

Role of Functional Foods and Beverages *in* Health and Wellness

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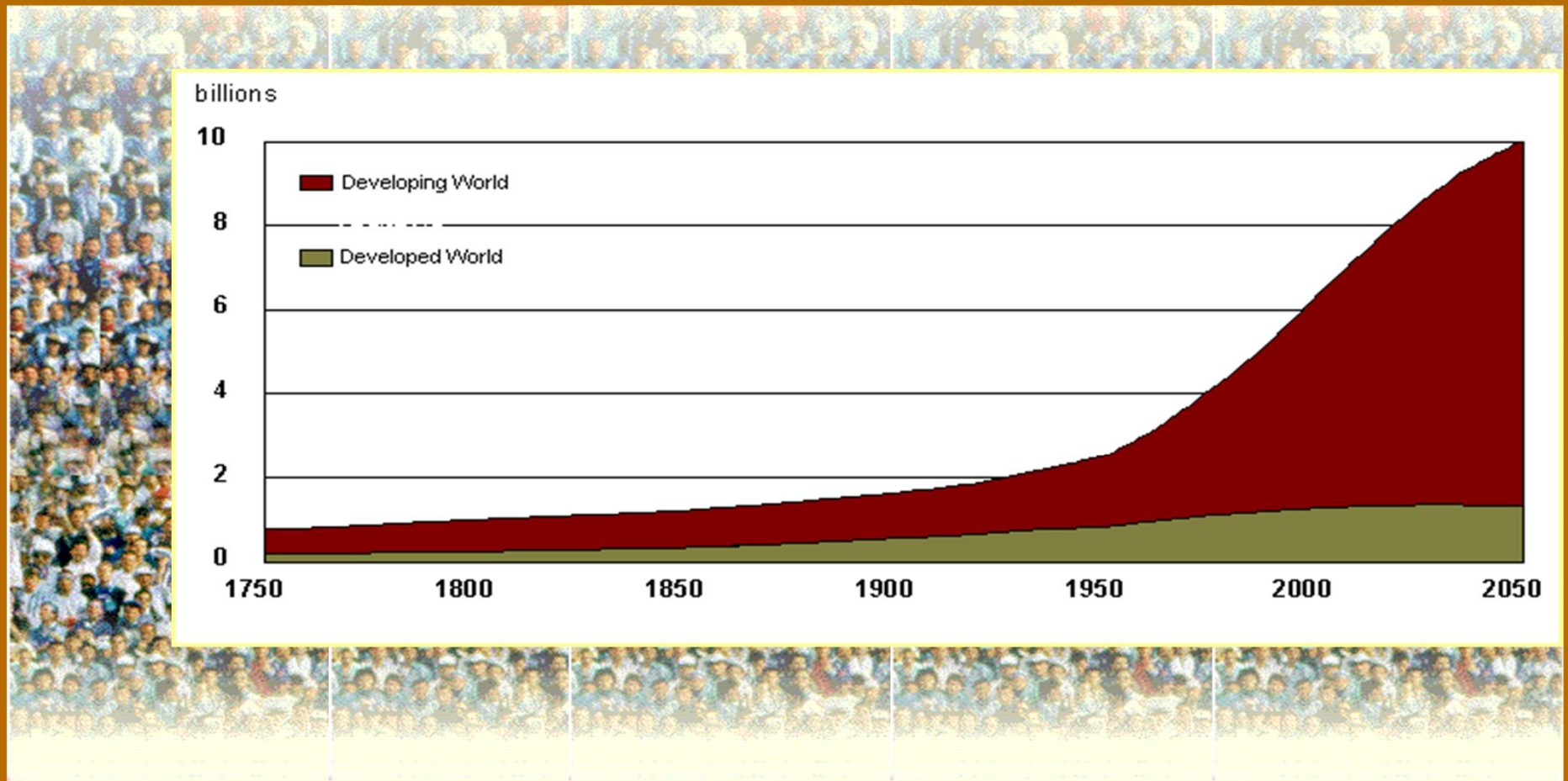
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ILSI-International Symposium on Diet, Lifestyle & Health at Colombo, Sri Lanka 20-21 Nov 2015

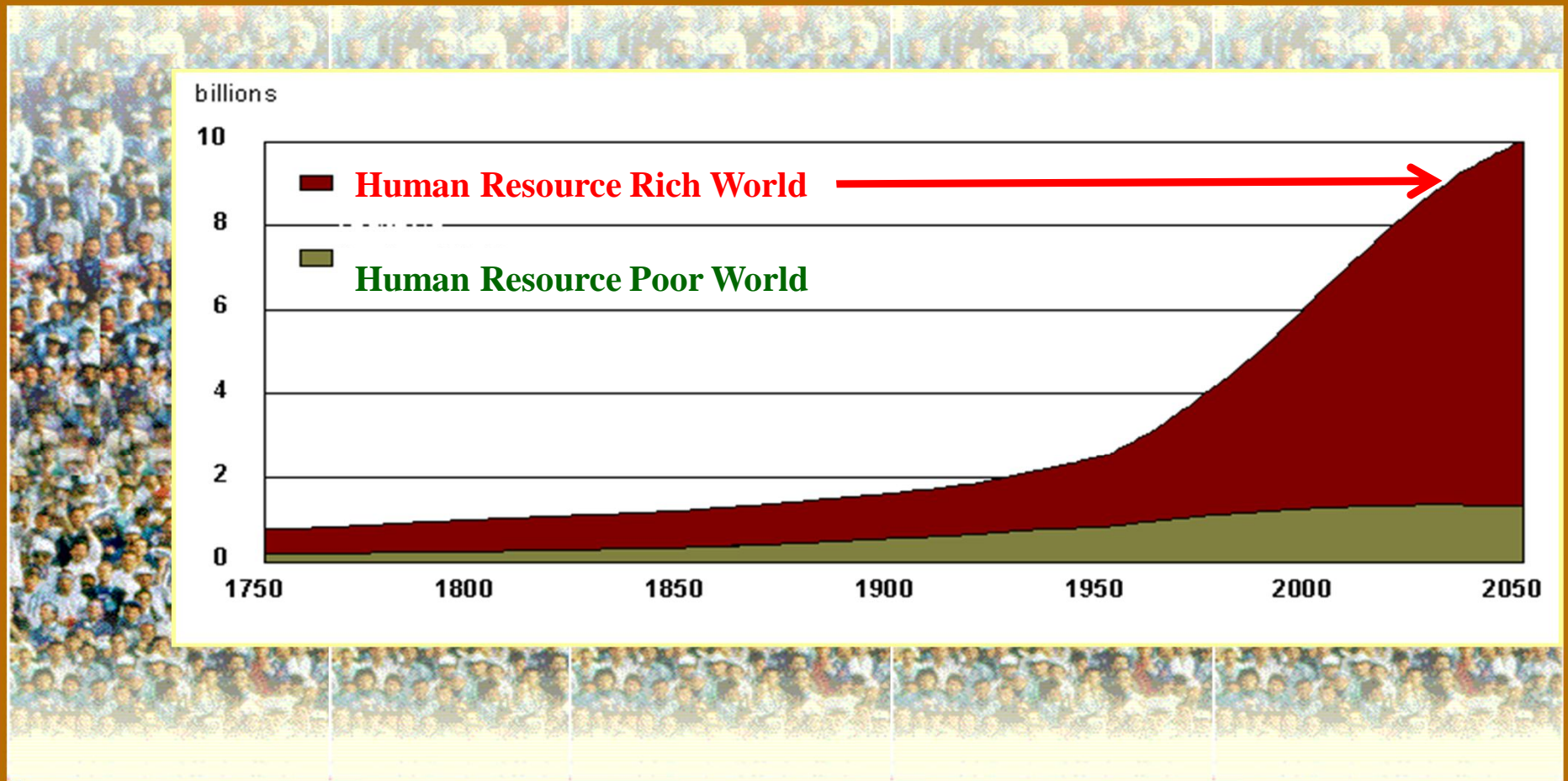
Global Population Growth



“There is enough space for everybody to grow provided equal opportunity is available”!!

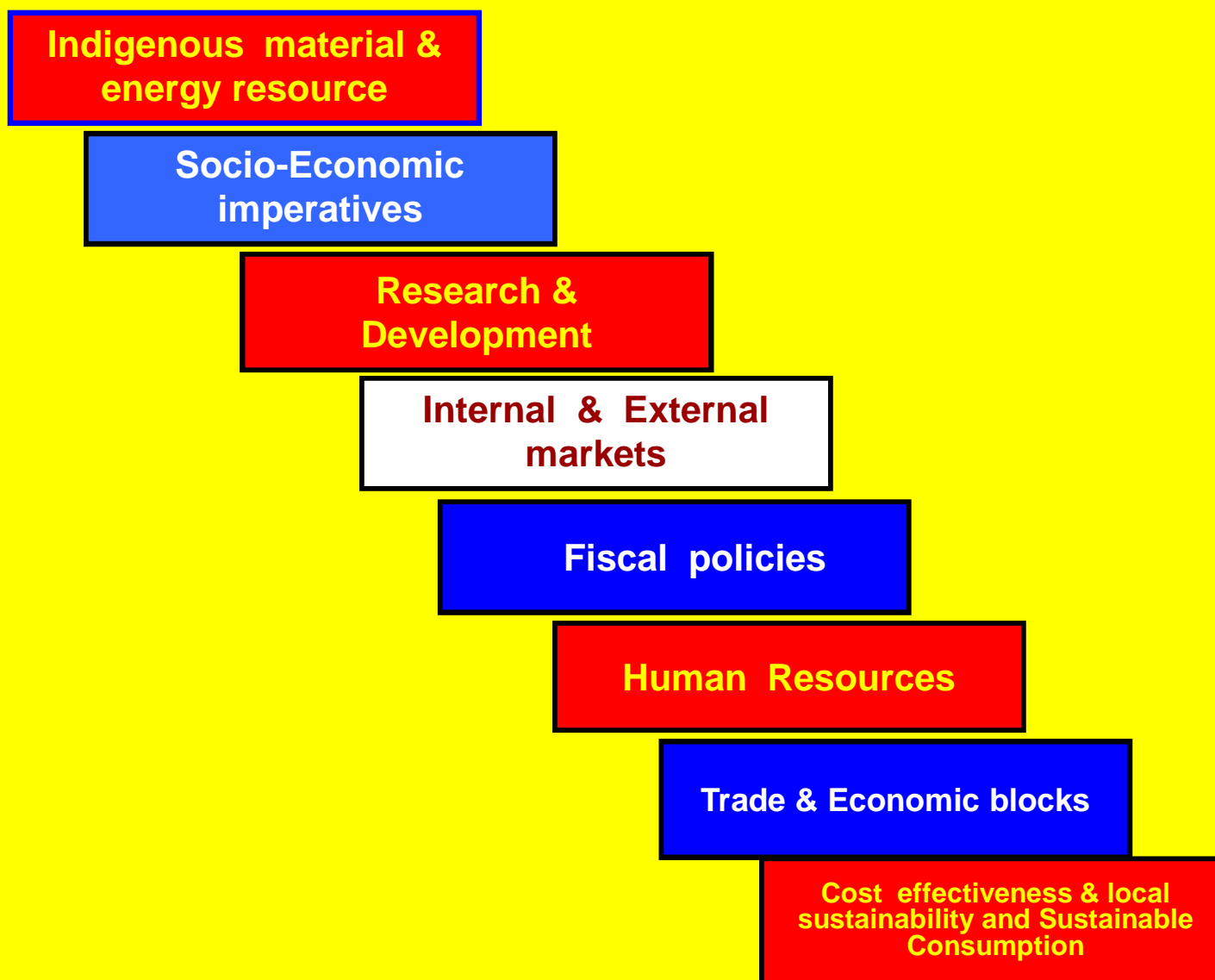
Source: United Nations Population Division and Population reference Bureau

Global Population Growth

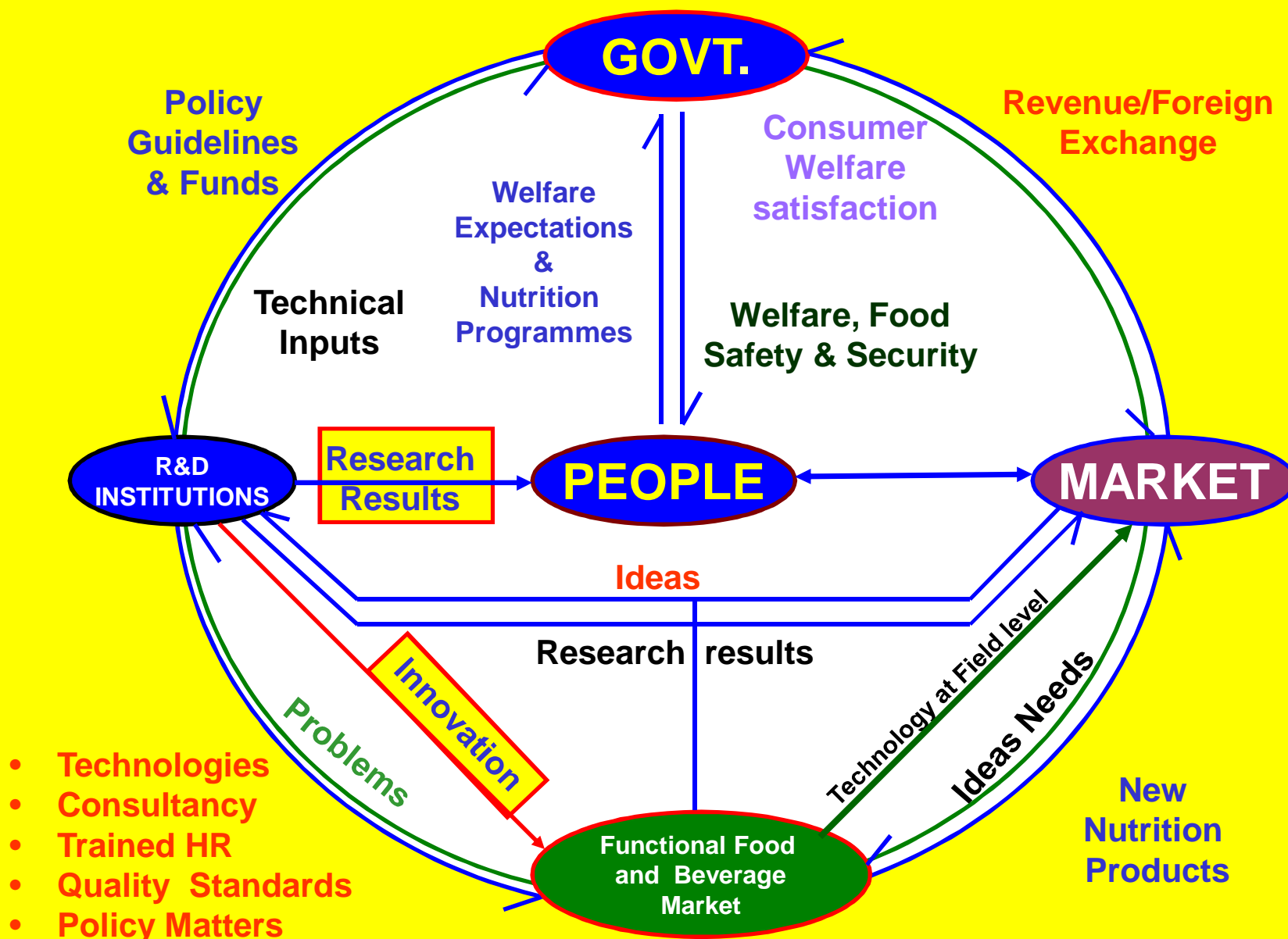


**“There is enough space for everybody to grow provided equal
SPACE OF OPPORTUNITY is available”!!**

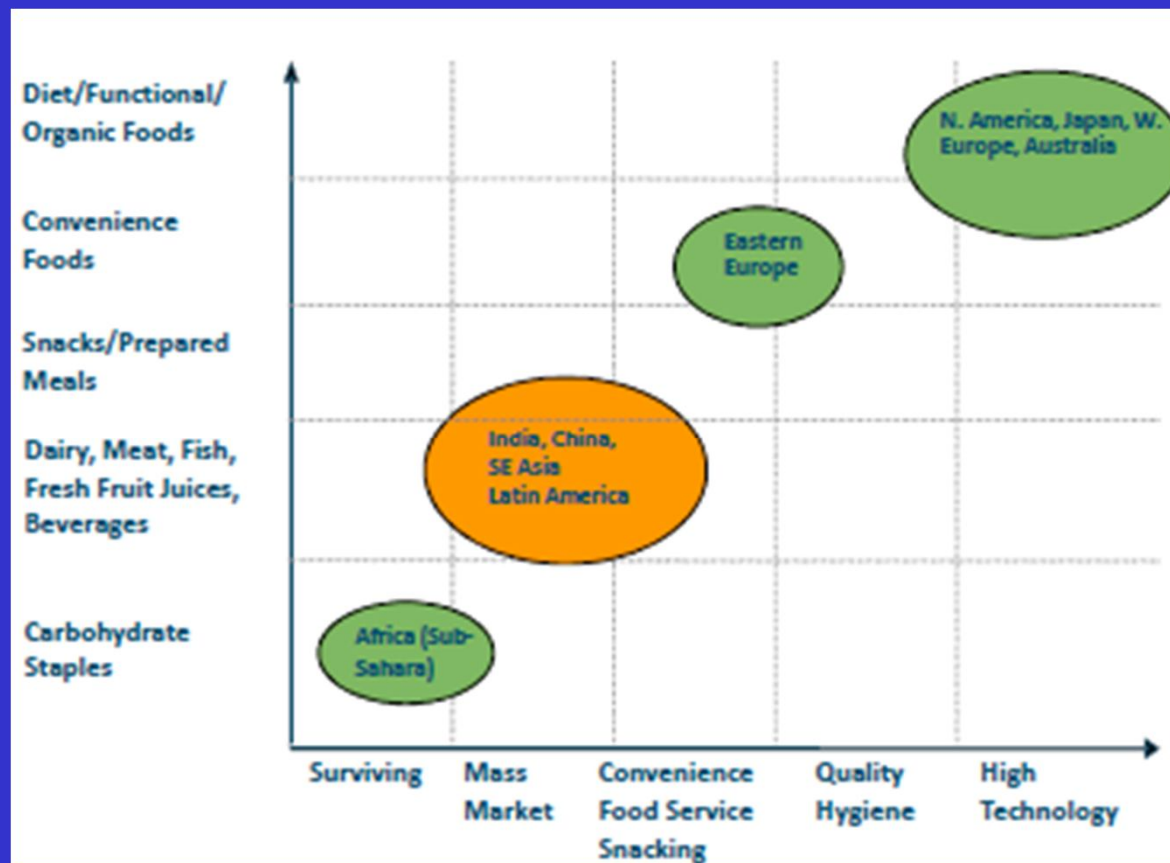
FORCES THAT SHAPE THE INGREDIENT MARKET FOR FUNCTIONAL FOODS AND BEVERAGES



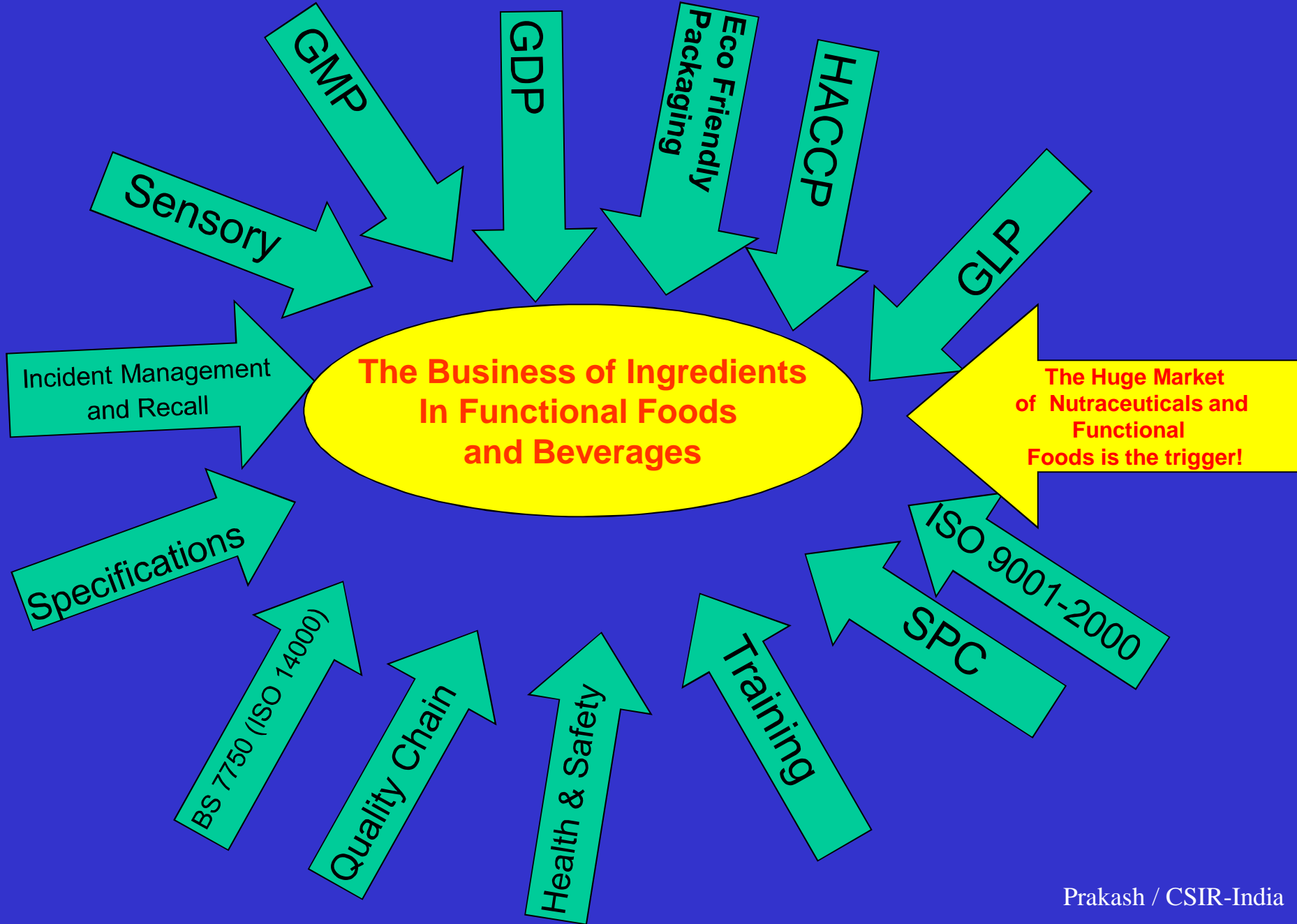
R&D IN THE FUNCTIONAL AND BEVERAGE CHAIN CONTEXT



Economic development and shift in consumption patterns



The Broader Perspective – Where to Begin ?!



■

**Value addition to
Ingredients and Quality raw materials
is a must to focus**

in Informal, Organised and Unorganised sector

***The balance between these are very
vital in the long run***

CATCHING THE EXPANDING MARKET!

“Functional foods are foods that have a potentially positive effect on health beyond basic nutrition. Proponents of functional foods say they promote optimal health and help reduce the risk of diseases”

Is this definition enough?!!:

“The Functional Foods and Beverages has alarmingly captured large segment of Food market and is expected to reach almost \$180 billion by beginning of 2016”

The New approach, that the Consumer is taking, is to Choose Healthy foods and manage food costs and minimize Medical expenses and this needs to be kept in mind by the Academia and Industry.

**Immunity, preventive aspects
of diseases,
weight management,
heart health, bone health and
mental health are the
concerns of consumers
today.**

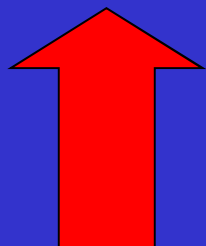
***Is Functional Food and Functional
Beverages the answer ??***

FUNCTIONAL INGREDIENTS & **Healthy Developments**

A growing number of nutraceutical companies are offering **ingredients that add health and value to finished Food products.**



On a scale of
increasing
importance



The ladder
of
Phytochemical
Nutrition

Garlic
Cabbage
Licorice
Soybeans
Ginger
Umbelliferae
(carrots, celery, parsnips)

Onions Tea Turmeric
Whole wheat
Flax Brown rice
Solanaceae
(tomato, eggplant, peppers)
Cruciferous (broccoli, cauliflower, brussels
sprouts)

Oats Mints Oregano Cucumber
Rosemary Sage Potato Thyme Chives
Cantaloupe Basil Tarragon Barley Berries

**Foods and Food Ingredients containing phytochemicals with disease preventive
claims of Ingredients in Functional Foods and Beverages**

The Biodiversity of a few Traditional & Ethnic Foods in India, Sri Lanka, Japan , China and Vietnam

can mean a lot to combinatorial theory of Food ingredients. Complexity of combination of Foods and positive effect on Health?!

Traditional Wisdom (More than 5,000 years of Epidemiological data) to Indian sub Continent and Pacific ocean Countries



Courtesy:
Dr Vaidya

Traditional Foods

It is a Treasure of Informatics on Nutrients and Nutraceuticals to prevent diseases and Sustain Recoveries.

One of the key points in Traditional Foods and Ethnic Foods in India is derived from *Ayurveda* which uses mostly Herbs, Spices and Condiments, Fruits and Vegetables .The focus is on method of processing along with a reproducible final product with Bioactives being Bioavailable.

Knowledge of 5000 years of Epidemiological data is an important aspect and cannot be set aside.

2000 years of Indian documents indicates different Salts going into Beverages and Foods to make it Functional!

III. Spices - 3/7

Source : *Bhojanakutūhalam*

लवणम् lavaṇam-Salts



| | | |
|---|---|---|
| Rock Salt  | a) saindhava lavaṇa vr̥ṣya cakṣuṣya vanhidīpanam tridōṣaśāmakā vṛṇadōṣavikāranut | a) Rock Salt aphrodisiac healthy for eyes stimulates appetite alleviates vitiated dōṣa alleviates wounds and diseases caused due to vitiation of dōṣa |
| Sedimented Salt  | b) gaḍha lavaṇa dīpana kaphavātaghnamaśrōghnam kōṣṭhaśōdhanam malāpaha | b) Sedimented Salt increases digestive fire alleviates vitiated kapha and vāta and treats piles cleanses internal organs reduces quantity of stools |
| Common Salt  | c) sāmudra lavaṇa laghu hṛdya palitāsraśupittadam vidāhi kaphavātaghna dīpana rucikṛt | c) Common Salt light for digestion conducive for heart causes greying of hairs, vitiates blood causes burning sensation alleviates vitiated kapha and vāta increases digestive fire imparts taste |
| Bamboo Salt  | d) drauṇeya lavaṇa lavaṇa pākē nātyuṣṇa vidāhi bhēdana snigdha śūlaghna amlapittalam | d) Bamboo Salt salty in post metabolic effect not much hot in potency causes burning sensation causes breaking of stools unctous alleviates pain causes gastritis syndrome |
| Black Salt  | e) aukhara lavaṇa kaṭu kṣāra tikta vātakaphāpaham vidāhi pittakṛt mūtrasamśōṣakāri | e) Black Salt pungent alkaline bitter aggravates kapha and vāta causes burning sensation aggravates pitta reduces urine output |
| Lake Salt  | f) romaka lavaṇa tikṣṇa atyuṣṇa kaṭu tikta dīpana dāhaśōṣakara pittakōpakaram | f) Lake Salt penetrating very hot in potency pungent bitter increase digestive fire causes burning sensation and dryness aggravates pitta |

THE NEW TREND

Food not for just Physical health, Preventive aspect and Nutrition ***but also for Mental Health.***

How does one define Mental Health and its Nurturing through Traditional Foods?

*The answer may be networking of all disciplines from Traditional Knowledge to Technology thru Traditional & Fermented Foods distilled over 5000 yrs especially in the use of specific, Herbals, Fruits & Vegetables, and Spices **for Ingredients***

ASIA'S
TRADITIONAL KNOWLEDGE
&
PRACTICES
WEBS INTO
MODERN SCIENCE.

*EMERGENCE OF
NEW MODEL FOR REACH OUT OF
KNOWLEDGE TO SOCIETY*

A true metamorphosis

■
**Integrated approach is the key to
success.**

**Traditional Knowledge + Modern
Scientific Support + Rich
Epidemiological data in India,
Sri Lanka China and SE Asia, Africa
and Mediterranean Region.**

***What a treasure for Functional
Foods!?***

HEALTH & WELLNESS



- Applied Science
- Consumer Research/Trends
- Innovation/New Technologies
- Marketing & Packaging
- Product Development
- Regulations
- **Functional foods & Functional Beverages**

Specialty Functional Foods

Traditional & Ethnic foods

*The Challenge is, compatibility of Food
and its preparation in daily Kitchen at
Home, in catering and Factories*

DATA BASE ON TRADITIONAL FOODS

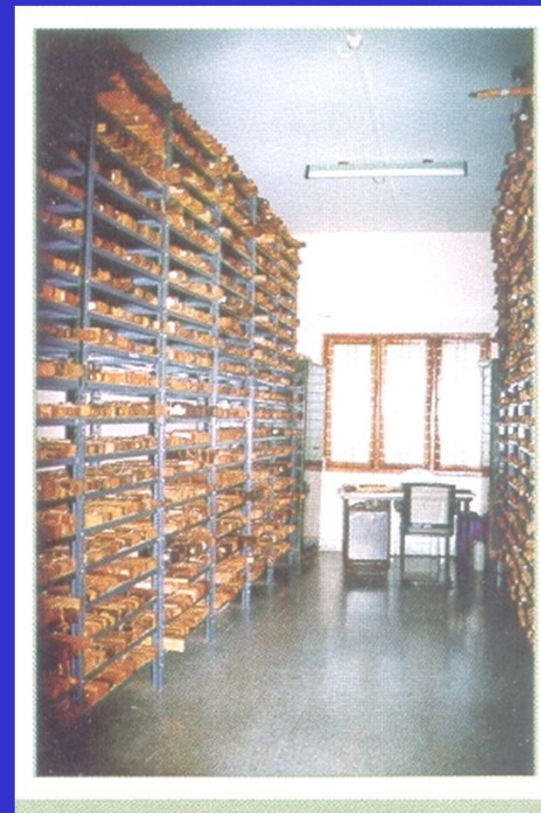
The traditional foods are a rich heritage of the world and offer a wide diversity because of their origin in different regions and their multidimensional culture. They have evolved through trial and error over many centuries of cultural, social, economic and sensory experiences.

Scientists to learn traditions which has come in generations and give a supporting role through their scientific knowledge.

The Chemistry of writing on Palm Leaves using *Ragi* ink and then lacquering them with a base of essential oils from spices from a base of Sesame oil to preserve them forever is simply a marvel of Chemistry.

Do we understand the benefits of combination
of different Foods & Ingredients ?

We must tap this knowledge with the credit of sharing




Curcumin as “Curecumin”!

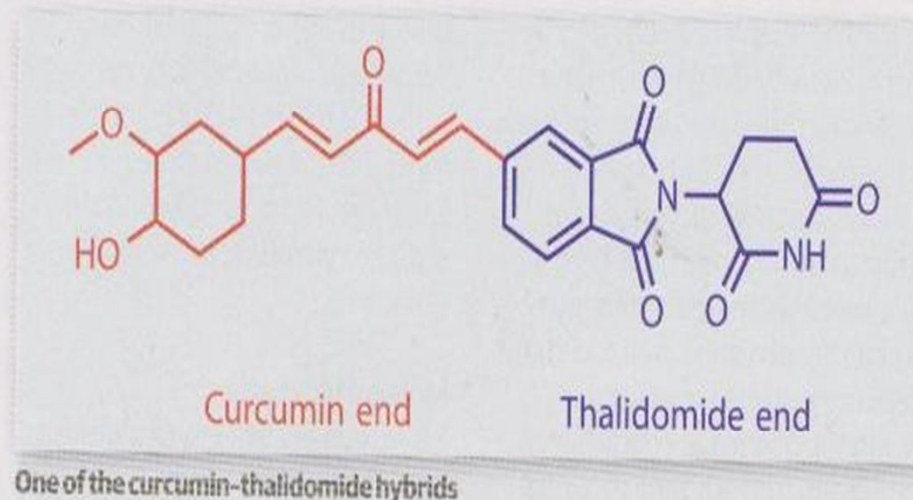
Traditional Knowledge Marriage with Modern Science!

Thalidomide teams up with turmeric

Hybrid compound can kill blood cancer cells

 Cancer researchers in the US and China have combined the turmeric spice pigment curcumin and the drug thalidomide to create hybrid compounds that can kill multiple myeloma cells.

Multiple myeloma is the second most common type of blood cancer, killing 20% of affected patients each year. The drug thalidomide, banned after causing birth defects when given during pregnancy in the 1950s, was recently approved for the treatment of multiple myeloma. Thalidomide works by disturbing the microenvironment of tumour cells in bone marrow. However,



it disintegrates in the body. Curcumin, a yellow pigment from the common spice turmeric, is also active against cancers, including myeloma, but is limited by its poor water solubility.

Shijun Zhang at Virginia Commonwealth University, US, and colleagues have synthesised compounds combining structural features from both

thalidomide and curcumin. 'The hybrids have enhanced solubility and higher toxicity against myeloma cells than curcumin, thalidomide, or a mixture of both,' explains Zhang, 'so our design rational is going in the right direction.' Zhang says the hybrids kill myeloma cells through combined mechanisms of action that include the

generation of reactive oxygen species and cell cycle inhibition.

'The advantage of the hybrid compounds is that they are stabilised, and do not degrade in the body as thalidomide does,' says William Douglas Figg from the National Cancer Institute in Bethesda, US, who has conducted numerous studies with thalidomide derivatives. However, from his experience, compounds considered for further trials should be more toxic to myeloma cells.

In the meantime, one of Zhang's hybrid compounds has shown activity against myeloma and prostate cancer in animal models. *Sonja Hampel*

REFERENCE

K Liu *et al*, *Org. Biomol. Chem.*, 2013, **11**, 4847-4849, (DOI: 10.1039/c3ob40595h)

Diabetes, heart disease and other non communicable diseases and CVDs are rapidly emerging as THE major causes of death in most of the Obesing Economies !

Food and Nutrition as Medicine in

Urban World-

*A Challenging task
and a more challenging task
in Rural reachout*

The challenges facing scientists in institutions, industry and public health agencies who have the responsibility of assuring a safe, Ingredients supply chain are enormous and, at the same time, demanding high Science with deeper and wider Knowledge base.

1. Food for Celiac patient



- Only treatment for celiac disease is a gluten-free diet (GFD)
 - Strict, lifelong diet
 - Avoid:
 - Wheat
 - Rye
 - Barley

The need of Functional Foods

(Just in India 10 million Celiac patients reported)

2. HEALTH ISSUES IN SOUTH AND SOUTH EAST ASIA

- **Severe Malnutrition**
- **Child undernutrition(Stunting)**
- **Different forms of malnutrition**
- **High infant mortality rate, Approximately 1.72 million children die each year before turning one**
- **Poor sanitation**
- **Female health issues**
- **Rural health**
- **Chronic diseases**
- **Malaria, TB, other infectious diseases**
- **Cancer and HIV**
- **CVD**
- **NCD's**
- **Obesity**

All these require Specialty Functional Foods and Beverages

3. Inborn Errors of Metabolism (IEM) and need of Specialty diet (PKU)

**4.Diabetes, heart disease and other non
communicable diseases are rapidly
emerging as the
major causes of death in most of the
Obesing Economies !**

Do we have a quick remedy for this?

***Can Functional Foods and Beverages
fill this gap?***

The New approach that the Consumer is taking is to Choose Healthy foods and manage food costs and prevent Medical expenses need to be kept in mind.

Drugs are expensive! But not possible to avoid.

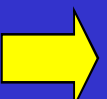
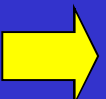
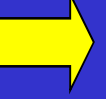
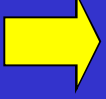
India may have cheaper drugs compared to global prices but not cheap enough for the unaffordable even generics especially for the Inborn Errors of Metabolism (IEM) Population

***Need of the hour is FSMP & FSDU
Functional Foods and Beverages.***

- *Is Ingredients the answer ??*
- **Science based evidence for utility of ancient Safe Ingredient knowledge**

Chemistry and Ingredients

Travel of

%  ppm  ppt  nano  femto

Should Analytical limits dominate
the Safety rather than Physiology
of Ingredients ?

**Value Addition to
Ingredients through the
path of Chemistry!?**

**Growing opportunities
with Nutraceuticals !
A great Market ahead !**

WHY NUTRACEUTICALS AS INGREDIENTS IN FUNCTIONAL FOOD AND BEVERAGES PLAYS A MAJOR ROLE?

Consumers are deeply concerned about how their health care is managed, administered and priced. They are frustrated with the expensive, high-tech, disease-treatment approach predominant in modern medicine. The consumer is seeking complementary or alternative beneficial products.

Chemistry and Science of Functional Foods and Beverages

The idea of Soup!

Food Technology,
Nutrition,
Health Foods and
Nutraceuticals.

*Food Safety has to be based
on sound Food Science
approach.*

(How much they are related ?)

Example:

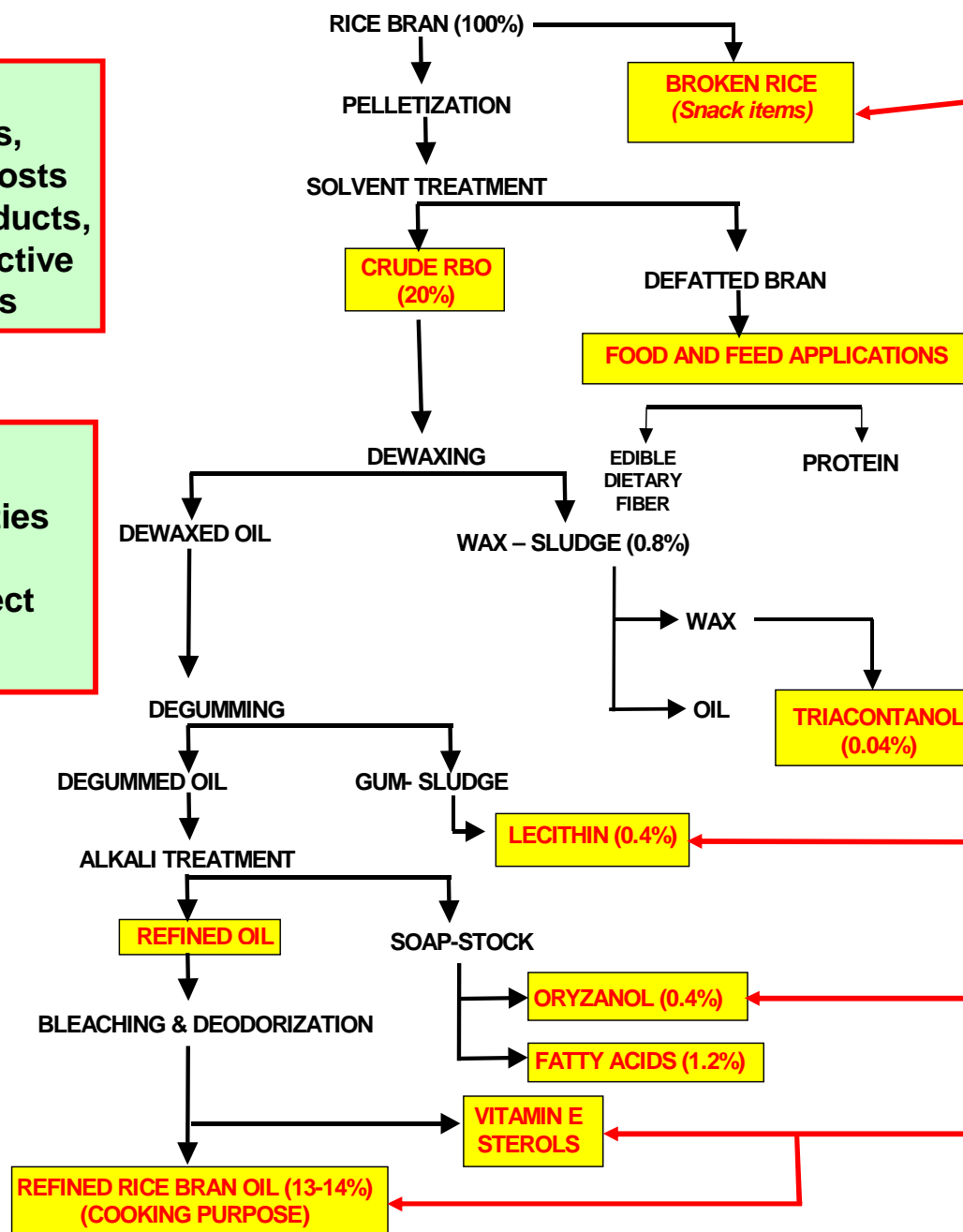


(Paddy Husk)

RICE BRAN AND ITS BYPRODUCTS

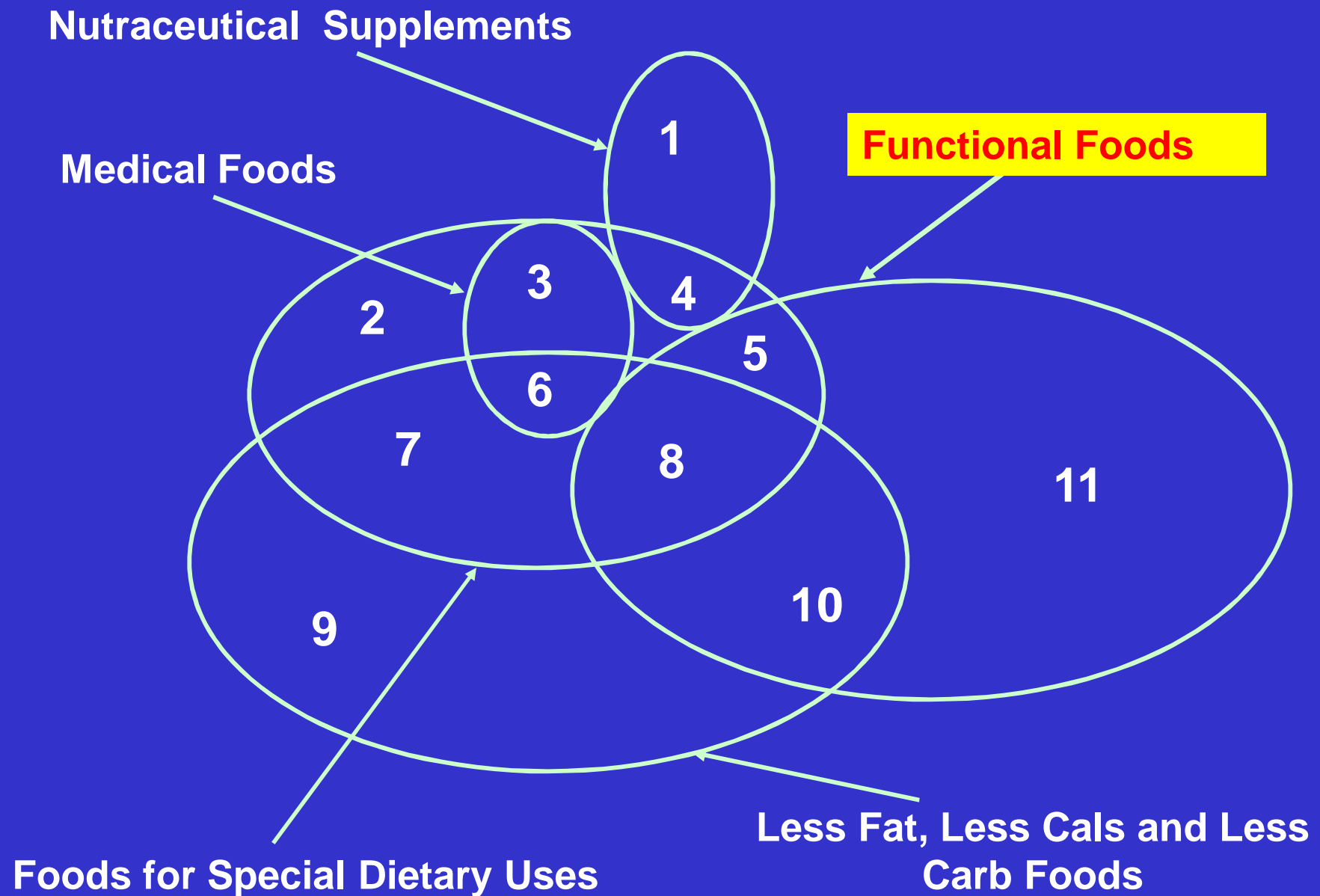
Upgrade
Technologies,
Reduce input costs
Market savvy products,
New & Cost effective
Technologies

Create more
Job Opportunities
both
Direct & Indirect



Intervention
of High
Science and
Technology
To use
These
Ingredients

Several terms used in commerce for Health Foods



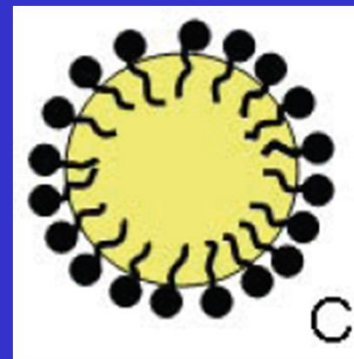
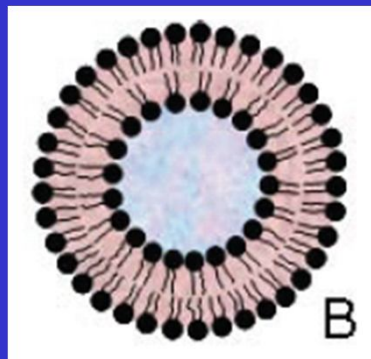
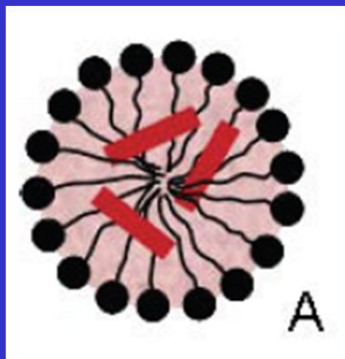
**Innovation in Ingredients
is the need of the hour!?**

Nanoscience and Ingredients !

Nanoparticles are attractive delivery systems for nutrients.

Some of the nanoparticle delivery systems are :

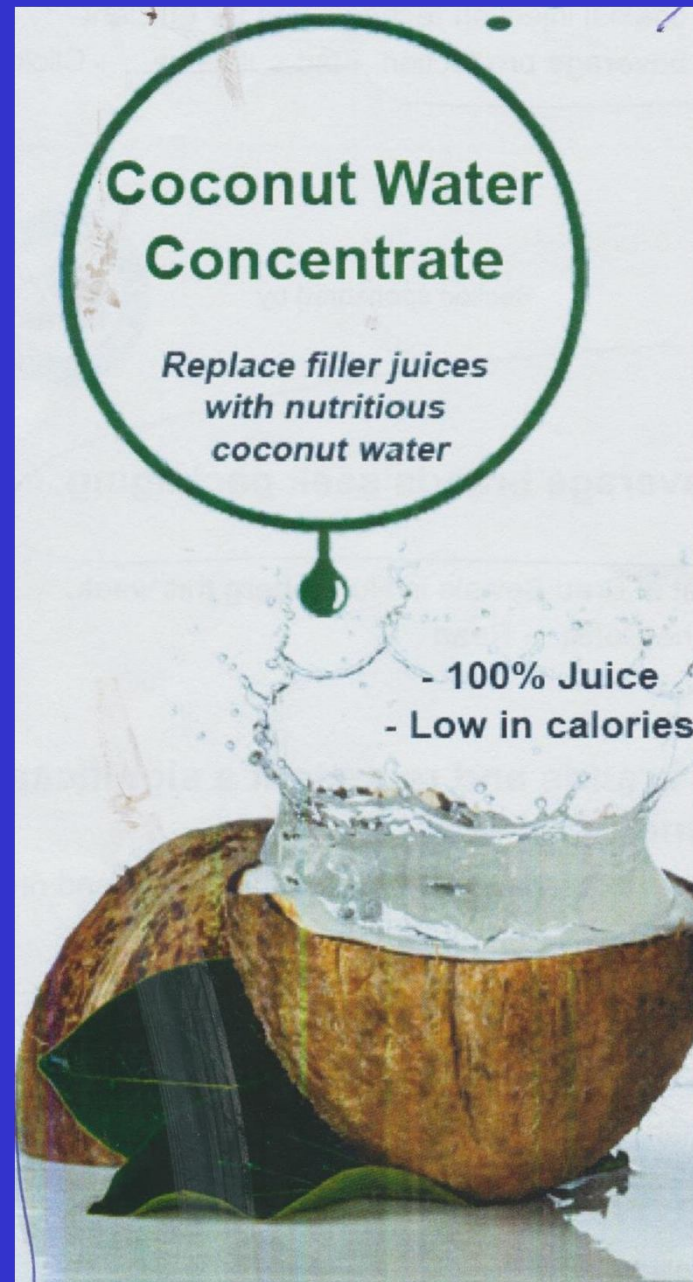
- A. Microemulsion
- B. Liposome
- C. Nanoemulsion



Functional Beverages claim goodness from pediatrics to geriatrics but sometimes goes overboard in Advertisement!?



Natural ingredients in Functional Beverages



Some latest in beverage Processing.....



Combines radial jet and coaxial injection for efficient addition and mixing of Powders and concentrates in functional beverages production



Cottle Can, as beverage brands seek packaging differentiation of Functional Foods stability

Food Safety

- **Ingredients**
- **Functional Foods**
- **Functional Beverages**
- **RDA**
- **Nutrients and Nutraceuticals that go with FF and FB**

Safe Ingredients is the key for Designer and Functional Foods

WHAT ARE SAFE INGREDIENTS?

The Food Safety system must have *FOUR KEY* attributes to achieve its objectives :

- 1. Prevention**
- 2. Accountability**
- 3. Integration in the Chain**
- 4. Risk Assessment**

The Ingredients Chain passes these challenges many a times we fail to recognise as we take it for granted!

*Build R&D
continuously
to be on the
Cutting Edge of
Technology for
Food Safety*

The Safety Chain of Ingredients

- Raw materials and INGREDIENTS
- Packaging
- Process activities
- Temperature and time profile
- Equipment design
- Redesign dynamically
- Storage conditions
- Distribution
- Waste handling
- of course HRM

**How can Food Safety barriers
to trade be mitigated so that
gains from food trade can be
better realized still ensuring
Safe Food for consumer ?**

- **RISK Assessment (very complex)
for *Ingredients***

**Industry must be more proactive in this area
than ever before.**

**Risk Assessment has to be a thorough job
too.**

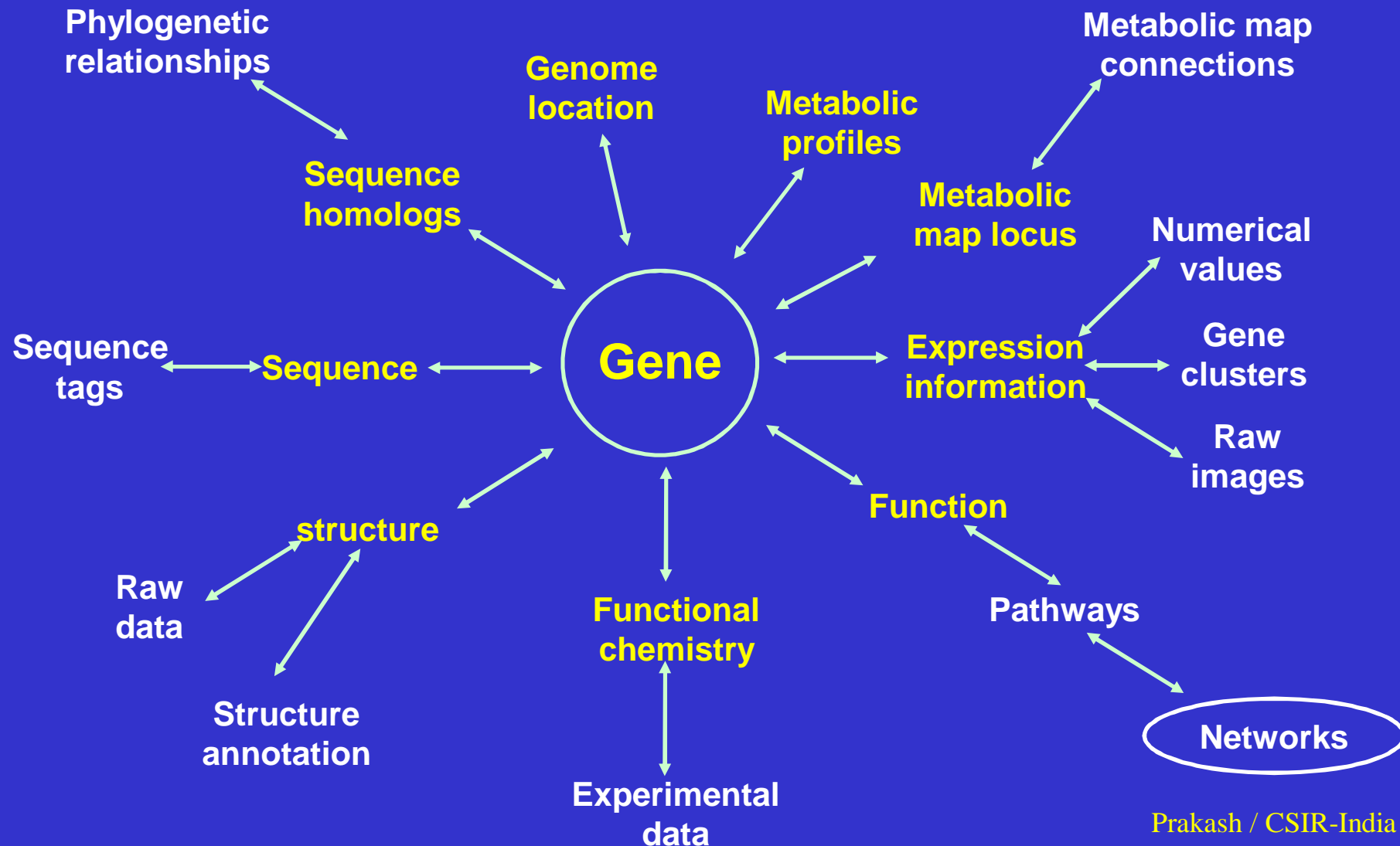
To deliver Safe Ingredients with

- Zero contamination of Pesticides,
- Zero contamination of Heavy metals
- Absence of toxins and no pathogens
- The quality of water used in ingredients making is also important and is the Real Challenge

■

**It is time for a revolutionary
approach in nutrition to
understand how foods
interact at *cellular level*
among individual genotypes
and how Ingredients interact?.**

Information (annotation) associated with a single gene.
The marvel of Chemistry in the physiology!
The depth of which is still unexplored in Ingredients



DECONSTRUCTING MOLECULAR GASTRONOMY

Part food science and part culinary art, molecular gastronomy and its offshoots are revolutionizing food preparation, presentation, and eating and sensory experiences.

Functional Pre and Pro Biotics has a major role in changing the fingerprint of *Gastrobio*

Combinatorial Food Science

Combining science and food is not new. For decades, the food industry has used food science and technology to decrease food borne disease, process and preserve perishable items, and provide wholesome food. But now that food safety and food preservation have become fairly routine - and resulted in mass-produced items that rarely titillate all the senses - a comparatively new application of science to food has emerged : ***Molecular Cooking!***

- Personalized **diet** is already emerging based on an individual's **Genetic code**.
- This **diet** can then **lessen the risk** of certain **diseases** which that individual may be susceptible including CVD and Diabetes.
- Studies focusing on the health benefits of ingredients may help pave the way for this new approach of **Nutrigenomics through Functional Foods**.

**In an interdependent
world, knowledge
sharing and
knowledge costing is
unavoidable.**



Quality Ageing healthy ageing

Making 60 the new 40

GENOTYPE

aberration

genetic aberration

Single gene
polymorphisms

Multi-gene
Polymorphic interactions

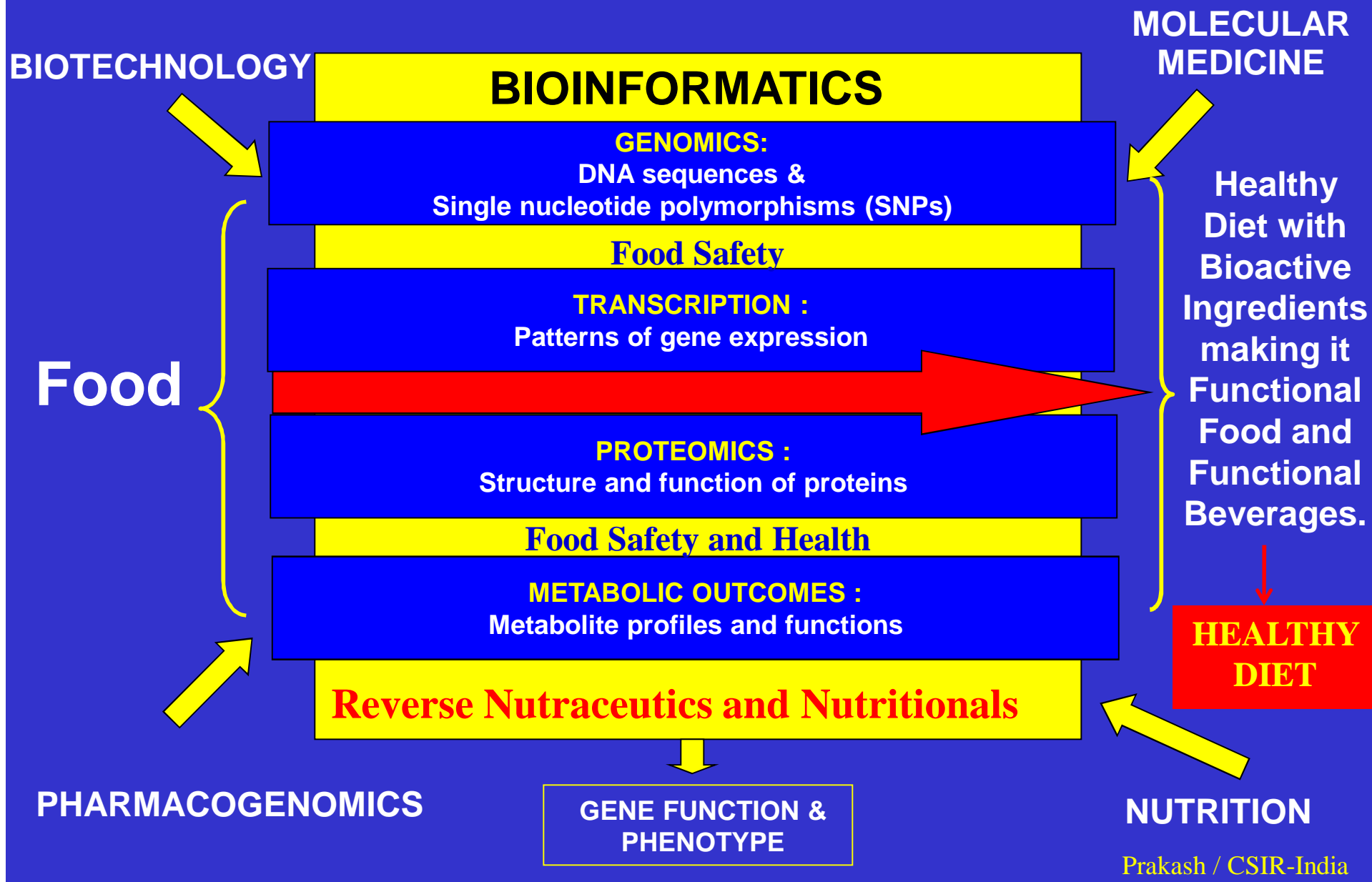
Functional
foods

PHENOTYPE

Specialty
Diet

**“Nurture your Genes Naturally and Help it Function Better
with Nutraceuticals and Ayurnutraceuticals”**

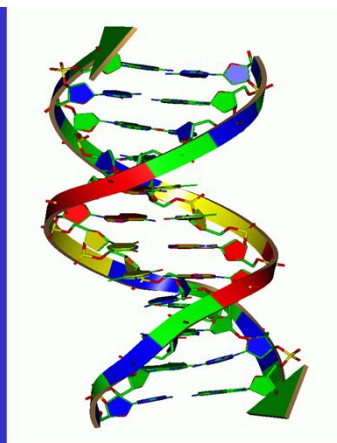
**COMPLEXITIES OF SCIENTIFIC DISCIPLINES INTERACTING AND INTERFACING WITH
MODERN MANAGEMENT TECHNIQUES FOR TOMORROWS MULTIDISCIPLINARY
APPROACH TO HEALTH & WELLNESS THROUGH BIOACTIVE INGREDIENTS**





Spring in the air. A male house sparrow flies up to a bird box with an insect in its beak to feed its nestlings in Bloomsburg, Pennsylvania. At this time of year sparrows compete with eastern bluebirds, house wrens, tree swallows and other cavity-nesting birds for the nesting boxes erected next to the Columbia County offices. Photo: AP

VIEW
POINT



ILSI

International Life
Sciences Institute



“...it is important to remember that Culture, Science and Habits with adequate Physical & Mental exercise by Humans co-exist and have a role in improving the Quality of Life and by Global Networking. This can be achieved by way of Health and Wellness knowledge through the power of Herbals , Informatics and Awareness for a Healthy body especially through knowledge sharing of Chemistry and Technology for fighting Hunger, Malnutrition and Diseases through Functional Foods and Beverages.”

-V Prakash, Distinguished Scientist of CSIR-India

“If the agenda of Sustainable Health through Diet, lifestyle changes and Gene Nurturing matters to us, we shall matter More to it through Safe Functional Foods and Functional Beverages in our daily multi component Foods ”-V Prakash



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