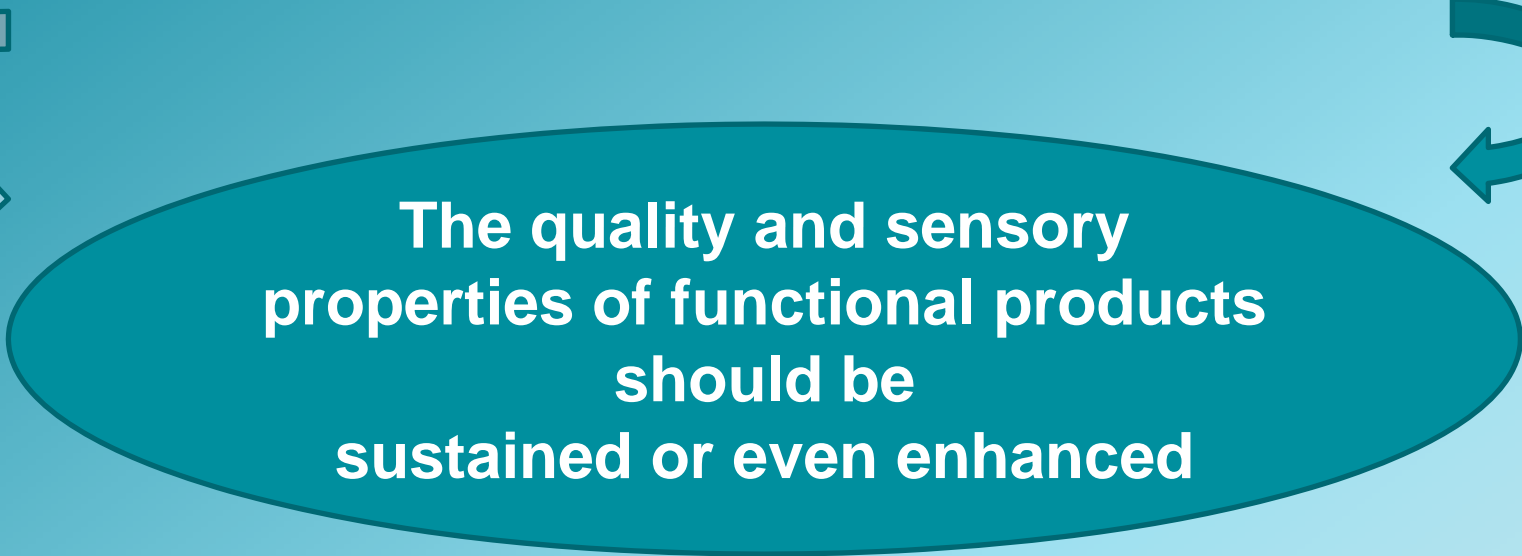
- *Streptococcus thermophilus*
- *Lactobacillus bulgaricus*

Incorporation of functional ingredients:

- *Lactobacillus casei* as probiotic
- oligofructose enriched inulin as prebiotic
- microencapsulated synbiotic (chitosan-Ca-alginate microparticles with mean volume diameter of $8.6 \pm 0.3 \mu\text{m}$)

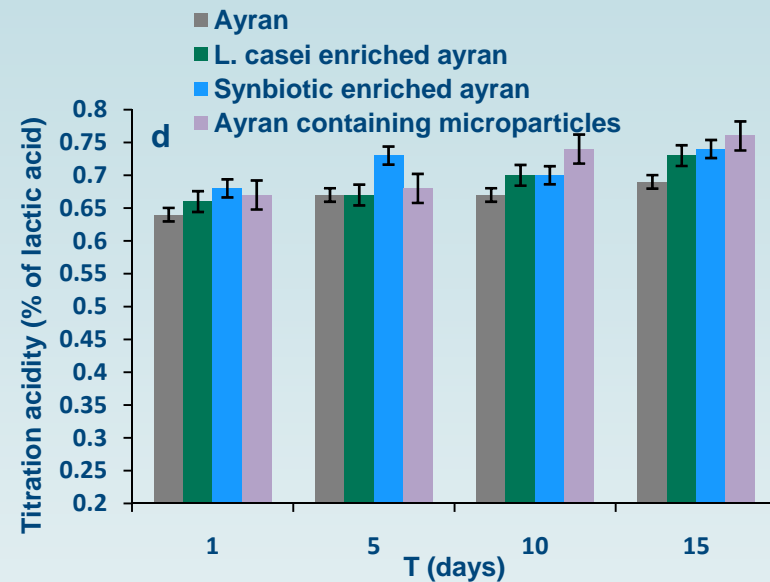
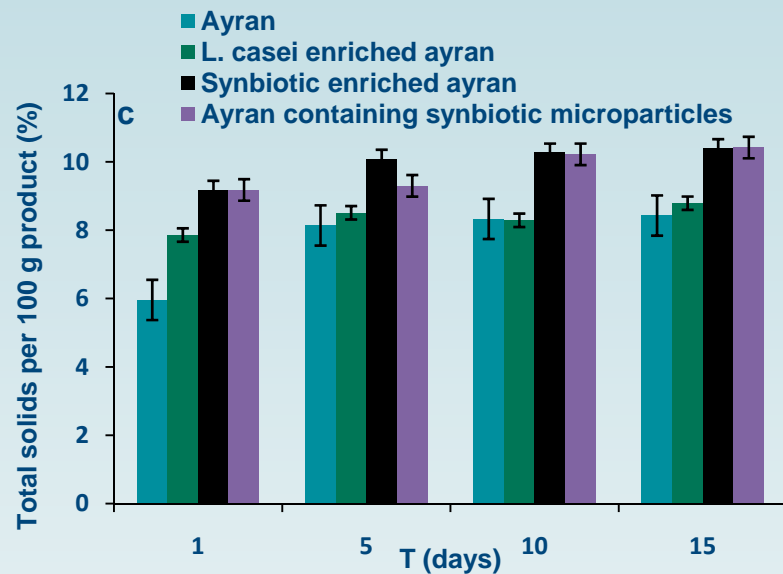
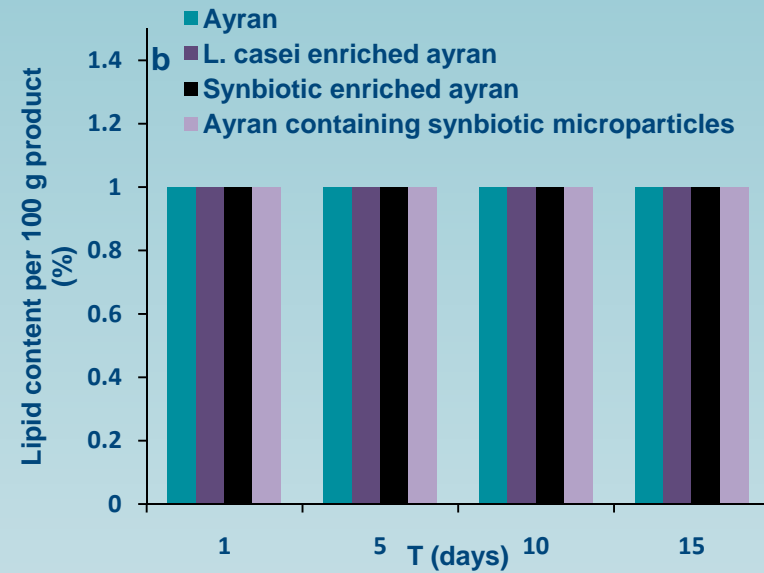
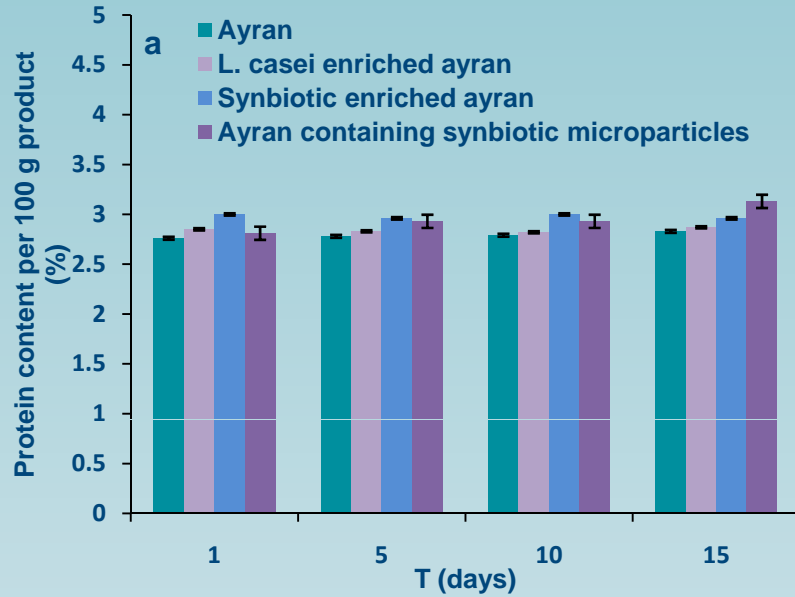
Analyses of the quality of functional samples of ayran and comparison with the quality of the plain ayran:

- determination of titration acidity (lactic acid, %)
- pH measurements
- protein content of the ayran (Pyne method)
- fat content of the ayran (Gerber method)
- determination of total solids (gravimetric method)
- microbiological analysis of probiotic viability (plate-count method)
- quantitative determination of produced organic acids (lactic and acetic acid) (HPLC method)

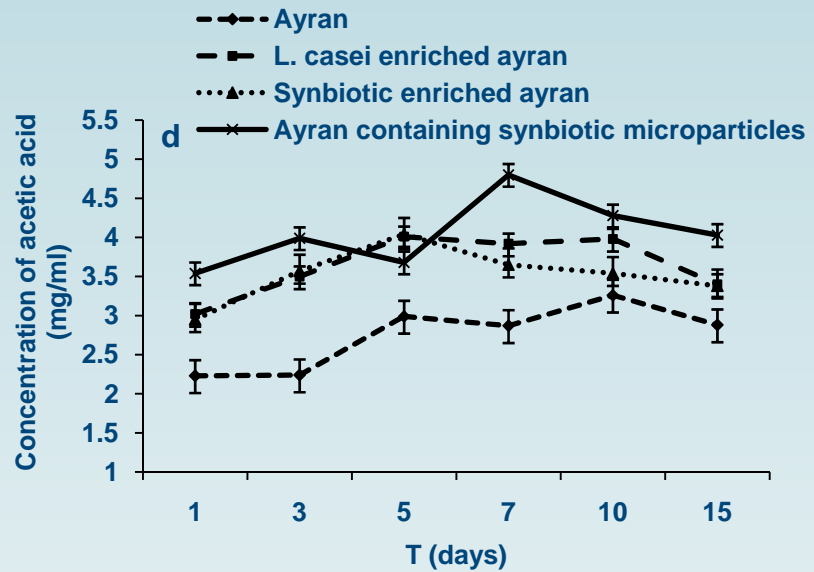
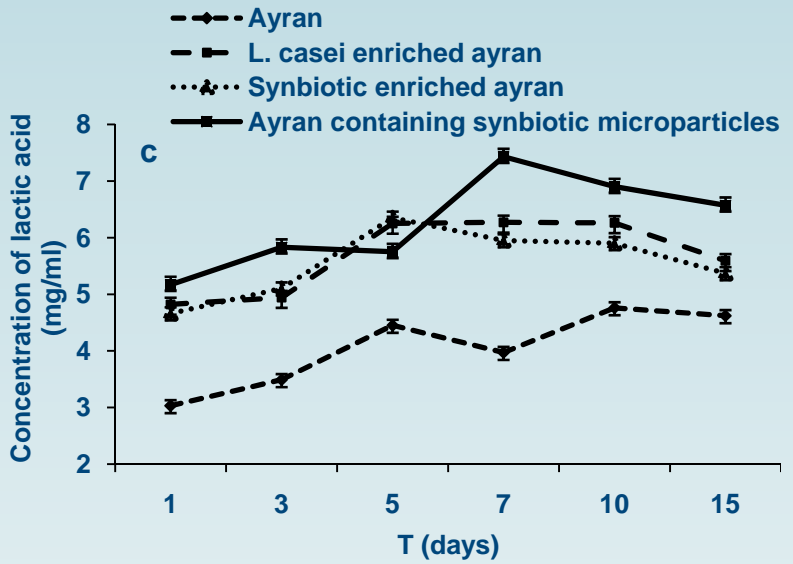
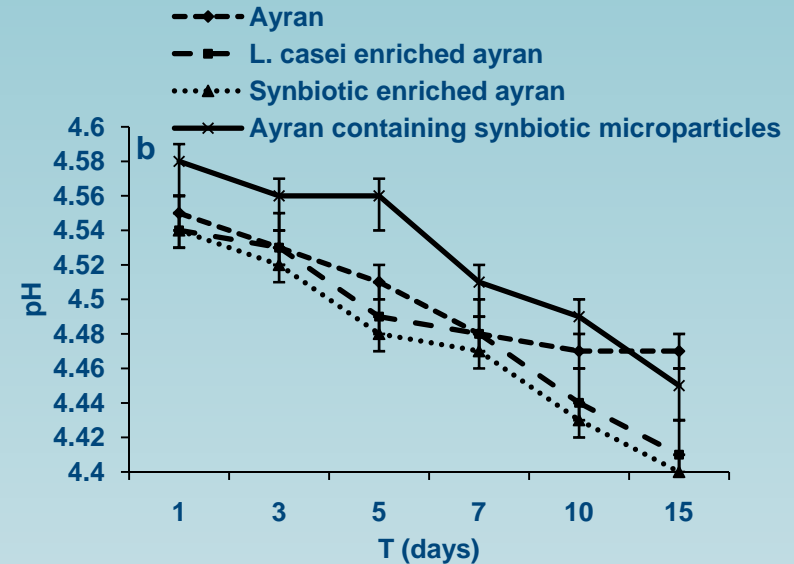
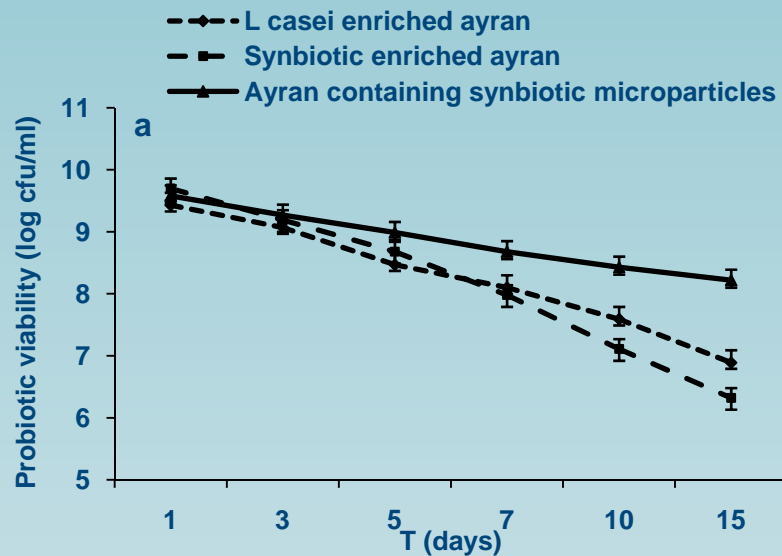


The quality and sensory properties of functional products should be sustained or even enhanced

Analyses of ayran samples during 2 weeks of cold storage, a) protein content; b) fat content; c) total solids and d) titration acidity



Analyses of ayran samples during 2 weeks of cold storage, a) viability of *L. casei*; b) pH; c) production of lactic acid and d) acetic acid



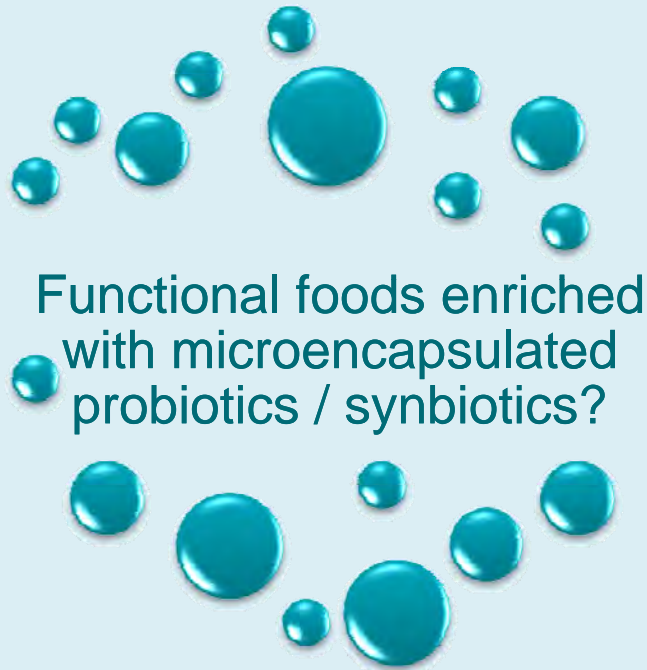
Conclusions

- ✓ New dairy functional products (probiotic enriched ayran, synbiotic enriched ayran and ayran containing microparticles) were developed and maintain the required quality of the ayran within the expiry date of the product (2 weeks of cold storage)
- ✓ Content of proteins and fats was within the required levels of the plain ayran
- ✓ Total solids in the ayran samples fortified with probiotic, synbiotic and synbiotic microparticles were moderately increased due to added dry matters
- ✓ Significant differences of titration acidity and pH values were not detected between the samples
- ✓ Probiotic counts of ayran samples using MRS media showed that the viability of *L. casei* remained significantly higher in ayran fortified with synbiotic microparticles
- ✓ Encapsulated *L. casei* retains higher level of metabolic activity followed by increased production of lactic acid that therapeutically affects the GIT and acetic acid that possesses antimicrobial properties

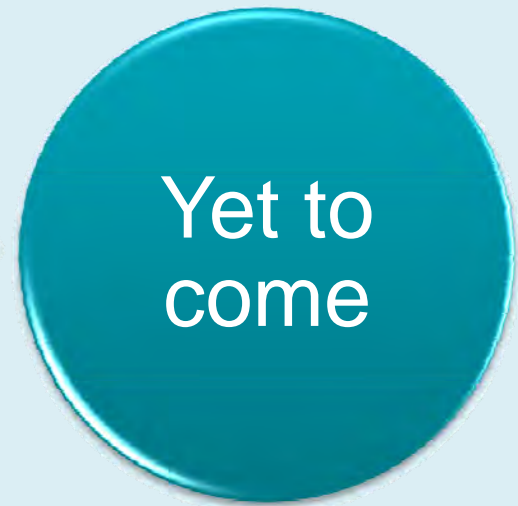
FUTURE TRENDS



In vivo investigations of beneficial effects of functional ayran samples using Wistar rats with chemically induced ulcerative colitis



Functional foods enriched with microencapsulated probiotics / synbiotics?



Thank you for the attention