Probiotics & Functional Foods

Friendly Flora
Gabriela Pacheco, RD, LD, SNS
Microbes

- Not all microbes are bad
  - Pathogenic bacteria
  - Yeast
  - Viruses

- Belief that all are associated with morbidity and mortality
Growing amount of research, evidence and documentation of “other” microbes called Probiotics

- Contribute to human health
- Live microorganisms
“The Dr. of the future will give no medicine, but will interest the patient in the care of the human frame, in diet and in the cause and prevention of disease”

Thomas Edison
The human body holds a vast internal ecosystem consisting of millions of living microorganisms that coexist, sometimes harmoniously and sometimes disruptively.

This ecosystem, our human intestinal flora, dramatically influences, and to a certain degree even directs, every individual's personal state of health and well being:
- physical and mental health
- metabolism
- our life span?
An appetite for bacteria?

PROBLEMATIC PROBIOTICS

The best-studied and most commonly microorganisms in probiotic products are bacteria from two major groups, or genera:

- Lactobacillus
- Bifidobacterium

But different strains from the same genera can be as different as “a German shepherd and a Chihuahua,” says microbiologist Mary Sanders. Determining which strains are most valuable for which purposes is a major, ongoing research goal. So is determining whether probiotics - already sold in unproven supplements - have probiotic potential.
Objectives

- History
- Definitions
  - Pre-biotics
  - Pro-biotics
  - Syn-biotics
- Physiology
- Health benefits
- Future directions
Guidelines

The science and practice-based guidelines presented will enhance understanding of probiotics, prebiotics, and functional foods

Sum of current knowledge & practice
Goal

To improve appropriate *recommendations* and *informed* use of these emerging dietary ingredients and the products containing them.
Recent History

- Probiotic concept - Created the probiotic revolution
- Isolated lactobacillus culture from Bulgarian yogurt
- Lactic Acid bacteria in fermented milk

Immunologist Elie Metchnikoff (1845-1916)
Definitions

- **Pro-biotics** / **Antonym = Antibiotic**
  - Pro-Greek “for life”
  - 1950’s
  - Live microorganisms
    - Modify intestinal microflora
  - Provide benefit beyond nutrition
    - Improves Vit K production, nutrient absorption, stimulate immune system
**Definitions**

- **Pre-biotics** - food for the probiotic
  - Complex CHO - not metabolized
  - Energy source for probiotics
  - Inulin is most common-soluble fiber
    - Artichokes, asparagus, onions, garlic, raisins, bananas

- **Syn-biotics**
  - Pairing of pre- and pro-biotics
  - Suitability-success in colonizing gut
  - Allows manufacturers to design products w/very specific functional claims
No “Legal” Definition for “probiotic”

- There is an accepted scientific definition
  - w/o legal definition—consumers are at a disadvantage

- Term often used commercially
  - Minimum criteria for probiotics
  - Never associated with dead bacteria
  - Must be viable
Minimum Criteria

- Purified strain of microbe
- Identified to the strain level using biochemical and genetic techniques
- Shown in human studies to improve some parameter of human health
- Safe for target consumers

Jrnl of the American Dietetic Assoc.
Recommending Probiotics

- Generally of interest to two groups of people
  - With specific health concerns
    - Can have measurable outcome-symptom improvement
  - Generally healthy people
    - Enhance immune function
    - Reduction of risk of disease
Current Emphasis is on Whole Foods

- Philosophy changed from what to avoid to what to include
  - Naturally occurring beneficial components
  - Functional foods
Distinction- drug or food?

There is a major concern, among many, that functional foods blur the distinction between foods and drugs.

- Ongoing debate over labeling – health claims*

*relationship of dietary substance to reduction of risk of disease or health related condition

Jrnl American Dietetic Association
Distinction - drug or food?

- Add a functional ingredient that is not normally present in food

- Replace a component (fat) with a functional component (fructan)

- Increase the bioavailability of a functional component
Food or Drug?

- Eliminate a component known to have an adverse effect
- Fortify a food with a functional ingredient to promote health
“The Smelliest Lab”

- Total human cells = $10^{13}$
- Total microbial cells in human body = $10^{14}$
- Diversity >400 microbial species
  - > 5 million genes
- Directing similar metabolic functions
  - Immunomodulation
  - Detoxification
  - Mucin secretion
  - Protection from enteric disease

Pincock, The Scientist, 2005
Human GI tract

- Diverse microbial populations
- Factors affecting
  - Age, nutrition, antibiotics, stress, EtOH, pH, transit time
- Balance is key – a symbiotic relationship
Strains

- **Lactobacillus**
  - L. acidophilus
  - L. casei
  - L. fermentum
  - L. gasseri
  - L. johnsonii
  - L. lactis
  - L. salivarius

- **Bifidobacterium**
  - B. bifidum
  - B. breve
  - B. lactis

- **Streptococcus**
  - S. thermophilus

- **Yeast/mold**
  - Saccharomyces bouldarii
Published Target Points

Oral microbiology
- Dental caries
- *S. mutans*
- Halitosis

Allergy
- Atopic dermatitis
- Asthma

Colorectal cancer

Vaginal infections

Colds, respiratory infections

*H. pylori*

Delivery of components active in gut

**GI effects**
- Diarrhea
  - AAD
  - Traveler’s diarrhea
  - Rotavirus
- Lactose digestion
- IBS symptoms
- Food Allergies

**Systemic effects**
- Immune function
- Reduced absences
- Growth parameters in undernourished children
Microflora in Allergic Children

- Hypothesis that allergic conditions among children may be associated with differences in their gut bacteria.

- 2 y/o’s – Northern Europe.

**Allergic children**

- L. bacilli colonization
- Aerobic bacteria
  - Coliform
  - S. aureus

**Non-Allergic children**

- L. bacilli colonization
- Aerobic bacteria
  - Coliform
  - S. aureus

WIIFM? (What’s in it for me?)

- Probiotic options
  - Food
  - Supplement
  - Medical food
  - Pharmaceutical (pending)
Levels Needed?

- How much is needed to have an affect?

- Questions still remain
  - Levels needed in combination w/ other functional foods
  - Multiple dietary sources
  - Strain interactions

- Dosages not known-consumption is known to be beneficial
Live & Active Culture

- Nat’l Yogurt Assoc
  - Established criteria for L&A culture
    - Refrigerated dairy products must contain 100M cultures/gm
    - Frozen – 10M/gm

- Seal – front panel

* Meets National Yogurt Association criteria for Live and Active Culture Yogurt
Probiotic Foods

- Yogurt - most common
- Cheese
- Cereal
- Juice
- Frozen yogurt
- Kefir (fermented milk drink)
- Daily dose drinks
- Fresh sauerkraut
- buttermilk
Viability of a Probiotic

- Adding fermented foods to diet
  - Many do not contain live cultures in the finished product
    - Sourdough bread – baked
    - Cheese baked into pizza
    - Fermented meats – smoked or cooked

- Filtration of wine & beer removes all microbes

- Foods treated with preservatives
Maintaining Viability

- Technological challenge
- Sensitive to environmental factors:
  - Heat
  - Moisture
  - Oxygen
  - Acid
Supplements

- Widely available
- Differing strains, doses
- Minimal efficacy data
- Shelf life? Buyer beware
SuperFoods Rx

- F/Vs
- Whole grains
- Protein
- Healthy fats

- Food for thought
  - Daydream, friendships, laughter
SuperFoods Rx

- Dark chocolate
- Cinnamon
- Extra virgin olive oil
- Garlic
- Honey
- Kiwi
- Tea
- Blueberries
- Beans
Is more better?

- NO!!!!
  - Balance and variety

- We can be getting too much
  - Energy drinks
    - B vitamins, caffeine, amino acids
    - And we still take supplements
  - Fortified cereals, flour, pasta
    - Then take too many supplements too!

- Too much of a good thing is NOT a good thing!
Conclusion
A symbiotic affect

- Balanced diet
- Moderation of stress
- Appropriate physical activity

“It’s not a diet or an exercise program or a magic bullet”
“For general health, incorporating more probiotic-rich foods may lead to better nutritional status – overall improved health”
Resources

www.usprobiotics.org

www.medicinalfoodnews.com

www.eatright.org (Am Dietetic Assoc)