Report from the seminar on
FERMENTED FOODS, HEALTH STATUS AND SOCIAL WELL-BEING
held on 13-14 Nov 2003 at Anand, Gujarat State, India

By

Lata Ramachandran[1], Vinod Huria[2], Prapulla SG[2], Sagarika Ekanayake[3], Rekha Singhal[4] , Madhurima Dixit[5] and Prapapati JB[1]

[1]SMC Dairy Sciense college, Gujarat agricultural university, Anand, India. [2]Central Food technological Research Intitute, Mysore, India. [3]Faculty of Medicine, University of Jayawardenepura Colombo, SriLanka [4]University of Bombay Department of Chemical Technology, Mumbai, India. [5]University of Pune, Ganeshkhind, Pune, India

OPENING SESSION

The first International Seminar and Workshop on Fermented foods, Public Health and Social Well-Being was inaugurated in a traditional manner by the lighting of the lamp on November 13, 2003 by Padma Vibhushan Dr V Kurien, Chairman of the institute of Rural management, Anand India. In his inaugural speech, Dr Kurien highlighted the significance of fermented foods in Indian diet and its nutritional significance. Further he was glad to note that the International Seminar & Workshop titled "Fermented Foods, Health Status and Social Well-Being" was being organized at Anand, the Milk Capital of India and he continued "I am thankful to the SMC College of Dairy Science, Anand and Lund University, Sweden, the organizers of this Seminar and Workshop for inviting me to inaugurate this event. Fermentation has been one of the oldest and simplest processes

known for preservation of foods. Amongst the various Fermented Foods, Milk based fermented foods constitute the largest group of food products consumed by a great majority of our population. Since time immemorial, fermented or I would like to call them "Cultured Dairy Products" are a part of our Indian Diets. Our great "Rushis" used to consume Dahi and " Chaas" (Butter Milk) besides Milk and Cereals as the Era of vegetarianism began. It was and still believed that Dahi and Chaas helps digestion of foods in the stomach. The legend tells that yoghurt and kefir were born on the slopes of Mount Elbrus in the Caucasus range more or less by a miracle of Nature. The Eminent Russian bacteriologist and Nobel Prize Winner, Dr. Metchnikoff, was the first person who identified the bacteria which were present in yoghurt and attributed the longevity and stamina of the people of the Balkan countries to this marvellous food. Some of our dairies in the past tried to market Dahi in the returnable glass bottles and in containers in an industrial scale. " Shrikhand" is an indigenous fermented product and popular in the Western Part of the country. About 3000 MT per annum of this product is being

bulk containers. Gujarat Co-operative Milk Marketing Federation Ltd., (GCMMF) having India's largest cold chain was the first to manufacture and market Dahi (Masti Dahi) packed in plastic manufactured and marketed per annum by our dairies. The consumption of cheese, one of the most valuable and popular fermented dairy products, is increasing through-out the world due to its taste, better digestibility, nutritional value and functional properties. Idly, Dosa, Khaman and Dhokla which are some of the fermented foods prepared from Cereals and Legumes are widely consumed in India, have found there way to other countries in the world and becoming popular at the faster rate. Several tuber crops in Africa and other countries are traditionally fermented to get nutritious and safe foods. Fresh fruits and vegetables are difficult to store. Indians are pioneers in the art of pickling vegetables and fruits by fermentation, where fermentation preserves and improves the sensory qualities of the fruits/vegetables for an entire year.. Fermented fish products like fish sauces, fish paste or salted fish have been consumed since ancient times in the Southeast Asian countries like Thailand, Kampuchea, Malaysia, Philippines and Indonesia. Fermented meat products seem to have originated in Mediterranean region,

where, Romans added salt, sugar and spices into ground meat and ripened for varying periods of time to get a palatable product with a longer shelf-life.

At the moment, many cultured dairy products containing probiotics and prebiotics are marketed as functional foods. Probiotics are living bacteria that survive the travel to the large intestine where they live and help improve the intestinal micro flora, while Prebiotics are food ingredients that the body doesn't digest but selectively stimulates the growth and activity of good bacteria already living in the large intestine. These products are still in their infancy, since they were only introduced in the late 1990s. Research and development work is required as there is a large untapped market for these products. I am glad to note that Scientists and Technologists are here to exchange the information and knowledge about Fermented Foods, its Technology, Microbiological aspects and Nutritional as well as Therapeutic values. I wish this Seminar great success and declare it inaugurated. Thank you"

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In his presidential address Dr R P S Ahlawat, Vice Chancellor of Gujarat Agricultural University gave facts and figures about Indian food industry. And went on to state that while people have used the Lactobacillus bacteria and fermentation technologies for thousands of years, how and why it works was unknown. Research has shown that adding "friendly" bacteria to your diet will improve the health of your gut microflora, and may help protect both the lining of your intestinal tract and your immune system. By 1997, the use of probiotics was becoming well established in Europe, with fermented dairy products accounting for 65 percent of the European "functional food" market.

The potential health benefits of these products are numerous and include: promotion of intestinal health, reduction of cholesterol levels, lowering of blood pressure, Improving immune response, Protection against cardiovascular problems and certain cancers etc. A majority of functional foods are dairy products (milk and yoghurt), however they can also be breads, cereals, fruit juices, non-alcoholic beverages or 'fast foods'. Examples of functional foods include, Milks enriched with calcium and iron, Cereals containing additional Folate, Eggs containing Omega-3 oils. Yoghurts containing AB cultures,

Breads containing extra fibre, DHA phytoestrogens and Margarine containing plant sterols. The two most common bacteria added in the production of probiotic foods are Lactobacilli and Bifidobacteria.

Currently, there are no established recommended consumption levels of pre- and probiotics for beneficial effects. Pre- and probiotics are exciting areas of food and nutrition research, however, more studies are needed to substantiate some of the links between these nutrients and health. The determination of specific strains of beneficial bacteria may help address various gastrointestinal diseases including Crohn's disease and ulcerative colitis, irritable bowel syndrome, and infections in the stomach and small intestine. Research on this area may also suggest ways to improve tube feedings and infant formula as well as the nutritional status of the elderly.

We have several indigenous fermented foods like idly, dhokla, dosa, vadai, dahi, shrikhand and lassi to name a few with excellent nutritional value. We have also developed new products based on cereal, legume and fruit along with L. acidophilus and bifidobacteria products here at at Gujarat Agricultural university. There is a need to develop more fermented foods with good nutritional as well as therapeutic properties and also reasonably good shelf life. I am happy that the leading scientists from different parts of the world have gathered here for workshop on fermented foods, health status and social well being and wish the workshop all the success.

In his welcome address Dr Baboo M Nair, Professor of Applied Nutrition, Lund University, Sweden who was also the coordinator of the seminar and workshop presented data on population growth, rate of urbanisation and the conditions of food production and supply to stress the importance of research and higher education in food science and nutrition as an important step towards development of novel functional food products of added value to increase the income of the people who live on agriculture. He said that the population of the world is increasing and it will soon become about 8 billion in 25 years. Further he pointed out that the population is being urbanised at an alarming rate and soon in a limited number of years some 30 cities of the world will have a population of

more than 10 million inhabitants and most of these cities will be in the so called developing countries. As such it will be a matter of great concern for the governments of the world to know how to organise safe and secure food supply at a reasonable price to all the people. Previous experience shows that this cannot be achieved without causing serious environmental problems like depletion of energy, water and other natural resources pollution of environment with pesticides, acidic rain, nitrogen leaching and green house effect, to mention a few.

"Even though the world food production by way of cereals, pulses and legumes, root crops, meat, milk products and fish during the last 20 –25 years has been considerably increased almost to the double. However, an estimated number of about 840 million people, out of which800 million are living in south Asia and sub-Saharan Africa are considered to be suffering from what is defined as hidden hunger. Protein energy malnutrition, iodine deficiency disorder, vitamin-A deficiency and iron deficiency anaemia are common among the very low income people of the south Asian countries who live on an income which is less than one dollar a day".

"The other side of the coin is the state of affairs among the higher income people of the affluent societies, where the occurrence of chronic diseases like obesity, diabetes, cardiovascular diseases, osteoporosis and cancer show an increasing frequency year by year. This situation has been found to be strongly related to higher income, better health care, safe living conditions and low amount of physical activity in combination with unbalanced intake of nutrients, intake of excessive fat and carbohydrate, intake of wrong kind of fat as well as low intake of dietary fibre".

"More painful to note is that the number of people who live on an income which is less than one dollar a day in south Asian countries of Pakistan, India and Bangladesh put together have increased by 40% during the last ten years to a total of 530 million. Further, most of these poor people live on agriculture based economy forming about 60-70 % of the total labour force of the countries while their share of the GNP remains only 25 –30

%, mainly because, they continue to be the suppliers of raw materials with very low added value".

"It is in this background, we are meeting here at Anand today to discuss the use of fermented foods and its relation to public health and social well-being. You will agree that Research and higher education in general and in particular research and higher education the field of food science and nutrition in relation to public health and social well-being is an extremely important area of profitable investment. Not only because it will help to increase the income and purchasing power of the people living on agriculture by producing and marketing value added products with increased input of technical know-how but also because it will help to promote improved public health, social welfare and higher quality of life."

"A number of independent as well as interconnected problems can be identified as highly relevant subjects of research and higher education. How ever, our aim to day here in Anand is to make a review of the knowledge available for us in the field of fermentation especially in the countries of south Asia"

"Fermentation is a unique process with great potential would choose fermentation as a method of food preservation because; it easily satisfies in a positive way a large number of criteria which can be applied to a feasible method of food processing. It is an environment friendly process, consume less energy, produce less waste and easy to manage under house hold conditions as well as in industrial scale. It is a typical example of bio-diversity put into efficient use, could be applied to a wide verity of raw materials to produce a variety of different finished food products. It has the advantage of being generally regarded as safe(GRAS) and at the same time offer immense opportunity for production of products which can be classified as "organic foods", "natural foods", "health foods", "convenience foods"," ethnic foods" "neutraceuticals" "functional foods" and not to forget "food for clinical nutrition". Fermented foods are manufactured and consumed in practically every parts of the world. Cereals, pulses, root crops, vegetables, fruits, meat and fish are preserved by one or other method of fermentation in

some part of the world. The knowledge of making traditional fermented foods has been recognised to be of immense value to the future generations by FAO, WHO and a number of other related agencies. Many of you will definitely know that Dr. Metchnikoff who was awarded one of the earliest Nobel prizes was also famous for his observations on the effect of fermented foods on the health status and well-being of human beings. That was some time in the year 1908. Now in 2003 after all these years, the positive effects of fermented foods with prebiotic substances and, probiotic organisms in synbiotic foods is a matter of great attention among the researchers, medical practitioners, food companies, and marketing agencies, because the demand for such products is enormous and growing fast day by day".

"Research and development is a considerably expensive item in the economy of a food company. However research and development could be effective and less expensive when it is carried out efficiently as collaborative network projects where various universities industries, institutions, faculties and researchers work together to wards a common goal. Development of modern food products also requires input from many different specialised areas of science and technology. Each step, starting from cultivation, harvesting, quality of the raw materials, processing, storage, nutritive value and safety before consumption, immediate effects on wellbeing and long term effects on health is too complex to be understood well by a single scientist. Moreover, a number of specialists can work together more efficiently and create lot knowledge about a product or process in a short period of time. That is the logical reason why Swedish Network for South Asian Studies has selected our proposal for financial support. Some relevant problems of high priority I hope that the group work will definitely produce some viable, research proposals for which international support can be obtained. With these words, I want to extend a happy welcome to you to this meeting and wish that you will take full advantage of the seminar and workshop in the coming two days. Thank you"

The session ended with a vote of thanks by Dr J B Prajapati, Organizing Secretary of the programme.

During this function, Dr Kurien also released the Souvenir containing abstracts of papers and a book entitled "Basics of Mozzarella Cheese making" authored by Dr K G Upadhyay.

The programme was jointly organized by Swedish South Asian Studies Network (SASNET), Lund University Sweden and SMC College of Dairy Science, GAU, Anand. In all 164 delegates participated in the programme, representing different parts of India and also Sweden, Denmark, Sri Lanka, Bangladesh, Nepal, USA and Australia.

The seminar had six technical sessions in which 25 papers were presented. Highlights of papers are given in Annexure-I

In two days, total 36 research papers were presented in two poster sessions (for highlights, see Annexure – II).

The first day culminated with a multi-group cultural programme, giving glimpse of the rich cultural heritage of India, presented by about 60 artists.

The second day began with the fifth and sixth technical sessions as parallel sessions, which was followed by a short session to brief about the intentions of group discussion. Dr. Prajapati and Dr Nair explained the objectives of group discussion to the delegates and then distributed them into four groups to facilitate group discussion. The outcome of the group work in each group was presented by a representative of each group in the Group Discussion Session II, which was a joint session. The salient points which emerged in the group work are given in Annexure III

The Joint Group Discussion Session-II was chaired by Dr Baboo Nair. The participants voted unanimously in support of the following proposals put forward by the Chairman of the concluding session.

- Establishment of Network on Fermented foods

- Making the present organizing committee as interim committee for development of proposals for an interim period of two years.
- Entrusting Dr. JB Prajapati as the coordinator of this network during this period

  and
- Dr.Prajapati accepted the proposal.

The concluding session was presided over by Dr S. S. Sannabhadti, Principal and Dean, SMC college of Dairy Science, Anand., when the Chairmen/Raporteurs of all six sessions presented a summary of the presentations. Dr. Sannabhadti gave the presidential address and extended his fullest cooperation in development of network on fermented foods. Best poster awards were distributed during this session and the programme ended with a proposal of vote of thanks by Dr. J B Prajapati.

Interested delegates were taken for a visit to Amul Dairy, Vidya dairy, a village cooperative milk producers' society and to Sardar Patel Memorial where the last conference dinner was serverd.

ANNEXTURE- I

The high lights of the papers selected for presentation under each technical session are summarised below

TECHNICAL SESSION I

STATE OF THE ART IN FERMENTED FOODS OF SOUTH ASIA

Chairman: Baboo M Nair
Rapporteur: Vinod K Huria

In this session five papers were presented focusing on functional and fermented foods of Sweden, India, Srilanka, Maldives, Nepal and Bangladesh.

Development of Novel Functional Food from Oats

Rickard Oste, Lund University, Sweden.

Oats were traditionally used as grains for feed, but the development of 'oat milk' gave a new raw material for beverage as well as for the manufacture of products such as ice cream, flavoured drinks, pan-cake mix, etc. The paper presented the process for the manufacture of oat milk, while emphasizing that the technology could be customized for viscosity, sweetness, and specific traits like fiber composition. Clinical studies of oat milk consumption in Sweden indicated that oat milk retained cholesterol-lowering properties even when the insoluble fiber was separated, in the process of milk manufacture, thus establishing that oat was a wonderful resource for functional foods. He concluded saying "the non-dairy oat milk technology produce well tasting, healthy alternatives to dairy products that may be consumed as milk substitutes or as functional foods with clinically proven health effects".

Fermented Foods of India

J B Prajapati, SMC College of Dairy Science, GAU, Anand, India.

The paper gives an overview of traditional fermented foods from milk and foodgrains. Amongst the milk-based foods, dahi was the raw material for the manufacture of lassi (sweet and salty), chhash (buttermilk), chakka and shrikhand. The process flow diagram for the manufacture of these products as well as the cultures used were presented. The

foodgrain-based products discussed were, idli, dosa, khamman, dhokla, nan, kulcha bhatura, jalebi, bhalla, wada and warries and they are popular in different parts of India. The second part of the paper deals with the development of probiotic products such as acidophilus lassi, banana powder, malt powder and combinations of milk, banana, tomato, sugar and cereal blended powders. The formulations, process technology and advantages of these spray dried probiotic powders were discussed and the paper concluded by highlighting the need for evolving suitable probiotic microorganisms and technology for their commercial applications.

Fermented Foods of Sri Lanka and Maldives
E Sagarika, Sri Jayewardenepura University, Srilanka.

Fermented foods have been a part of the culture of Sri Lanka and foods such as hoppers, thosai, idli, wadai, curd, toddy, jaddi (cured fish), dry fish, lime pickles etc. have traditionally been consumed. All fermented fishery products in Sri Lanka are salt-based, of this, 75% are Maldives fish. This are widely used as a flavouring agent in most local products. New products such as yogurt, arrack, vinegar, pepporoni, tempeh, have been developed and are now available in the market. Yogurt and curds are normally consumed as after-meals desserts and are produced by lactic acid fermentation. The paper brought to light that although a large number of fermented milks were consumed, scientific understanding and awareness about health benefits were lacking amongst the people. Research on fermented foods needed to be taken up, leading to the development of process technology for the commercial manufacture of fermented products.

Fermented Foods of Nepal and Bhutan,
Jagat Bahadur KC, Tribhuvan University, Kathmandu, Nepal.

The fermented foods traditionally popular in Nepal and Bhutan are kinema (fermented soya bean), gundruk, sinki, tama (sweetened bamboo shoot), dahi, mohi (buttermilk), shee, shergun (soft cheese from buttermilk), chhurpi, selroti (deep fried preparation from rice flour), jhand (local beer from rice or maize), rakshi (alcohol distilled from fermented rice, maize, millet), tumba (fermented millet drink) and a variety of acidic pickles. The process for the production of cheese from yak milk was also presented. The paper

highlighted the fact that not much research and development on production, processing, storage, and quality aspects of many native fermented foods of Nepal were carried out. He stated "some of the popular traditional fermented foods are gradually diminishing due to increased rate of urbanization and indigenous technology not being transferred to the new generations or due to lack of interest on the part of younger generations…. it is a challenge to the food scientists not to miss such an important history as well as to help the ethnic community or region to improve the quality and quantity so that larger segment of consumers could be benefited…"

Fermented Foods of Bangladesh
Golam Mowlah, University of Dhaka, Bangladesh.

The paper briefly presented the major fermented foods of Bangladesh and their manufacturing practices and discussed the health and nutritional benefits from these foods. The major traditionally consumed foods discussed were pickles, vinegar, bread, black tea, jhalpitha and kanji. Dahi, yogurt, acidophilus milk, cultured butter and cheeses were amongst the milk based fermented foods consumed in Bangladesh. As was the case in other neighbouring countries of Asia, R&D for process development and mechanization of manufacturing processes was lacking in Bangladesh. The paper focused on the need for such research and stressed on collaboration with institutions in the neighbouring countries.

TECHNICAL SESSION II
HEALTH, NUTRITION AND CLINICAL ASPECTS OF THE FERMENTED FOODS

Chairman: Dave JM
Rapporteur: Prapulla SG

Health Benefits and Safety Aspects of Fermented Products
Nagendra Shah, School of Molecular Sciences, Victoria University, Australia

This review paper presented the state of the art on the health benefits and safety aspects of probiotic cultures. Lactobacilli and Bifidobacteria are the most potent candidate

organisms as probiotics. It is estimated that 3400 tonnes of LAB cells are used per year in Europe only. The world consumes nearly 20 million tones of fermented milks annually. Probiotics have established role in restoration of normal balance of flora in intestine, suppression of pathogens and helping lactose digestion.

The hypocholesterolemic, anti-cancer, immunostimulating, anti-mutagenic and other activities are highly encouraging but are strain dependent. The safety concerns of probiotic cultures are not worrying as the cases of translocation or transfer of antibiotic resistance are negligible. He indicated that S. thermophilus and B. lactis Bb-12 have been tested in children and FDA has approved GRAS petition for baby formula containing these two bacteria.

Fermented Milk in Control of Diarrhoea and in Immune Mechanisms and Malnutrition

Agarwal KN, Health Care and Research Association for Adolescents, Noida, India.

In this paper the result of feeding Dahi and Actimel on immune status of 32 malnourished children of 1-4 years of age was presented. The nutritional parameters like anthropometry, haemoglobulin and serum ferritin while immunological parameters viz., C-Reactive Proteins, Cytokines, and T Cell Subpopulations were measured. Overall, the feeding of dahi helped in combating malnutrition and had improved immunological status.

Studies on implantation ability of probiotic culture of Lactobacillus acidophilus in gastrointestinal tract of tribal children

Khedkar C D, Dairy Technology College, Pusad, India

Community feeding of probiotic fermented milk was carried out on 135 tribal children of Maharashtra. The effect of probiotic was assessed by physical check-up and intestinal microflora analysis of the children during 3 month long feeding and 3 months post-

feeding period.The trial was a randomized, placebo-controlled, double-blind design. Children were randomly allocated into three groups. One hundred and thirty five tribal kids (TK) of three age groups (viz. two-three, three-four and four-five years) were randomly selected. Volunteers from each of the age groups were in three equal sub-groups comprising of fifteen kids. A control group received dahi (0.60% LA) containing 10 7 cfu of mixed lactic bacterial culture/g @100 g/day/volunteer, blank control group received 100 g buffalo milk/day/volunteer and the test group volunteers received 100 g freshly prepared Probiotic Acidophilus Milk (PAM) with 0.60% LA and containing 10 7 cfu/g of a human origin isolate of L. acidophilus. It was observed that the feeding of PAM resulted many fold increases in Bifidobacteria (the rangewas 0.4 to 2.6 log counts), Propionibacteria (0.2 to 1), Lactobacilli (o.4 to 2) and Lactococci (0.6 to 1.7) counts and a very sharp decline in the harmful type organisms in the faecal matter after fifteen days of commencing feeding trial in all the three age group test volunteers. The trend was continued further to lead almost negligible counts of coliforms and other putrefactive groups and huge increases in the friendly organisms in the test group receiving PAM as against the control and blank control groups.

Probiotics in Fermented Milk

Anne Skriver and Maike Lisberg, Chr- Hansen AS, Denmark.

Some probiotic bacteria belonging to the groups of Lactobacilli and Bifidobacteria developed by Chr. Hansen have been highlighted. The parameters considered while developing Probiotic strains were discussed. These cultures survive food manufacturing conditions and have clinically proven health benefits. The paper also gave examples of some of the probiotic foods in market , which employ these microorganisms The interest in probiotic bacteria and their application in food products has been increasing throughout the last couple of decades. With the present functional food era, probiotic products are more popular than ever. The word “probiotic” is a translation from Greek, which means “for life”. A more modern definition for probiotics is “living organisms that

upon ingestion in certain numbers exert health benefits beyond basic nutrition" (Guarner & Schaafsma, 1998). Sufficient numbers are considered to be 10 8 cfu (colony forming units) per day (Kurmann & Rasic, 1991) and a daily dose of 100g of fermented milk containing 10 6 cfu/g will supply this amount. Probiotic products are available in a variety of forms, including conventional dairy products such as yoghurt and fermented milk and food supplements and dietary supplements in the form of tablets or capsules. The available range of products continue to expand. Probiotic bacteria belong to the group of Lactic Acid Bacteria (LAB). Bifidobacterium and Lactobacillus species are the most common species applied to probiotic or functional food products. Examples of probiotic Lactobacillus strains are L. rhamnosus, L. paracasei, L. reuteri, L. helveticus, L. plantarum, L. johnsonii, L. crispatus and L. salivarius. The most common Bifidobacterium species used in probiotic food are B. infantis, B. animalis (former B. lactis), B. longum, B. bifidum and B. breve

TECHNICAL SESSION III
TECHNOLOGICAL ASPECTS OF FERMENTED FOODS

Chairman: Rickard Oste
Repporteur: Rajiv K. Shah

Enzymatic conversion of oat suspension for manufacture of fermented and non-fermented cereal foods

Angie Oste, Ceba AB, Lund, Sweden.

The paper started with introduction on cereal chemistry followed by outline for manufacturing of oat-based products/milk. The use of enzymes and lactic acid bacteria for fermentation was elucidated. Depending on the specific applications, the process, enzyme treatment as well as the cultures can be manipulated. β-glucan characteristics of oat and that produced by lactic acid bacteria especially Pediococci was discussed. Microbial production of β-glucan in small concentration is also very significant for their end use. The feeding of oat milk to moderately hypercholesterolemic human subjects indicated significant lowering of blood lipid levels. Attempts can be made on incorporation of oats in other local dairy/ traditional products.

Fermented meat products - Scope for research and development in India
Mir Salauddin, Sher-e-Kashmir University, Srinagar, India.

The manufacturing steps and ingredients used for fermented sausages was high lighted with role of lactic acid bacteria as starter cultures in manufacturing and ripening. Different types of meat, poultry can be used for the preparation and even soya @ 10% may be incorporated in the products. LAB utilizes nitrates and hence reduces its content during fermentation. Fermented meat sausages are lesser developed products in India but needs more attention for popularization in states other than Goa, where they are widely used. The sausages will not only add value but has extended shelf life required for storage under ambient room temperature.

Fermented milk cultures- Development and applications
Anne Skriver, Chr- Hansen AS, Denmark.

The detailed procedure for selection and use of cultures specific to the fermented products was elucidated. Cultures can be selected not only for different applications but also based on the preferences of different age groups. Characterization of culture for several traits and DNA finger printing can be done for cataloguing them. The culture characteristics viz. rate of acidification, end acidity, flavour, viscosity, phage resistance can be selected as per the product need. This can be achieved even by selection of proper blends of different strains. EPS producing cultures can be used to reduce amount of fat in cultured dairy products. The applications and key benefits of DVS cultures developed by Chr. Hansen as also presented.

TECHNICAL SESSION IV
MICROBIOLOGICAL ASPECTS OF FERMENTED FOODS
Chairman: SS Sannabhadti
Repporteur: Rekha Singhal

Cured and Fermented Fishery Products of Sri Lanka
Pradeepa Jayasinghe, NARRDA, Sri Lanka.

The fisheries sector contributes to 2.5% of the national economics of Sri Lanka and provides food and employment to thousands of rural people. The paper discusses the preparation procedures of locally popular products like jaadi, salted fish, smoked fish, Maldive fish, dried salted fish, pickled fish and ambuthiyal. The microbiological, chemical and sensory changes that occur during fermentation of these products were also discussed. She stressed on the need to develop strategies including packaging technology and process standardization that can benefit the fish industry by making these products universally available.

One-Step Purification of a Broad Spectrum Lactococcin BM48PN using Whey as the Growth Medium

Shruti Samant, Bhavan's College, Mumbai, India.

Bacteriocins from lactic acid bacteria are becoming popular as natural food preservatives. The method for cultivation of bacteriocin producing Lactococcus lactis in paneer whey and partial purification of bactericoin by methanol-acetate extraction have been described. The bacteriocin BM48PN has broad spectrum activity and is heat stable. This method provides useful means of economically utilizing the by-product of the dairy industry and could help the industry solve the problem of whey disposal.

Angiotensin-I – converting enzyme inhibitory peptide obtained from dahi

Manisha Ashar, National Dairy Research Institute, Karnal, India.

This presentation suggested a possibility of developing dahi having antihypertensive property. A strain of Lactobacillus delbrueckii ssp bulgaricus was selected from among the 22 cultures screened for ACE-inhibition in vitro. The culture was grown in milk and ACE-inhibitory peptides were then isolated and purified by routine methods. The purified active fraction contained SKVYP sequence corresponding to beta-casein fragment 57-66. The characteristics of the peptides were studied with respect to pH and acid tolerance and resistance to trypsin and chymotrypsin as it has to cross the biological barriers in stomach and intestine during consumption. The in vivo ACE-inhibitory effect of dahi containing SKVYP was tested on rats which showed significant reduction in ACE

activity. The application of this peptide to reduce blood pressure in human subjects is being done at the author's laboratory.

Preparation and quality evaluation of Gundruk

Udas Sanju, Central Campus of Technology, Dharan, Nepal.

Gundruk is one of the most common and highly preferred fermented dry vegetable indigenous to Nepal. It is traditionally made by allowing to ferment the leaves of mustard, rayo, cauliflower and radish in earthern wares or pit for 7-9 days and then sun drying. Technology for gundruk production was standardized in the laboratory with addition of shredded cabbage. Cabbage supplied the lactic acid bacteria as fermenting agents, increased the acidity in 7 days and gave organoleptically superior products. The solar drying was practiced to maintain hygienic conditions and retaining better sensory scores. The standardized product needs to be commercially exploited.

TECHNICAL SESSION V
MICROBIOLOGICAL ASPECTS OF FERMENTED FOODS

Chairman: P A Shankar
Repporteur: S. Ekanayake

Fermented Foods- their microflora, spoilage and shelf life

Rekha Singhal, UDCT, Mumbai

A detailed presentation on micro flora, spoilage and self-life of common fermented South Asian foods and how some improvements can be done for production of healthy foods were indicated. Bio-preservation of fermented foods by lowering the pH and bio-enrichment (increase in amino acid content, vitamin and biological value of proteins, were presented. Destruction of anti-nutritional factors like afalatoxins and hemaglutinnins by microorganisms and their possible use as potent inactivators of such compounds was pointed. Health benefits reported with fermented foods were discussed. The paper

specially reported the technological and shelf-life aspects of idalis, which is very popular rice-black gram based snack food and needs commercialization.

PCR based methodologies for identification and typing of lactic acid bacteria
Ramesh A, IIT, Gauhati, India.

PCR based methodologies have provided simple,and rapid tools for identifying lactic acid bacteria and investigating the diversity of mixed populations. Reliability of RAPD-typing for inter and intra specific differentiation of most Lactobacillus species were put forward. Multiplex RAPD has been used for differentiation of LAB isolated form the GI tract and identification of probiotic strains. Advantages of this method over other conventional methods were given.

Prebiotics and probiotics in functional foods
Prapulla SG, CFTRI, Mysore.

The paper dealth with historical and marketing aspects of functional foods in general. The global market of functional foods is estimated to atleast 33 billion USD. Specific role of functional foods in nutrition and health was discussed. The work done at CFTRI on prebiotics has been presented. Isolation of a fructosyl transferase from two fungi Aureobasidium pullulans and Aspergillus oryzae and their use in production of fructo-oligosaccharides (FOS) was reported. FOS are fiber like substances which feed the bifidobacteria in the intestines. Use of this enzyme as a prebiotic was discussed.

Role of Fermented foods in Health and Disease
Lakhani JD, PS Medical College, Karamsad, India.

"When drugs especially antibiotics are becoming costlier and ineffective, the scientists have to look for other weapon which are cheaper and devoid of problems related with the chemical and biochemical substances. Probiotics is the novel idea which is natural, cost effective and culturally more acceptable". He also mentioned about several fermented foods of India, which supply these probiotics. Results of a research experiment on

feeding of fermented milk for cholesterol reduction gave encouraging results. It was pointed out that fermented foods may not be revenue generating like pharmaceutical industry, but it can be one of the solutions we can offer to the community to remain healthy and advising certain food items in diseased conditions.

TECHNICAL SESSION VI : TECHNOLOGICAL ASPECTS OF FERMENTED FOODS

Chairman: Nagendra Shah
Repporteur: Madhurima Dixit

Fermented Foods in Indian Context : Benefits and Challenges

E R Vedamuthu, Consultant to Food and Dairy Industry, Oregon, USA.

The author identified the goals set before administrators, scientists and social workers in bringing the benefits of fermented foods to the doorstep of every Indian. He felt that the long term goal would involve research and development; the medium term goal would involve the development of an all-India database for all the known fermented foods while the immediate goal would involve the social workers in making fermented foods reach every household through the existing social programmes. He also recommended to involve NGO's and self-help groups to distribute LAB-rich dahi and include in mid-day meal schemes. They can also help in developing fermented vegetable pickles that would be acceptable to the Indian palate and marketing them. This can take care of huge losses of vegetables in the season. Another enterprise that would be of great help to the rural population is to convert a huge mass of agricultural waste to silage.

Technology of Handwa – a Popular Cereal Pulse Based Fermented Food of Western India

Mini Sheth, MS University of Baroda, Gujarat.

Handwa is a popular fermented and baked food of Western India prepared from cereal-pulse flour. The study involved survey of Handva consumption in Baroda city and then standardizing the technology for preparing and storage of handwa in the laboratory. To

make it more nutritional and appealing, attempts were also made to incorporate germinated powders of red and Bengal gram and also vegetables. The ready-to-bake mixes could also be effectively formaulated with dry mixing of baking soda in handwa mix containing citric acid as acidulant, spices and vegetables. These mixes could be stored for one year satisfactorily.

Opo-the rice beer
PK Nema, NERIST, Itanagar, Arunachal Pradesh.

The eastern regions of India have several fermented foods and drinks. It involves use of raw materials available in plenty in the season and simpler technologies to ferment them. Rice beer is one such product popular in the region. The paper deals with standardization of method for production of opo and development of the equipment for extraction. He emphasized on the need to popularize such traditional technology and preserve the old knowledge systems.

Probiotic in fermented milk foods: R & D perspectives and planning,
Vinod Huria, CFTRI, Mysore.

Health benefits of probiotic fermented foods were narrated. Before launching new probiotic foods in market it has to pass various stages. These include market opportunity recognition, idea generation, product conceptualization, prototype development, R & D, clearance of the product regulatory agencies, clinical trials, test marketing and launch. At the end he also discussed on criteria for market approval of the product.

ANNEXTURE - II

A list of papers submitted to be presented as posters are given below. The posters were related to many different areas fermentation viz., product development, technology, microbiology, nutrition, health and safety.

1. **Preparation of Antioxidant Rich Apple and Strawberry Wines**
   Joshi VK, Sibby John, Sharma Somesh, Kaushal B.B. Lal and Rana Neerja
2. **Effect of Refrigerated Storage on the Quality of Fermented Mutton Sausages**
   Salahuddin Mir and Sharma Nagendra
3. **Development of a Fermented Value-added Product of the Button Mushroom (Agaricus bisporus)**
   Rai RD, Arumuganathan T and Hemakar AK
4. **Studies on Preparation of Synbiotic Yoghurt-cheese from Buffalo Milk**
   Kandelwal P and Tyagi SM
5. **Preparation of Shrikhand with Different Fruit Pulp**
   Kadam RM, Patil UR and Bhambure CV
6. **Preparation of Strawberry Shrikhand**
   Sonawane VM, Bhosale DN, Patange DD and Kankhare DH
7. **Proximate Analysis of Branded Srikhand**
   Mehta Meena
8. **Microbiological, Sensory and Rheological Aspects of Shrikhand Sold in Maharastra State**
   Salunke Prafulla and Thakar PN
9. **Development of Low Calorie Yoghurt and Bio-yoghurt using Polyols and Intense Sweetener**
   Navaneetha R and Natarajan AM
10. **Development of Low-calorie Mishti Yoghurt and Bio-yoghurt using Natural Sweetener**
    Sivadha M, Minal A Rukhana and Natarajan AM
11. **Preparation of Fruit Flavoured Buttermilk**
    Kankhare DH, Joshi SV, Narwade SG and Patange DD
12. **Preparation of Guava Yoghurt from Cow Milk**
    Patil AP, Bhosale DN, Patange DD, Pawar BK and Narwade SG
13. **Effect of Processing on Pesticide Residues in Milk**
    Naik Varsha S and Yardi Veena
14. **Apong, the Rice Beer of Arunachal: Some Socio-cultural Aspects**
    Pant RM and Nema PK
15. **Natural Colours from Fermented Foods for Fermented Foods**
    Vijayalakshmi G, Vanajakshi V, Kumaresan N and Diwakar S
16. **Sensitivity of Yoghurt Starters to Veterinary Drugs and Effect on Yoghurt Quality**
    Chand Ram and Bhavadasan MK
17. **Acid Tolerance of Bifidobacterium Bifidum Strains**
    Christopher MD, Padmanabha Reddy V, Mrudula N and Venkateswarulu K

A committee consisting of two eminent personalities, Dr. J. M. Dave, Former Dean, Dairy Science College, GAU, Anand and Dr. P.A. Shankar, Director of Instructions (DS), Dairy Science College, Hebbal, Bangalore evaluated the posters presented during the seminar. Separate posters were displayed on 13 & 14 Nov. 2003. The committee went round the various displays; silently observed the explanation/description offered by the authors to various scientists; critically looked into the objectives of each poster; closely examined the various techniques adopted to depict the results, such as graphs, bar-diagrams, photographs; keenly evaluated the topical relevance of the research work carried out; progressively assessed the contribution of the posters to the knowledge bank in the area, extensively monitored the neatness and aesthetics of the posters, etc. The committee members separately awarded marks to each of the parameters for every poster and then the marks were averaged. Based on these marks, the following four posters were selected for award.

Poster Session- I

First Prize:

Effect of processing on pesticide residues in milk

Naik Varsha and Yardi Veena from Goa.

Second Prize:

Development of low calorie yoghurt and bio-yoghurt using polyols and intense sweetener by Navneetha R and Natarajan AM from KC Das & Sons, Bangalore.

Poster Session – II

First Prize:

Isolation and screening of the human strains of Lactobacilli for their antagonistic activity against selected human pathogens

Ambalam PS, Mehta FR and Vyas BRM from Saurastra University, Rajkot.

Second Prize:

Acid tolerance of Bifidobacterium bifidum strains

Christopher MD, Padmanabha Reddy V, Mrudula N and Venkateswarulu K from College of Veterinary Science, Tirupati.

A SUMMARY OF THE HIGHLIGHTS OF THE POSTER SESSION IS GIVEN BELOW

Effect of processing by fermentation on Pesticide residues in milk

Naik Varsha & Yardi Veena from Goa, India.

Problem of organo-chlorine pesticide residues in milk and milk products is of serious health concern. Fermentation has been explored as one of the methods to reduce these residues in milk. The levels of HCH and DDT were measured in 18 samples of cow and buffalo milk. When the samples were fermented by normal dahi culture, the residues level in the curd reduced by 41-67%. It is speculated that the decrease is due to bacterial degradation and needs to be further investigated.

Development of low calorie Yoghurt & Bio-yoghurt using polyols and intense sweetener

Navaneetha R & AM Natarajan, KC Das & Sons, Bangalore, India.

To expand the use of yoghurt to 'diabetic' and 'dietetic' class of consumers, low calorie yoghurts and bio-yoghurts were developed using skim milk as the base material added with whey protein concentrate and natural low calorie sugar replacers from polyols such as isomalt and fat replacers like creamex and betatrim. The products had sensory scores and viable population of therapeutic starters very close to control fermented products.

Isolation and screening of the human strains of lactobacilli for their antagonistic activity against human pathogens

Ambalam, PS; Mehta FR and Vyas BRM, Saurastra University, Rajkot, India.

Probiotic microorganisms of human origin are the most suitable candidate organisms for development of functional foods and hence under this study 50 isolates of lactobacilli were isolated from human faeces. Thirty potential isolates were tested for their tolerance to bile salts, phenol, low pH and antibacterial properties against common pathogens like E.coli, Salmonella typhosa, S. typhi, Shigella dysenteriae, Enterobacter aerogenous and Klebsiella pneumoniae. The bacteriocin like substances were confirmed in ammonium sulphate precipitates of five isolates.

Acid tolerance of Bifidobacteirum bifidum strains

Christopher MD, Padmanabha Reddy V, Mrudula N & Venkateswarulu K, College of Veterinary Science, Tirupati, India.

The potential therapeutic advantages of Bifidobacterium bifidum could be expected only when the these organisms are able to survive passage through the acidic conditions of the stomach. The acid tolerance of four strains of Bifidobacteria was tested in broth culture. Which was found to be variable among the strains but all survived exposure for atleast 1 hour at pH 1.

Natural colours from fermented foods for fermented foods

Vijayalaxmi G, Vanajakshi V, Kumaresan and Diwakar S, CFTRI, Mysore.

Red rice extract produced by fermenting rice with mold Monascus purpureus is an ancient popular fermented food in South East Asian countries. The idea of producing natural colours from rice fermented with M. purpureus was employed in the present investigation. Red, orange and yellow pigments were extracted under solid state and submerged fermentation conditions and these were used in the preparation of idli, jilebies and milk based products.

Studies on safety aspects of Probiotic dahi

Patil AM, Khedkar CD and Chavan BR, Shivaji College, Udgir Dist., Latur, India.

Dahi was prepared with normal lactococcal and leuconostoc cultures alongwith a probiotic strain of Lactobacillus acidophilus. The safety evaluation of this preparation was done on 55 human volunteers of 2-63 years of age. No allergic reactions were found during 21 days of feeding and up to 3 weeks subsequent to feeding in the volunteers except one child of 3 years. In another trial with 15 volunteers, no case of bacteraemia was observed. The third study was conducted on two groups of men and women, each comprising 20 randomly selected volunteers of 10-54 years. After feeding the dahi for 20 days, the volunteers were examined by urologist and none of them were found to have UTI. However, one woman showed presence of lactic streptococci in urine.

Probiotic potential of bacterocin producing environmental isolates of lactic acid bacteria

Srivastava Sheela, Tiwari Santosh Kumar, Manoj Kumar and Virdi JS, South Campus University of Delhi, Delhi.

Environmental isolates of lactobacilli were screened for bacteriocin production. Bacteriocin produced by Lactobacillus lactis LR/6 was found to have stability at wider pH and temperature range and recommended for use as food biopreservative.

Effect on Aflatoxin-M1 level during dahi preparation and storage

Choudhary PL, Borkhatriya VN, Sharma RS and Aparnathi KD, SMC College of Dairy Science, GAU, Anand.

Fermentation has been found as one of the means to reduce levels of aflatoxins in milk. Milk added with 3 mg/kg level of aflatoxin M1 was used as base material and fermented by three different cultures of Lactobacillus acidophilus, Str. thermophilus and Lactococcus lactis. The M1 level reduced to 30-58 % during fermentation based on the type of culture. During storage of dahi, the toxin levels further reduced upto 5 days. The results are highly encouraging but the metabolites need to be studied further for toxicological effects.

Preparation of soybean tempeh using Rhizopus oligosporus and it's nutritional evaluation by rats bioassay

Dhaduk JJ, Rai S, Rema S and Sail SS, Sardar Patel University, VV Nagar, India.

Method of preparation of soybean tempeh using Rhizopus oligosporus has been standardized. Soaking cooked soybeans in 0.1% acetic acid for one hour raised required level of acidity for effective mold fermentation within 1 hour and thus curtailed total time of preparation by 5-6 hours, apart from elimination of certain anti-nutritional and growth inhibiting factors from the raw soybeans. The standardized product was evaluated by feeding to rat model and it was found to give high body weight, PER and FER than control diet. The blood chemistry and organ weight of the rats were also found to be normal.

Fermentation in Ayurvedic pharamceutics w.s.r. to Sirisarista

Muralidhar R, Choudhary AK and Prajapati PK, Gujarat Ayurved University, Jamnagar, India.

Ayurvedic system of medicine has exploited fermentation technique for variety of pharmaceutic preparations. Technique of preparing one such fermented liquid, sirisarista, therapeutically useful in treating Swasa (bronchial asthma) has been described. It involves 10 herb/plant extracts and jaggery as fermenting substrate. The process involves selection of raw materials, selection of fermentation vessel and its fumigation, extraction, inoculation, fermentation and post fermentation processing. The specific environmental conditions and the adjuvant drugs provide a gradual selection of microorganisms involved in fermentation process of 4-5 days.

ANNEXTURE - III

The results of the Group discussions

Chairman Dr. Baboo Nair
Reporter : Ms. Lata Ramachandran

Group I identified five project ideas, namely;

- Development of non-dairy fermented foods;
- Development of databases on fermented foods of the Indian subcontinent;
- Research to substantiate the claims of probiotics and prebiotics in health and diseases;
- Characterization of probiotics and their genetic improvement;
- HACCP and safety aspects of fermented foods.

Group II came up with the following project ideas :

- Microencapsulation of the useful organisms/probiotics to enhance stability in gastrointestinal tract and materials that can be used for the process of microencapsulation;
- Creating a database of fermented foods;
- Understanding the unit operations that will lead to industrial mechanization of the traditional processes and design of suitable equipment;
- Study of feasibility of developing probiotic chocolates;
- Establishing a center for collecting and registering the established isolates as well as newer ones;

- Promoting some region-specific fermented foods;
- Use of oats as a substitute in milk based foods;
- Bio-preservation of meat and fish products using fermentation technology;
- Clarification of health claims vis-à-vis labeling as per the mandates of regulatory agencies.

Group III categorized their project under two heads. Those of industrial significance and those of academic interest.

- The following project were identified as of industrial interest,

- Production of bioactive peptides (lactoferrin);
- Development of fermented non-vegetarian food products;
- Development of soy based traditional products;
- Development of intermediate moisture foods using fruits and vegetables.

- The projects identified as being of academic interest included the following:

- Documentation of Socio-demographic aspects of traditional fermented foods;
- Creating a database of traditional fermented foods;
- Conducting nutritional and clinical studies on fermented foods already developed;
- Creation of a legislature for fermented foods by scientific community;
- Development of fermented foods incorporating biotechnology in development of suitable microorganisms and related products.

Group IV came up with detailed two-project presentation.

- The first project involved development of database for fermented foods of India and Asia. The parameters suggested for such a database included Identification of foods into different classes such as milk based, food grain based, livestock and

fisheries, fruits and vegetables and single cell protein; Description of the existing state-of-art of such fermented foods; Adaptation and appropriation of related technology; Development occurring in related technologies; Standardization of safety and quality specifications for such fermented foods; and Commercial viability of the fermented foods.

- The second project was for the development of probiotic curds wherein the areas of suggested research included Identification of suitable strains of microorganisms; Standardization of parameters of processing; Study of shelf-life of products; Scale-up from laboratory to industry level; Quality assurance and safety evaluation of the products; Clinical trials of the products; and Technology transfer and marketing of the products.

A list of relevant problems of high priority for research in the area of fermented foodscollected from the published literature.

- Systematic documentation of traditional fermented foods in a broad data base.
- The effects of lactic acid fermentation on the fate of parasites and studies on the effect of the process on viruses.
- The effect of fermentation on pathogenic bacteria and certain pathogens such as Escherichia coli O 157: H7.
- The effect of fermented foods on the incidence of diarrhoea among infants and young children receiving fermented or non-fermented foods.
- Effect of fermentation on mycotoxins and on the toxicity of breakdown products.
- Effect of fermentation on environmental contaminants.
- Effect of fermentation on bacterial toxins.
- Optimisation of processing with respect to biogenic amines.
- Effect of fermentation on the level of anti-nutritional factors focusing specifically on the mechanisms of change during the whole process.

- Effect of fermentation on the bioavailability of nutrients, especially iron, zinc, calcium and protein.
- Effect of fermented foods on the micronutrient status and growth of children under five fed fermented and non-fermented cereals.
- Characterisation of traditional fermentation, especially where they are used or could be used for feeding infants and children.
- Development of starter cultures for lactic acid bacterial fermentation.
- Methods for optimisation of fermentation conditions to achieve specific benefits.
- Effect of fermented foods on the immunoactivity and its use in applied nutrition.
- Effect of fermented foods on the glycemic index and degree of satiety in healthy as well as diabetic and obese individuals.
- Nutritional value of fermented foods in relation to requirements of weaning infants.
- Screening, identification, characterisation, documentation and industrial application of probiotic organisms from different traditional foods and geographic regions.