

PEREZ-GUERRERO TRUST FUND Project
Promoting Dairy Economic and Technical Cooperation Between China
and Africa Through Value-Added Functional Dairy Products
INT-09-K09

Final Report

Submitted by

South-South (Beijing) Biological Technology Center (SBBTC)

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G77 PGTF Project Final Report

Introduction

The Group of 77 approved the project entitled “Promoting Dairy Economic and Technical Cooperation between China and Africa through Value-Added Functional Dairy Products” for funding from Perez-Guerrero Trust Fund (PGTF) - Reference Number INT/09/K09 at the 32nd Annual Ministerial Meeting of the Group of 77, which was submitted by South-South (Beijing) Biological Technology Center (SBBTC). The Special Unit for South-South Cooperation (SU/SSC) as the Fund manager of PGTF approved to implement on May 31, 2011, the duration of the project is 1 year, started on July 1, 2011, and completed on June 30, 2012.

The Final report includes the project implementation activities and expenses and other related content.

The project implementing condition includes four major activities:

- T01. Sending a study group to Kenya, Tanzania and South Africa to study on site the current situation of dairy development and relevant policies in Africa**
- T02. Holding “The Sino-African Dairy Processing Technology Forum”**
- T03. Holding “The International Training Course on Sino-African Dairy Technologies”; Compiling Technical Manual**
- T04. Completing research report and putting forward to processing techniques of bioactive peptides appropriate to China and eastern & western Africa. Assisting to establish the demonstration plants in participating countries**

The Reason for Changing the Timeframe and Sequence of Activities:

- 1. Due to factors such as visa applications and itinerary programme related to African partners, the time of “T01. Sending a study group to Kenya, Tanzania and South Africa to study on site the current situation of dairy development and relevant policies in Africa.” was changed to Q4, 2011 from Q3, 2011.*
- 2. Due to factors such as Spring Festival, the time of “T02. The Sino-African Dairy Processing Technology Forum” and “T03. Holding the International Cooperation Training Course on Sino-African Dairy Technologies” was changed to Q2, 2012 from Q4, 2011.*

The outputs generated by this project are described as following:

T01. Sending a study group to Kenya, Tanzania and South Africa to study on site the current situation of dairy development and relevant policies in Africa

Background:

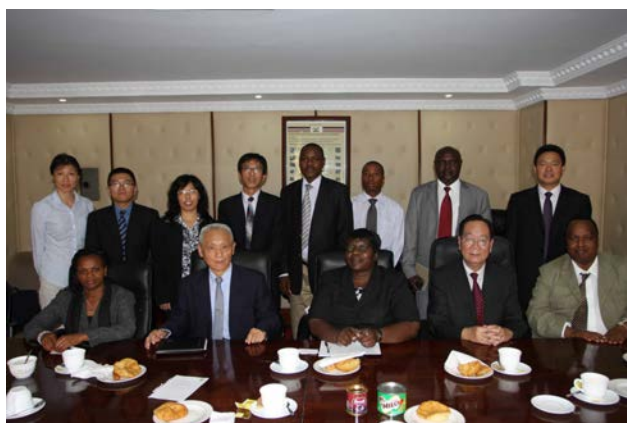
Pasture land is abundant in the east and west of Africa, which covers 80% of the whole area. However, because of grass dispersion and technological backwardness, it is inconvenient for mass milking and difficult to preserve and transport fresh milk, which restricts the development of dairy industry. Therefore, finding a way of processing the fresh milk in time will greatly promote the development of dairy industry in the east and west of Africa.

The processing technology of milk-derived bioactive peptides is convenient and easy for preserving, which can meet the above needs. At present, the bioactive peptide products can not meet the demand for bioactive peptides in developed countries. The development of bioactive peptide products can promote exporting, increase national income, and stimulate the development of the local dairy industry.

In this context, from October 17 to November 2, 2011, organized by South-South (Beijing) Biological technology Center (SBBTC), a study group went to Kenya, Tanzania and South Africa to study on site the current development situation of dairy industry. The members of the study group are Tian Zongxiang, Director of SBBTC, Zhao Hongjun, Deputy Director of SBBTC, Liu Shuangping, Deputy Manager of Project Department of SBBTC, Professor Nan Qingxian and Associate Professor Mao Xueying PhD, College of Food Science & Nutritional Engineering, China Agricultural University. During the study, the study group visited relevant government agencies, research institutes, and the dairy processing enterprises, and held talks with respectively.

Study on African Dairy Industry:

1. Kenya:



Ms. M.A.Nyandong (Front middle), Senior Deputy Secretary of the Ministry of Livestock Development of Kenya met with study group and held a talk



Study Group visited New KCC



Egerton University Vice-Chancellor Ms. Rose A.Mwonya met with study group and held a talk



Study Group held a Talk with professors and experts in Faculty of Agriculture, Egerton University



Study Group Visited the Guildford Dairy Institute in Egerton University

In Kenya, the study group first of all paid a visit to the Ministry of Livestock Development of Kenya, Senior Deputy Secretary of the Ministry of Livestock Development of Kenya Ms. M.A.Nyandong, Director of Livestock Production Mr. Julius Kiptarus, Technical Services Manager of Kenya Dairy Board Mr. Philip K. Cheron and other senior officials met with study group, and held a talk with the study group, they introduced in detail the current dairy development situation of Kenya dairy industry, policies and the Dairy Development Planning up to 2030.

Then, the study group visited the New Kenya Co-operative Creameries (New KCC), and held a talk with Factory Manager Ms. Florence Munga. By the talk and seeing on site, the study group had a better understanding of dairy processing technology and equipments in Kenya.

Finally, the study group went to visit Egerton University. Egerton University is the premier agricultural public University in Kenya, which is the oldest university in the history of agricultural training. Deputy Vice-Chancellor Professor Rose A. Mwonya PhD. met with study group and held a talk with the study group of the framework of the cooperation project; Associate Dean of Agriculture Dr. Antony M. Kibe showed the study group around the farm and dairy farm in Egerton University; the Chairman of Department of Dairy and Food Science and Technology PhD. Abdul Faraj saw the study group around the Dairy Department, Dairy Teaching Base, Dairy Factory and Laboratories, etc. Finally, the study group held a discussion with professors and experts in Faculty of Agriculture on dairy technological exchanges and cooperation.

Kenya Dairy Industry:

The history of the dairy industry in Kenya dates back to 1902 when the first exotic dairy cows were introduced by the European settlers. The first crops of the introduced animals were cross-bred with the indigenous cattle over time. The first creamery was established in Naivasha in 1922. In 1946, the first Artificial Insemination service was introduced. The

station provided A.I. services at a highly subsidized price and this led to the rapid multiplication of the country's dairy herd. As of now Kenya hosts about 3.35 million heads of dairy cattle.

After independence, smallholder dairy production grew rapidly. The Dairy industry was liberalized in 1992 which allowed the private sector to participate in milk processing. This saw the entrance of a number of private milk processors and also the advent and growth of the informal sector.

Since the mid-20th century, Kenya has some commercial development of dairy farming; dairy cattle breeds achieved remarkable results. Kenya treats agriculture, hospitality and industry as the three pillars of its economy, dairy industry is developing rapidly, Kenya has become an important milk production country among East African Community countries.

In 2003, the Government repossessed KCC and renamed it New KCC. The government also implemented a number of measures to revive the ailing dairy industry. These included improving producer prices, enforcing payments for milk deliveries and managing the importation of dairy products which posed a threat to the local dairy industry.

Milk production in Kenya is based mainly on dairy cattle which contribute 60% of the total milk production. Milk is also obtained from camels and goats. Kenya has an estimated cattle population of 13 million heads, among which dairy cattle has 3.3 million (mainly Holstein, 50%, the rest are Ayrshire cattle, Jersey cattle, etc.), Beef has 9.7million (mainly zebu). The average milk yield per cattle is about 1500-2500 liters. Rift valley and central provinces are the main milk producing areas where account for 80% of the total milk production. In Kenya, most of dairy cattle are open grazing; there are nearly one million farmers, each feeds 3-10 heads. Feeding is mainly in small farms, dairy cattle heads and milk production in small farms can respectively account for 80% and 56% of the country.

At present, the industry has made a turn around with the annual production of milk exceeding 4 billion liters out of which 2.1 billion liters are marketed formally and informally. The volumes of milk going to the processing plants have also increased to 516 million liters in 2010 as compared to 144 million liters in 2002 (a growth of 258%). The industry is also a major source of livelihood to a large majority of Kenyans and it contributes approximately 4% of Kenya's GDP (though recent studies indicate 8%) and acts as a source of income and employment to over 1.5 million smallholder dairy farmers in addition to 500,000 direct jobs in milk transportation, processing and distribution and a further 750,000 in related support services.

There are a large number of camels in Kenya, about 2.9 million, ranking fourth in the world. Because of the higher nutritional value of camel milk, especially VC and iron content of the camel milk are 3 times and 10 times of cattle milk respectively. Camel milk is a key research project in Department of Animal Science, Faculty of Agriculture, Egerton University.

Kenyan people have a good habit of drinking milk; milk per capita annual consumption is 84 liters. In 1980, the former President's proposed to implement the "School Milk" program. From 2009, the government enacted laws and policies to support domestic dairy development. In 2010, the government contributed 300 million shillings (about 4 million U.S. dollars) subsidy dairy processors and dairy farmers.

Analysis of Kenya Dairy Situation:

In Kenya, there are two rainy seasons, long rains from March to June, and the short rains from October to December. Except the dry season, the Kenya can be self-sufficient in milk production; milk production is maintained at the current 4 billion liters per year, which is sufficient for domestic consumption, as well as more turn to foreign markets.

Milk production is in fluctuations because of the difference in the dry and rainy season. There are surplus of milk during the rainy season, but in the dry seasons from January to March each year, milk production is insufficient. This situation directly impacts on producers and the price as well.

After liberalization, Kenya Dairy Board licensed 52 milk processors. However, only 34 of these are active presently processing 1million per day. However the total inbuilt capacity of Kenyan processors is estimated at 2.5 million liters per day.

These processors produce a wide range of products namely Fresh Milk, Yoghurt, Mala, Ice Cream, Cheese, UHT, Powder Milk, Butter and Ghee. In Kenya, there are 1% -2% of raw milk processed into cheese, 90% of raw milk processed into liquid milk, of which 30% are UHT milk, 60% are pasteurized milk.

In Kenya, the Constraints to increased milk production includes Poor quality and costly feed supplements; Lack of an organized and reliable market; Low quality breeding stock; High cost of animal health and diseases control services; Over reliance on rains resulting to uneven milk supply throughout the year; Lack of affordable credit facilities; High cost of AI services. The milk processing cost is high in Kenya; the main factors are high cost of road transport due to poor conditions in the rural areas especially during the wet season; High cost of packaging; High cost of electricity and diesel; High cost of taxes and levies.

The main challenges now facing the Kenya dairy industry is the informal sector that deals in raw milk trade accounting for over 75% of the total marketed milk. Other challenges include High cost of farm inputs; Poor infrastructure – Roads, costly electricity and telephone facilities; Low per capita consumption of milk and milk products; Stiff competition from other beverages; Inaccessible or expensive breeding and disease control services

2. Tanzania:



Mr. Zhao Zhongqiu, Representative of Economic and Commercial Representation of China in Tanzania, Met With the Study Group and Held a Talk



In Tanzania, the study group firstly visited the Economic and Commercial Representation of China in Tanzania, and held a talk with Representative Mr. Zhao Zhongqiu, through which the study group understood well the current situation and investment policies of the Tanzania dairy industry. Then, the study group held a talk with member representatives of Tanzania China-Africa Business Council of dairy technology, investment and trade cooperation with Tanzania. The study group also went to some shopping centers and public markets to do some market researches on dairy products, obtained valuable data.

Tanzania Dairy Industry:

Tanzania's dairy industry is still at the initial stage, the majority of milk production is from traditional varieties of dairy cattle. There are about 560,000 dairy cattle in the country which consist of Friesian, Jersey, Ayrshire breeds and their crosses to the East African Zebu. About 70% of the annually produced milk comes from traditional sector (indigenous cows), whereas the commercial sector (dairy cows) produce about 30%. As already stated total annual milk production has increased from 585 million litres in 1995/96 to 1.426 billion litres in 2006/07. The increase in milk production from both

indigenous and improved dairy cattle is mainly due to increase in herd size rather than in productivity per head (milking cow).

Currently, only a small proportion (10%) of marketable surplus of milk produced annually is filtering through, into the urban markets and processing plants. Remoteness and poor infrastructure constitute the largest bottlenecks to collection and marketing of milk. Thus the milk produced is mostly consumed locally and quite often a significant amount is left for the calves.

Development of the dairy industry is limited by inadequate nutrition, support services and so on, other factors include low numbers of fine breed cows, low production per capita, backward feeding technology, insufficient quality feed, inadequate financial credit and processing facilities, poorly organized marketing system, low consumption of milk and animal diseases and bad traffic etc.

The policy direction is to exploit available resources for market oriented dairying and further raise per capita consumption of milk from the present 40 litres to at least 80 litres.

At present, dairy production can not meet domestic demand, so there are a lot of dairy products imported from other countries such as Kenya, South Africa, France, the Netherlands and New Zealand in the supermarkets, Local products only pasteurized milk and yoghurt. But Potential for increased milk supply from rural areas still exists. To exploit it requires improved infrastructures such as milk collection centers, power supply, and roads network and transport facilities. Endeavors to increase milk production in the country have included research work in breeding including selection and crossbreeding leading to development of the Mpwapwa breed and animal nutrition. Development interventions have included direct importation of exotic dairy breeds for stocking large scale farms, Crossbreeding of Zebu cattle with Bos taurus European dairy breeds by Using both natural service and Artificial Insemination, necessitating establishment of the National Artificial Insemination Centre at Usa River Arusha.

In recent years, milk processing has undergone fundamental changes. From 1995, the seven dairy processing plants owned by Tanzania Dairies Ltd (TDL) were privatized in line with the market liberalization policy. They had a total capacity to process about 370,000 litres per day. Following privatization of the TDL milk processing plants, new plants have been constructed. They are mostly located in Tanga, Iringa, Dar es salaam, and Mara regions, bringing the total milk processing capacity to about 507,000 litres per day by 2006. Annex 6 shows the dairy processing plants in Tanzania.

Presently, most of the processing plants are working at less than 12% of the installed capacity, resulting in only 60,000 litres being processed per day. The low performance in milk processing makes the dairy industry uncompetitive in the region, Reasons for this low performance include inadequate raw milk production (due to seasonality, milk being produced in small quantities and small scale milk producers being widely spread in remote areas) which increases milk collection and transportation costs, high cost of milk processing due to high cost of equipment, machinery, packaging materials and utilities. In addition to the poor infrastructure, high cost of doing business and low milk consumption

levels also constrain milk processing.

Official figures showed that Tanzania's milk consumption per capita has been still increasing year by year, from 20.4 in 1995 to 40 liters now. However, compared with other countries and FAO recommendations, the level is still low, there is much room for further development.

3. South Africa:



During in South Africa, the study group held a talk with the representatives of China-Africa Development Fund of dairy technology, investment and trade cooperation, project negotiation. The study group also did dairy market researches in Cape Town and Johannesburg, and had a better understanding of the development condition of South Africa dairy industry.

South Africa is located in the southernmost tip of the African continent, it owns better natural environment and climatic conditions, its economy is the country with the highest level of development in Africa, agriculture and animal husbandry is well-developed.

South Africa Dairy Industry:

Dairy is one of the largest industries in South Africa. There are not only lots of advanced large-scale pastures, but also some the relative backward small and medium-sized pastures. In recent years, the number of dairy cattle and milk production increased relatively slowly, from 2005 to 2009, the number of dairy cattle kept around 540,000, annual milk production at 2.667 billion liters.

South Africa is more advanced than other African countries in dairy cattle breeding and feeding technology. Although the number of dairy cattle is small, only account for about 1% of the total number of dairy cattle in the whole of Africa, its dairy breeds are better, almost all are fine Holstein cows. Therefore, its milk production accounts for more than 9% of total production of Africa, the cow year-yield is up to 5000 liters, far higher than Kenya and other countries, while per capita consumption is 39.1 liters of milk, annual liquid milk consumption is 1.68 billion liters, this shows that dairy industry has a great room for further development in South Africa.

Dairy processing ability is strong in South Africa, in the year of 2007, 97.5% of raw milk production was send to process in dairy plants, its volume of dairy products ranks first in Africa. According to the information from the South African Dairy Association and FAO, in 2009, liquid milk production is 1.197 million tons in South Africa; fermented dairy production reached 290000 tons, cheese 77, 000 tons. LANCEWOOD, CLOVER and other dairy companies produce liquid milk, cheese, butter, etc., in addition to meeting with the needs of their people; some dairy products are exported to Tanzania and other neighboring countries.

Output of the Study:

- (1) By the study on site, visiting the relevant government agencies and universities, as well as dairy processing enterprises and the market, we have a preliminary understanding of the current development situation of dairy industry, dairy processing industry and related policies in Kenya, Tanzania and South Africa.
- (2) By the study on site, we find that the China-Africa dairy cooperation has broad prospects; African market has a wide range of demand for China's dairy technology and equipments.
- (3) By the study on site, we have established friendly relationship with the Ministry of Livestock Development of Kenya, Egerton University, New KCC, the Economic and Commercial Representation of China in Tanzania, China-Africa Development Fund, and other research institutions and government agencies, creating favorable channel for strengthening bilateral cooperation in future.
- (4) By the study on site, we find that milk-derived protein active peptide technology is suitable for African dairy environment. This technology can promote the dairy processing ability in African countries.

The Members of the Study Group

No.	Name	Gender	Title	Company
1	Tian Zongxiang	Male	Director	South-South (Beijing) Biological Technology Center
2	Zhao Hongjun	Male	Deputy Director	South-South (Beijing) Biological Technology Center
3	Nan Qingxian	Male	Professor	College of Food Science & Nutritional Engineering, China Agricultural University
4	Mao Xueying	Female	Associate Professor	College of Food Science & Nutritional Engineering, China Agricultural University
5	Liu Shuangping	Male	Deputy Manager of Project Department	South-South (Beijing) Biological Technology Center

T02. Holding “the Sino-African Dairy Processing Technology Forum”

Background:

We find by studying dairy industry in Africa that the dairy industry in Kenya is still developing at the initial stage, the dairy processing capacity is low, and technical level is relatively backward, but the dairy industry is developing quickly, and supported strongly by the Kenyan government with policies; Tanzania dairy foundation is relatively backward. Tanzania lacks large-scale commercial pastures and modernized dairy processing plants. Dairy resources are not enough, a large part of the required dairy products are imported from other countries; South African economy is the most developed in Africa, the dairy industry is relatively developed, the processing ability is higher, more than 97 % of the original milk are sent to processing plants. There are a wide range of dairy products, in addition to meeting their own demands, some dairy products processed in South Africa are also exported to other countries.

In order to find out the processing technology of milk-derived bioactive peptides which are suitable for China and the eastern and western regions of Africa, and promoting the development of the dairy processing technology in China and African countries. On May 16-17, 2012, as PGTF project implementation unit, South-South (Beijing) Biological Technology Center and its project partners jointly held “the Sino-African Dairy Processing Technology Forum” in Beijing, China.

Summary:



The theme of the Sino-African Dairy Processing Technology Forum is “Strengthening Exchanges in Dairy Industry, Promoting China-Africa South-South Cooperation”.

Ms. Pan Beilei, Fellow of IAFoST, Mr. Philip S. Marmo, Tanzanian Ambassador to China, Mr. Zhao Yongli, Director of the UN Global South-South Development Center, Ms. Liang Dan, Senior Adviser of the United Nations Industrial Development Organization, Prof. Alexander K. Kahi, Dean of Faculty of Agriculture, Egerton University, Prof. Luo Yunbo, Dean of College of Food Science & Nutritional Engineering, China Agricultural University, Mr. Tian Zongxiang, Director-General of South-South (Beijing) Biological Technology Center, Dr. Abdul Faraj, Chairman of Department of Dairy and Food Science and Technology, Faculty of Agriculture, Egerton University, and other more than 100 representatives attended the Forum and made remarks respectively.

In the Forum, participating representatives discussed on the topics of the status and prospects of China-Africa South-South cooperation, the current development situation of the dairy industry in African countries, overview of the China’s dairy industry, international cooperation and investment, the mode of South-South cooperation of dairy enterprises between China and Africa, the opportunities of South-South cooperation, policy and financial support and other issues, making efforts to find out right cooperation and development mode of dairy industry between China and African countries within the framework of United Nations South-South cooperation, improving the technology of Sino-African dairy industry, and promoting economic development.

Output:

- (1) Representatives fully understand the current development situation of the dairy industry in China and African countries, and have a more in-depth understanding of Sino-African dairy industry. Participants hope to take part in vigorously carrying out cooperation of dairy industry between China and African countries within the framework of the United Nations South-South cooperation.
- (2) In the forum, Egerton University in Kenya, South-South (Beijing) Biological Technology Center and Beijing Zhongqingji Dairy Equipment Co., Ltd. in China, three parties reached an intention of cooperation, South-South (Beijing) Biological

Technology Center and Beijing Zhongqingji Dairy Equipment Co., Ltd. will cooperate with Egerton University in the dairy processing technology and production equipment.

- (3) Representatives believe that the processing technology of milk-derived bioactive peptide is suitable for the dairy environment in China and the eastern and western regions of Africa, This technology can promote the development of dairy industry in these areas.

The Sino-African Dairy Processing Technology Forum

Programme, 17-18 May 2012, Beijing, China

Date	Timetable
May 15	Registration, 10:00-18:00
May 16, 2012	9:00-11:30 <ul style="list-style-type: none"> • Mr. Zhao Yongli, Director of the United Nations Global South-South Development Center • Ms. Liang Dan, Senior Advisor of the United Nations Industrial Development Organization in China
	Tea Break
	<ul style="list-style-type: none"> • Mr. Philip S. Marmo, Tanzanian Ambassador to China • Ms. Pan Beilei, Fellow of IAFoST
	12:00-13:30 Buffet Lunch
	<ul style="list-style-type: none"> • 13:30-14:30 Mr. Huang Shengming, Former Secretary-General of China National Food Industry Association • 14:30-15:30 Prof. Alexander K. Kahi, Dean of Faculty of Agriculture, Egerton University
	15:30-15:50 Tea Break
	<ul style="list-style-type: none"> • 15:50-16:50 Prof. Luo Yunbo, Dean of College of Food Science & Nutritional Engineering, China Agricultural University • 16:50-17:50 Mr. Fang Zhimin, Former Economic and Commercial Counselor in African countries
	18:00 Evening Banquet
May 17, 2012	<ul style="list-style-type: none"> • 9:00-9:30 Prof. Nan Qingxian, College of Food Science & Nutritional Engineering, China Agricultural University • 9:30-10:00 PhD. Abdul Faraj, Chairman of Department of Dairy and Food Science and Technology, Faculty of Agriculture, Egerton University • 10:00-10:30 Mr. Wang Yong, Investment Director of China-Africa Development Fund
	10:30-10:50 Tea Break

	<ul style="list-style-type: none"> • 10:50-11:20 Dr. Wang Xiaoyong, Secretary-General of China-Africa Business Council • 11:20-11:50 Ms. Yang Fenglan, Vice President and Secretary-General of Tanzania China-Africa Business Council
12:00-14:00	Buffet Lunch
	<ul style="list-style-type: none"> • 14:00-17:30 The Chinese and foreign representatives make speaking, discussions, project negotiations and so on
18:00	Evening Banquet

Participants of the “Sino-African Dairy Processing Technology Forum”

No.	Name	Title	Agencies/Company
1	Zhao Yongli	Director	The United Nations Global South-South Development Center
2	Pan Beilei	Fellow	IAFoST
3	Liang Dan	Senior Adviser	the United Nations Industrial Development Organization
4	Philip S. Marmo	Ambassador	Embassy of the United Republic of Tanzania
5	Wang Qiang	Vice Director	Liaison Department, China Zhigong Party Central Committee
6	Dr.Alexander Kahi	Dean	Faculty of Agriculture, Egerton University
7	Luo Yunbo	Dean	College of Food Science & Nutritional Engineering, China Agricultural University
8	Tian Zongxiang	Director	South-South (Beijing) Biological Technology Center
9	Zhao Hongjun	Deputy Director	South-South (Beijing) Biological Technology Center
10	Zhang Wei	Projector Manager	The United Nations Global South-South Development Center
11	Huang Shengming	Former Secretary-General	China National Food Industry Association
12	Fang Zhimin	Former Counselor	Economic and Commercial Counselor's Office in African countries
13	Guo Li	Director	The UNDO South-South Industrial Cooperation (China)
14	Wang Xiaoyong	Secretary-General	China-Africa Business Council
15	Wang Yong	Investment Director	China-Africa Development Fund
16	Yang Fenglan	Vice President and Secretary General	Tanzania China-Africa Business Council
17	Zhou Yiqiu	Vice president	Beijing Food Association
18	Xu Feng	Secretary-General	Beijing Food Institute
19	Chen Xueming	Deputy Secretary-General	China Elder Health Care Association
20	Nan Qingxian	Professor	College of Food Science & Nutritional Engineering, China Agricultural University

21	Dr. Abdul Faraj	Chairman	Department of Dairy and Food Science and Technology, Egerton University, Kenya
22	Sheng Yong	General Manager	Chongqing Sangao Dairy Co.,Ltd
23	Chai Shouchang	President Assistant	China Huiyuan Juice Group Limited
24	Chen Hao	Sales Manager	Sdic Zhonglu Fruit Juice Co.,Ltd
25	Chen Yinsong	Manager	Beijing Gaoerzhengye Culture Development Co.,Ltd
26	Dan Desheng	Technology Manager	Beijing Dongfanghong Aerospace Biological Products Co.,Ltd
27	Gao Qingshan	General Manager	Beijing Jiuhe Food Co.,Ltd
28	Gao Shifang	Manager	Beijing Wilson Technology Co.,Ltd
29	Gao Tieyan	General Manager	Beijing Kiers Science & Technology Co. Ltd
30	Gu Dongli	Manager	Beijing Ershang Group Co.,Ltd
31	Han Ying	Deputy General Manager	Beijing Dongfanghong Aerospace Biological Products Co.,Ltd
32	He Yueen	Quality Minister	China Mengniu Dairy Company Limited
33	Hu Yuling	Sales Manager	Jingbei First Grassland Original Eco-Food Technology Co.
34	Hu Yuan	Deputy Directing Physician	Capital Institute of Pediatrics
35	Hua Chen	President	Shandong International Sunshine Co.,Ltd
36	Huang Zhanxian	Regional Sales Manager	Beijing Xinhuyan Food Additives Co.,Ltd
37	Jia Yuanyuan	Manager	Shandong International Sunshine Co.,Ltd
38	Jiang Yueying	Director	Beijing Aerospace Infant Food Research Institute
39	Xie Fei	Deputy Director	Beijing Sanyuan Foods Co., Ltd
40	Jin Xiaoling	Director	Beijing Chaoyang General Chamber of Commerce
41	Li Boyan	Marketing Manager	Conseco Seabuckthorn Products Co., Ltd
42	Li Dong	Deputy Manager	Denmark Teja Nutrition Dairy Products Group
43	Li Fei	Technical Director	Xiaoyangren Biodairy Foods Co., Ltd
44	Li Guihua	Secretary- General	Beijing Cold Drinks Association
45	Li Shuyi	Director	Bean Commission, China National Food Industry Association
46	Li Qifang	Manager	Shanghai Jiafengbao Foods Co., Ltd
47	Li Qian	Deputy General Manager	Dongfang Dingchen Technology Co., Ltd
48	Li Xiaofei	Deputy General-Secretary	China Health Care Association
49	Li Yonghai	Chairman	Conseco Seabuckthorn Products Co., Ltd
50	Lin Yunxia	Manager	Shandong Jianren Health Foods Co., Ltd

51	Liu Gang	Manager	Beijing Xinhuyan Food Additives Co.,Ltd
52	Lu Yang	Director	Technology Department, Beijing Sanyuan Foods Co., Ltd
53	Ma Jinyan	Manager	Heilongjiang Feihe Dairy Group
54	Ma Yanli	Researcher	Inner Mongolia Yili Industrial Group Co., Ltd
55	Mao Xueying	Associate Professor	China Agricultural University
56	Pan Weimin	Office Vice Director	Shanghai Bright Dairy & Food Co., Ltd
57	Pang Bo	Manager	Shanghai Defengtang Co., Ltd
58	Ren Liang	Manager	Zhejiang Chinagene Biomedical Co.,Ltd
59	Sha Chunni	Manager	Jingbei First Grassland Original Eco- Food Technology Co.
60	Shi Wanjun	Chairman	Beijing Chaofan Dairy Co., Ltd
61	Sun Hongchi	Manager	Beijing Zhonghaikang Medicine Co., Ltd
62	Tang Zhiyong	Manager	Beijing Tedisi Biotechnology Co., Ltd
63	Wang Qiang	Deputy Director	Institute of Agro-Products Processing Science and Technology CAAS
64	Wang Shaohai	General Manager	Shanxi Tianlihai General Company
65	Wang Shu	General Manager	Shanghai Xumei Flavors Co., Ltd
66	Wang Yi	Marketing Manager	Shanghai Xumei Flavors Co., Ltd
67	Wang Yingyao	PhD	Academy of State Administration of Grain
68	Wang Zhanli	Chairman	Beijing Xinglipeng Cow Breeding Center
69	Wu Jincheng	General Manager	Food Package Co., Ltd
70	Wu Lesheng	Manager	Beijing Institute of Public Utility
71	Yang Dan	Manager	Dongfang Dingchen Technology Co., Ltd
72	Yi Junjie	General Manager	Beijing Dehaijiuhong Water Factory
73	Yun Zhanyou	General Manager	Tech. Center ,Inner Mongolia Yili Industrial Group Co., Ltd
74	Yun Jingchang	Chairman	Beijing Zhongqingji Dairy Equipment Co., Ltd
75	Zhang Li	Chairman	Xiangshan Yuquan Beverage Co. (Sanjing Group)
76	Tao Ye	Secretary	China National Light Industry Council
77	Bai Xiaofeng	Vice Minister	Project Department, China-Africa Business Council
78	Liu Hanxiong	Senior Manager Assistant	China-Africa Development Fund
79	Magabilo I.Murobi	Counselor	Embassy of The United Republic of Tanzania
80	Wang Xueping	Director	Training Center, China Meat Research Center
81	Hu Xiaoguang	Director	Int'l Cooperation Section, Beijing Academy of Agriculture And Forestry Sciences
82	Liu Yinghua	Director	Dairy Center, Beijing Yidian Beverage Research Institute

83	Wang Zhiqi	Engineer	Dairy Center, Beijing Yidian Beverage Research Institute
84	Gu Ming	Director	Swedish Dairy Industry Training Center
85	Niu Jing	Project Director	Conseco Seabuckthorn Products Co., Ltd
86	Wang Zhihao	Manager	Henan Sunjock Dairy Co.,Ltd
87	Li Yingjun	Administrative Director	Gansu Tengda Food Co., Ltd
88	Yao Chuanming	Manager	Heilongjiang Suifenhe Food Trade Co., Ltd
89	Shang Yuefei	Chairman	Beijing Jinyue Drinks Co.,Ltd.
90	Su Xiaofang	Deputy General Manager	Beijing Jinyue Drinks Co.,Ltd.
91	Shang Lisi	General Manager	Beijing Jinyue Drinks Co.,Ltd.
92	Xu Xiang	Vice Minister	Planning Department, Beijing Capital Agribusiness Group
93	Li Jiping	Director	Technology Department, Beijing Capital Agribusiness Group
94	Wei Meifeng	Deputy Director	Technology Department, Beijing Capital Agribusiness Group
95	Li Xia	General Manager	Beijing Gaoyuedalu Food Co.,Ltd
96	Mahamat Adam	Chairman & CEO	Africaccess Consulting Co., Ltd
97	Innocent Otto	Manager	Africaccess Consulting Co., Ltd
98	Li Guofa	Manager	Zhejiang China Gene Biomedical Co.,Ltd
99	Wang Guangbin	Technology Manager	Xuzhou Lujian Dairy Co., Ltd
100	Ni Kai	Deputy Chief	Technology Division , Xuzhou Lujian Dairy Co., Ltd
101	Zhang Changli	Manager	Easy Television Limited
102	Jiao Bosheng	Manager	Easy Television Limited
103	Liu Shuangping	Deputy manager	Project Department, South-South (Beijing) Biological Technology Center
104	Zhang Changwang	Deputy manager	Marketing Department, South-South (Beijing) Biological Technology Center
105	Wu Xiuping	Director	General Administration Department, South-South (Beijing) Biological Technology Center
106	Dai Hua	Officer	General Administration Department, South-South (Beijing) Biological Technology Center
107	Wu Binbin	Marketing Manager	Beijing Health-Fountain Biotechnology Co., Ltd
108	Wu Nan	Sales Manager	Beijing Health-Fountain Biotechnology Co., Ltd
109	Liang Ynalín	Sales Manager	Beijing Health-Fountain Biotechnology Co., Ltd

T03. Holding “the International Training Course on Sino-African Dairy Technologies”; Compiling Technical Manual

Background:

Pasture land is abundant in the east and west of Africa, which covers 80% of the whole area. However, because of grass dispersion and technological backwardness, it is inconvenient for mass milking and difficult to preserve and transport fresh milk, which restricts the development of dairy industry. In recent years, the China dairy industry is rapidly developing, but because of uneven development, the kinds of dairy products in the east and middle of China are far richer than those in western China, this condition has also restricted the healthy development of China dairy industry. Compared with the developed countries, the level of dairy processing technology is relatively low in China and the east & west of Africa. Therefore, how to raise the technical level of the dairy industry to promote the development of the Sino-African dairy industry is an important subject that China and African countries are facing.

The milk-derived bioactive peptide is convenient for processing and preserving, which can meet the above needs.

Bioactive peptides can be produced into capsule and tablet, and also can be added into milk powder, liquid milk, biscuit, grain products, fruit juice, and beverage, etc. without any complicated processing steps. Milk-derived bioactive peptides have good bio-functionality and nutrition, accordingly can be used in healthy food to prevent and cure hypertension, cardiovascular disease, obesity, osteoporosis and immune maladjustment. Therefore, the development of milk-derived bioactive peptides can significantly improve the health status of the Chinese and African.

In this context, on May 17-20, 2012, South-South (Beijing) Biological Technology Center held “the International Training Course on Sino-African Dairy Technologies”, more than 30 trainees from dairy industry, organizations and research institutes in China and African countries participated in the training.

Summary:



The training objectives are: sharing and promoting the technology and experience of high value-added dairy products, upgrading the technical level of Sino-African dairy industry, and promoting the development of Sino-African dairy industry.

In the international training course, domestic and international dairy technology experts, who from Egerton University in Kenya and College of Food Science & Nutritional Engineering, China Agricultural University, were invited to give lectures to the technical staff in dairy industry, organizations and research institutes. The specific content of the training includes the developing status and trend of the modern dairy industry, the developing and processing status of the functional dairy products, using bio-technology to reducing the allergy of milk protein, the characteristics and application of the milk protein, lactase, and dairy processing, milk-derived bioactive peptides and technology, etc.

More than 30 trainees, who are the technical staff from Beijing Zhongqingji Dairy Equipment Co., Ltd., Chongqing Sangao Dairy Co., Henan Sunjock Dairy Co., Ltd., Faculty of Agriculture of Egerton University and other industry organizations, research institutions and enterprises, participated in the training.

At the opening ceremony of the Training course, Mr. Tian Zongxiang, Director of South-South (Beijing) Biological Technology Center, first of all made opening remarks; he warmly welcomed the experts and trainees, then the training course began. China Agricultural University Prof. Nan Qingxin and Associate Prof. Mao Xueying PhD. presided over the training course respectively.

Ms. Liu Meiju, Secretary-General of China Dairy Industry Association, gave a lecture entitled “China New Dairy Industry”. She elaborated china dairy industry overview, the main reason for melamine event, dairy industry reorganization and reform, rectify made outstanding achievements, “the 12th five year plan ” dairy planning targets

Prof. Li Ning, China Agricultural University and Academician of China Academy of Engineering, gave a lecture entitled “Using Genetic Engineering R&D to Produce Human Emulsified Milk in Cows”. He analyzed the difference between human milk and cattle, and by bio-engineering technology, changing the composition of cattle milk to of the human milk to produce the so-called emulsified milk, and he also explained the safety issues of emulsified milk in the training course.

Prof. Nan Qingxian, College of Food Science and Nutritional Engineering, China Agricultural University, gave a lecture entitled “The Current Situation of Functional Dairy Products”. He spoke of the overview of functional dairy industry in China and the definition of functional foods of the American Dietetic Association. He analyzed in –depth the development trend of the functional dairy products. He thinks that the functional dairy products will become the bright development spot of the dairy industry in future; it will be an economic growth point.

Dr. Chen Lijun, Deputy General Manager of Beijing Sanyuan Foods Co., Ltd., gave a lecture entitled “China's Dairy Policy and Future Challenges: View of Raw Milk Supply and Demand”. He analyzed China's dairy policy and development strategy, as well as the impact on China dairy industry. He also spoke of the supervision system of China dairy industry, the coming challenge of China dairy industry; Trainees shared some experiences of Beijing Sanyuan Foods Co. Ltd.

PhD. Abdul Faraj, Chairman of Department of Dairy and Food Science and Technology, Faculty of Agriculture, Egerton University in Kenya gave a lecture entitled “On Aflatoxin”. He analyzed the structure of chemical molecule of Aflatoxin, and explained the reason for deadly threat on human and animal health in developing countries. Its content is divided into the Introduction of aflatoxin, aflatoxin chemical structure, poison effects, Kenyan cases and prevention and control, etc. PhD. Abdul Faraj thinks that all countries in the world should establish a unified and consistent management and testing regulation, and carry out a consistent management and testing standard.

Prof. LV Jiaping, Chinese Academy of Agricultural Sciences gave a lecture entitled “the Processing Technology of Low-Lactose Milk”. He spoke of the physiological function of the lactose, lactose maldigestion, lactase deficiency, Adverse effects, lactose intolerance, Application of low-lactose milk, etc., and analyzed the productive process of low-lactose milk.

Prof. Guo Shuntang, College of Food Science and Nutritional Engineering, China Agricultural University, gave a lecture entitled “Soybean peptide reactive groups and its biological functions”. He spoke of nutritional value and physiological functions of soybean peptide, the biological effects of soybean peptide-calcium complex enhancing bone quality and glycopeptide improve intestinal shielding function of intestinal mucosa.

Prof. Zhang Liebing, College of Food Science and Nutritional Engineering, China Agricultural University, gave a lecture entitled “Milk Protein Concentrates (MPC) Market Situation and the Current Situation of China Market”. He at first compared the cost and added value of dairy products at home and abroad to point out the problems of Chinese enterprises. He also analyzed the function and processing method of milk protein concentrates,

Prof. Zhang Bolin, Beijing Forestry University, gave a lecture entitled “The Study and Practical Applications of Reducing the Allergy of Milk Protein”. He spoke of milk protein allergy background, milk allergy solutions and the researching situation and practical application in milk allergy, etc.

Prof. Li Shengli, College of Animal Science and Technology, China Agricultural University, gave a lecture entitled “The Feed and Feeding Chinese Dairy and Milk Quality”. The content he spoke of mainly consists of four parts: Feeding patterns and future trend of China Dairy Farming, Feed resources and utilization in China, Researching in the field of dairy nutrition, Improvement of raw milk quality in China.

PhD. Mao Xueying, Associate Professor, College of Food Science and Nutritional Engineering, China Agricultural University, gave a lecture entitled “Activity and Preparation of Bioactive Peptides Obtained from Milk Proteins”. Her teaching content consist of four parts: Potential health benefits of milk peptides, Multifunctional of milk protein peptide, How to produce peptides, and Products contained bioactive peptides.

She said that recent research has shown that milk proteins can yield bioactive peptides with opioid, mineral binding, antihypertensive, immunostimulating, antimicrobial and antioxidative activity in the human body.

Bioactive peptides have the potential to be used in the formulation of health enhancing nutraceuticals, and as potent drugs with well-defined pharmacological effects.

Visit Beijing Sanyuan Foods Co. Ltd.:



On May 20, 2012, the trainees participating in the international training course visited Sanyuan Foods Industrial Park, which is invested totally 778 million Yuan by Beijing Sanyuan Foods Co., Ltd., its daily milk processing capacity is 1200 tons. Sanyuan Foods Industrial Park is an integrated industrial base with R&D, processing and distribution, main products are normal-temperature milk, low-temperature pasteurized milk, low-temperature yogurt and bottled products.

The trainees saw on site the set of modern production line from the milk collection point to the finished products.

In the milk collection area, Trainees saw that the cleaning system was cleaning milk cars after milk were collected, the workers of the collection point said that milk car "bath" is to reduce microbial contamination. The total milk collection capacity of Sanyuan Foods Industrial Park is up to 160 tons per hour.

The trainees saw on site the production lines processing different products. The production line includes mainly bottle washing, filling, packing, palletizing, and so no. The filling capacity is about

20,000 glass bottles per hour. Workers operate the production line by the control system. The milk packaging process is fully automatic, reducing human intervention and reducing food safety risks.

During the visit, the trainees by the way discussed with staff of Sanyuan Foods on the prospect of the China-Africa cooperation of dairy industry.

Through this training and visit, the trainees improved the technical level, and they hope they can develop the new idea of technology in their own factories and laboratories.

Output:

In the international training course, 11 domestic and international experts and professors of dairy industry were invited to give lectures to trainees. They taught and analyzed the dairy high-technology at the present days, the trainees who are researchers and technical staff of the dairy industry improved greatly their level of theory.

The Trainees deeply understand the milk-derived bioactive peptides function, processing technology, and the development trend of dairy products. Their technical level of the milk processing will be improved.

Compiling Technical Manual:

In the international training course on Sino-African dairy technologies, 11 domestic and international experts and professors in dairy industry gave lectures to trainees. According to their course contents, a technical manual was compiled. The manual describes the developing status and trend of the modern dairy industry, the developing and processing status of the functional dairy products, using bio-technology to reducing the allergy of milk protein, the characteristics and application of the milk protein, lactase, and dairy processing, milk-derived bioactive peptides and technology, etc. The specific contents as follows:

- **China New Dairy Industry**
By Ms. Liu Meiju, Secretary-General, China Dairy Industry Association
- **Using Genetic Engineering R&D to Produce Human Emulsified Milk in Cows**
By Prof. Li Ning, China Agricultural University, Academician of China Academy of Engineering
- **The Current Situation of Functional Dairy Products**
By Prof. Nan Qingxian, China Agricultural University
- **China's Dairy Policy and Future Challenges: View of Raw Milk Supply and Demand**
By Dr. Chen Lijun, Deputy General Manager, Beijing Sanyuan Foods Co., Ltd.
- **On Aflatoxin**
By PhD. Abdul Faraj, Chairman, Department of Dairy and Food Science and Technology, Faculty of Agriculture, Egerton University

- **The Processing Technology of Low-Lactose Milk**
By LV Jiaping, Chinese Academy of Agricultural Sciences
- **Soybean Peptide Reactive Groups and Its Biological Functions**
By Prof. Guo Shuntang, China Agricultural University
- **Milk Protein Concentrates (MPC) Market Situation and the Current Situation of China Market**
By Prof. Zhang Liebing, China Agricultural University
- **The Study and Practical Applications of Reducing the Allergy of Milk Protein**
By Prof. Zhang Bolin, Beijing Forestry University
- **The Feed and Feeding Chinese Dairy and Milk Quality**
By Prof. Li Shengli, China Agricultural University
- **Activity and Preparation of Bioactive Peptides Obtained from Milk Proteins**
By PhD. Mao Xueying, Associate Professor, China Agricultural University

The International Training Course on Sino-African Dairy Technologies

Programme, 17-20 May 2012

Date	Timetable
May 16	Registration
May 17	<ul style="list-style-type: none"> • 8:30-10:00 Ms. Liu Meiju, Secretary-General, China Dairy Industry Association • Course: China New Dairy Industry
	10:00-10:30 Tea break
	<ul style="list-style-type: none"> • 10:30-12:00 Prof. Li Ning, China Agricultural University, Academician of China Academy of Engineering • Course: Using Genetic Engineering R&D to Produce Human Emulsified Milk in Cows
	12:00-13:30 Lunch
	<ul style="list-style-type: none"> • 13:30-15:00 Prof. Nan Qingxian, College of Food Science & Nutritional Engineering, China Agricultural University • Course: The Current Situation of Functional Dairy Products
	15:00-15:30 Tea break
	<ul style="list-style-type: none"> • 15:30-17:30 Dr. Chen Lijun, Deputy General Manager, Beijing Sanyuan Foods Co., Ltd. • Course: China's Dairy Policy and Future Challenge

May 18	<ul style="list-style-type: none"> 8:30-10:00 PhD. Abdul Faraj, Chairman, Department of Dairy and Food Science and Technology, Faculty of Agriculture, Egerton University, Kenya Course: On Aflatoxin
	10:00-10:30 Tea break
	<ul style="list-style-type: none"> 10:30-12:00 Prof. LV Jiaping Chinese Academy of Agricultural Sciences Course: The Processing Technology of Low-Lactose Milk
	12:00-13:30 lunch
	<ul style="list-style-type: none"> 13:30-15:00 Prof. Guo Shuntang, College of Food Science & Nutritional Engineering, China Agricultural University Course: Soybean peptide reactive groups and its biological functions
	15:00-15:30 Tea break
	<ul style="list-style-type: none"> 15:30-17:30 Prof. Zhang Liebing, College of Food Science & Nutritional Engineering, China Agricultural University Course: Milk Protein Concentrates (MPC) Market Situation and the Current Situation of China Market.
May 19	<ul style="list-style-type: none"> 8:30-10:00 Prof. Zhang Bolin, Beijing Forestry University Course: The Study and Practical Applications of Reducing the Allergy of Milk Protein
	10:00-10:30 Tea break
	<ul style="list-style-type: none"> 10:30-12:00 Prof. Li Shengli, College of Animal Science and Technology, China Agricultural University Course: The Feed and Feeding Chinese Dairy and Milk Quality
	12:00-13:30 Lunch
	<ul style="list-style-type: none"> 13:30-15:00 PhD. Mao Xueying, Associate Professor, College of Food Science & Nutritional Engineering, China Agricultural University Course: Activity and Preparation of Bioactive Peptides Obtained from Milk Proteins
	15:00-15:30 Tea Break
	<ul style="list-style-type: none"> 15:30-17:30 Answer Questions, Discussions
May 20	Visit Beijing Sanyuan Foods Co. Ltd.

The Interantional Training Course on Sino-African Dairy Technologies

Experts List

No.	Name	Title	Organization
1	Liu Meiju	Secretary- General	China Dairy Industry Association
2	Nan Qingxian	Professor	College of Food Science & Nutritional Engineering, China Agricultural University

3	Mao Xueying	Associate Professor	College of Food Science & Nutritional Engineering, China Agricultural University
4	Li Shengli	Professor	College of Animal Science and Technology, China Agricultural University
5	Lv Jiaping	Professor	China Agricultural University , Chinese Academy of Agricultural Sciences
6	Zhang Liebing	Professor	College of Food Science & Nutritional Engineering, China Agricultural University
7	Guo Shuntang	Professor	College of Food Science & Nutritional Engineering,, China Agricultural University
8	Zhang Bolin	Professor	Beijing Forestry University
9	Chen Lijun	Deputy General Manager	Beijing Sanyuan Foods Co., Ltd
10	Li Ning	Professor and Academician	China Agricultural University, China Academy of Engineering,

The Interantional Training Course on Sino-African Dairy Technologies

Trainees List

No.	Name	Title	Company
1	Alexander K. Kahi	Dean	Faculty of Agriculture, Egerton University, Kenya
2	Abdul Faraj	Chairman	Department of Dairy And Food Science And Technology, Egerton University, Kenya
3	Cheng Xu	Technician	Beijing Ruwang Foods Co., Ltd.
4	Chu Linsen	Engineer	Beijing Ruwang Foods Co., Ltd.
5	Gu Ming	Director	Swedish Dairy Industry Training Center
6	He Yueen	Quality Control Minister	China Mengniu Dairy Company Limited
7	Hu Yuling	Sales Manager	Jinbei First Grassland Original Eco-Food Technology CO., Ltd
8	Huang Zhanxian	Regional Sales Manager	Beijing Xinhuanan Food Additives Co., Ltd.
9	Xie Fei	Deputy Director	General Manager Office, Beijing Sanyuan Foods Co., Ltd
10	Li Jiping	Minister	Technology Department, Beijing Capital Agribusiness Group
11	Li Meng	General Manager	Beijing Chaofan Dairy Co., Ltd.
12	Li Shushui	Technology Manager	Beijing Green Yard Ecological Agriculture Development Co. Ltd.

13	Li Xiangdong	Manager	Beijing Bright Dairy & Food Co., Ltd
14	Lu Yang	Director	Technology Center, Beijing Sanyuan Foods Co., Ltd
15	Ma Jinyan	General Manager	Beijing Office, Heilongjiang Feihe International, Inc.
16	Ma Yanli	Researcher	Inner Mongolia Yili Industrial Group Co., Ltd
17	Ni Kai	Deputy Manager	Technology Division, Xuzhou Lujian Dairy Co., Ltd.
18	PAN Weimin	Deputy Director	General Manager's Office, Shanghai Bright Dairy & Food Co., Ltd
19	Qiao Chengya	Director	Beijing Bright Dairy & Food Co., Ltd
20	Qiao Yingdong	Product Manager	Beijing Green Yard Ecological Agriculture Development Co. Ltd.
21	Sha Chunni	Manager	Jingbei First Grassland Original Eco-Food Tehnology Co., Ltd
22	Sheng Yong	General Manager	Chongqing Sangao Dairy Co.,Ltd
23	Sun Zhuo	Manager	Beijing Bright Dairy & Food Co., Ltd
24	Wang Guangbin	Technology Manager	Xuzhou Lujian Dairy Co., Ltd
25	Wang Xiumei	Product Manager	Beijing Green Yard Ecological Agriculture Development Co. Ltd.
26	Wang Zhihao	Manager	Henan Sunjock Dairy Co., Ltd
27	Wei Meifeng	Deputy Director	Technology Department ,Beijing Capital Agribusiness Group
28	Xu Xiang	Deputy Director	Managing Department, Beijing Capital Agribusiness Group
29	Yun Zhanyou	Technology Manager	Inner Mongolia Yili Industrial Group Co., Ltd
30	Yun Jingchang	Chairman	Beijing Zhongqingji Dairy Equipment Co., Ltd

T04. Completing research report and putting forward to processing techniques of bioactive peptides appropriate to China and eastern & western Africa. Assisting to establish the demonstration plants in participating countries

As the final activity of the PGTF project, we completed the research report and putting forward to processing techniques of bioactive peptides which is suitable for China and the east & west of African countries. We also assisted to establish demonstration bases in China and Kenya, and make effort to achieve the industrialization of the high value-added functional dairy products. We will recruit experts for technical support and introduce technology and equipments, and establish a platform for technical and economic cooperation between China and African countries.

Research Report on Milk-Derived Bioactive Peptides:

1. Introduction

Bovine milk is designed for nutrition, growth stimulation, and immunological protection of the young calf. Since prehistoric times, bovine milk has been consumed by human beings either as fluid milk or other dairy products. Milk contains 3.0-3.5% total protein, fat, lactose, minerals and some vitamins. Milk proteins contain all essential amino acids required by humans. Total milk protein content and amino acid composition varies with cow breeds and individual animal genetics. There are two major categories of milk protein that are broadly defined by their chemical composition and physical properties. In cow's milk, approximately 82% of milk protein is casein and the remaining 18% is serum, or whey protein.

2. Peptides derived from milk protein

Milk proteins are considered the most important source of bioactive peptides. The bioactivities of several milk proteins are latent. Only during proteolytic digestion of the protein are the active peptide fractions released from the native protein/peptide. These active peptides can be formed also during food processing. Once the bioactive peptides are liberated, they may act as regulatory compounds with hormone-like activity. At present, numerous peptides exhibiting various activities-such as opiate, antithrombotic or antihypertension activity, immunomodulating or mineral utilization properties.

2.1 Peptides with opioid activity

Opioid peptides, i.e., opioid receptor (μ -, δ - and κ - type) ligands with agonistic activity, originate from different milk proteins and exert naloxone-inhibitable opioid activities. After intracerebral administration to experimental animals, opioid peptides modulate social behavior and produce analgesia. The major exogenous opioid peptides, i.e. β -casomorphins (β -CMs), are fragments of the β -casein sequence and have been characterized as μ -type ligands. As shown in Table 1, the opioid activity in the GPI assay and μ -receptor affinity of β -CMs of various lengths were measured. β -CMs of [His8]-type were more active than those of [Pro8]-type. β -CM-9 and-13 showed stronger opioid activity than β -CM-7.

Peptides	Opioid activity in GPI assay IC ₅₀ (μM)	Receptor affinity IC ₅₀ (μM)
[His ⁶⁷]-β-casein		
β-CM-7	3.2	3.6
β-CM-9	3.3	3.3
β-CM-13	2.9	12
β-CM-21	4.4	10
[Pro ⁶⁷]-β-casein		
β-CM-9	4.3	11
*β-CM-13	4.2	13
*β-CM-21	8.5	30
Neocasomorphin-6	59	92

Table 1 Opioid activity of β-CMs

2.2 Peptides with Antimicrobial and Anti-inflammatory activity

Antimicrobial peptides have been demonstrated to kill Gram negative and Gram positive bacteria, mycobacteria, enveloped viruses, fungi and even transformed or cancerous cells. Unlike the majority of conventional antibiotics it appears as though antimicrobial peptides may also have the ability to enhance immunity by functioning as immunomodulators. It is demonstrated that active peptides derived from milk protein can protect mice from *Staphylococcus aureus* and *Candida albicans* infections. The milk protein peptides have been reported to lessen the occurrence of mastitis. In addition, antimicrobial peptides protect new born from gut-related systemic infection and exert anti-inflammatory activity by inhibition of a number of different molecules that play a role in inflammation. As shown in Table 2, antibacterial activity of the purified peptides against several microorganisms. Both fragments showed activity against Gram-positive and Gram-negative bacteria. The zone of inhibition was obtained with peptides derived from milk protein against microorganisms as shown in Figure 1.

Microorganism	MIC ^a (μM)	
	α ₂ -Casein f(164–179)	α ₂ -Casein f(183–207)
Gram-negative bacteria		
<i>E. coli</i> ATCC 25922	25	16
<i>E. coli</i> MC 1061	99	16
Gram-positive bacteria		
<i>L. innocua</i>	50	16
<i>B. cereus</i> P7	75	16
<i>M. flavus</i> DSM 1790	75	16
<i>St. thermophilus</i> Rs	50	8

Table 2 Antibacterial activities of milk protein

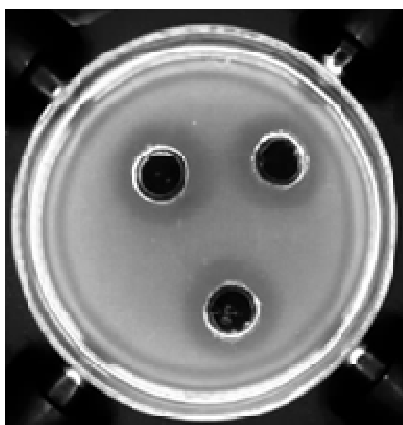


Figure 1. The inhibition zones of peptides derived from milk protein

2.3 Peptides with Immunomodulatory effects

The bioactivity of immunopeptides has been characterized by different *in vitro* and *in vivo* test systems. Immunomodulating peptides have been found to stimulate the proliferation of human lymphocytes, the phagocytic activities of macrophages and antibody synthesis. As shown in Figure 2, whey protein isolate were tested for their immunomodulating effects using murine splenocytes cultured in the absence and presence of concanavalin A (ConA). The WPI and ED all stimulated the proliferation of splenocytes in the presence and absence of ConA.

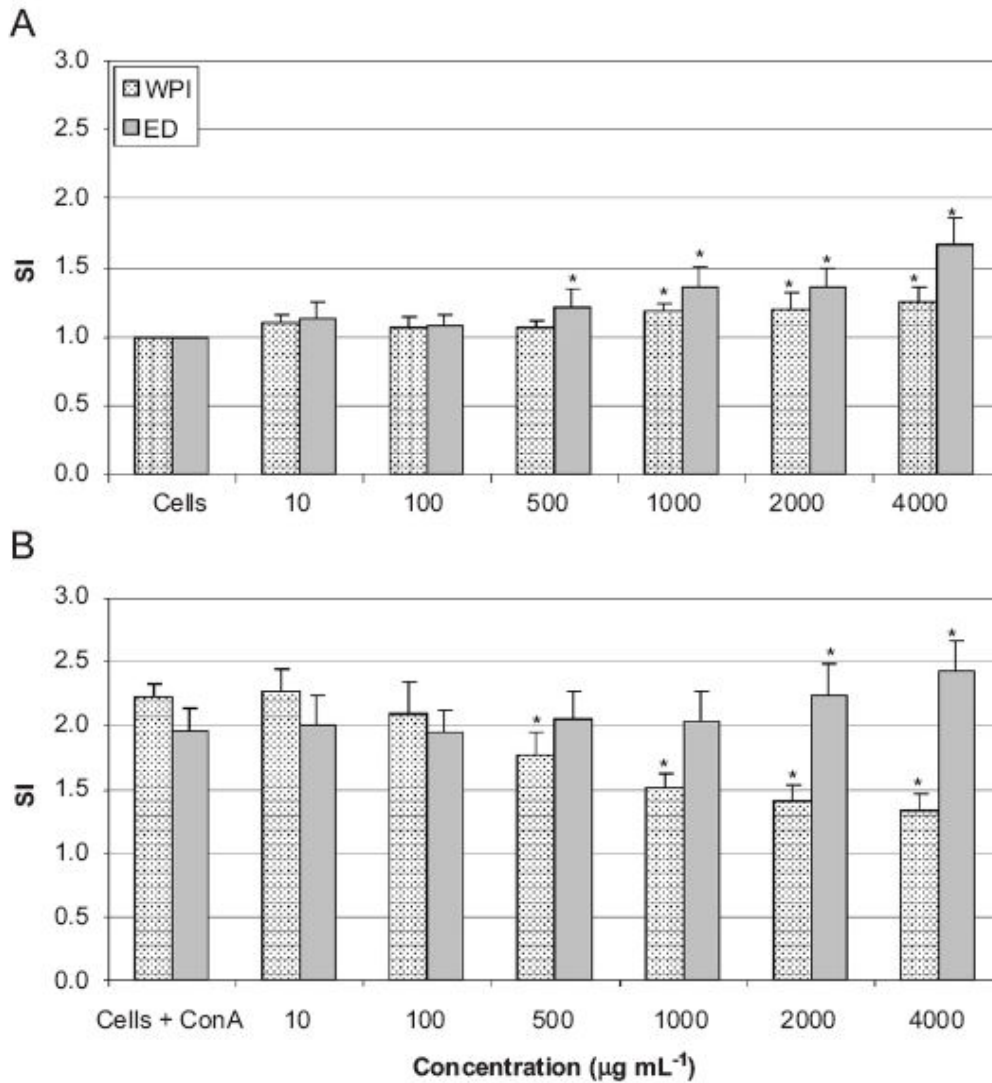


Figure 2. Effects of whey protein on the proliferation of (A) resting murine splenocytes or (B) concanavalin A-stimulated (0.5mg/mL) splenocytes.

2.4 Peptides with Mineral binding properties

Milk protein may function as carriers for different minerals, such as calcium, iron, manganese, copper, selenium. Hence they might exert an influence on absorption of calcium or other minerals and trace elements in the intestine. Mineral-binding peptides have been widely used as functional food additives in Japan and Germany. As shown in Table 3, the active peptides can improve calcium absorption from milk in different age group.

Age group	The calcium absorption rate for milk (%)	The calcium absorption rate for milk with added peptides (%)
Children	60	90

Teenagers	70	95
Adults	70	95
Elderly	50	85

Table 3 Promotion effect on calcium absorption in different age group

2.5 Peptides with angiotensin-converting enzyme (ACE) inhibition activity

Angiotensin converting enzyme (ACE) converts angiotensin I into angiotensin II. Angiotensin II is found in the pulmonary circulation, as well as in the endothelium of many blood vessels. ACE is a multifunctional enzyme that is located in different tissues and plays a key physiological role in the regulation of local levels of several endogenous bioactive peptides. Milk protein-derived inhibitors of ACE may therefore prevent vasoconstriction and lower blood pressure.

Figure 3, shows the development of ACE inhibitory activity of milk protein. Figure 4 shows that systolic blood pressure was significantly decreased.

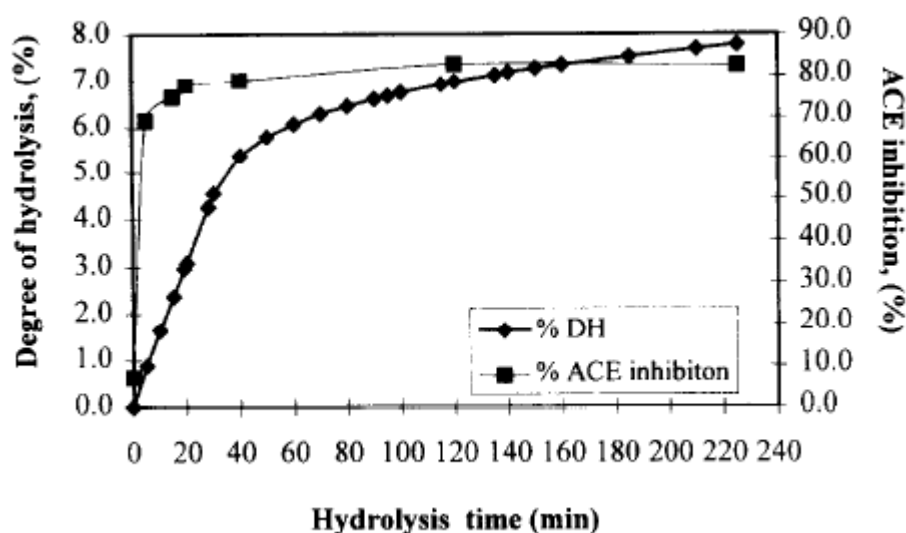


Figure 3 Development of ACE inhibitory activity

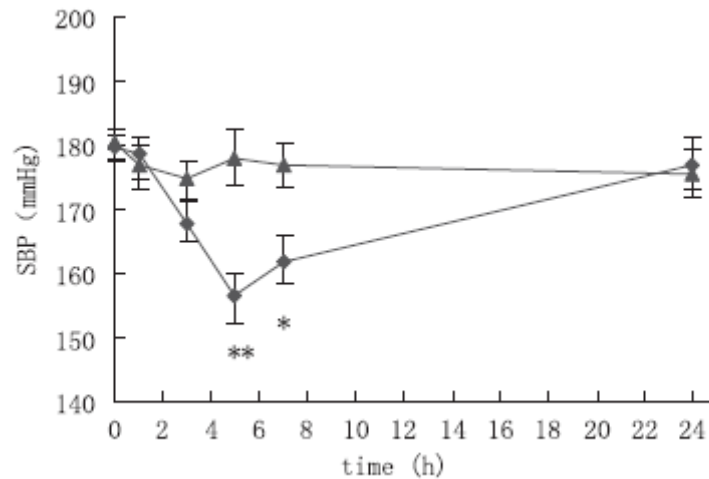


Figure 4 Antihypertensive effect oral administration milk protein peptides

2.6 Peptides with antithrombotic activity

On a molecular level, the clotting of blood and milk shows a large number of similarities. The interacting region of the fibrinogen γ -chain in platelet aggregation is the C-terminal dodecapeptide sequence which itself possesses similar inhibitory effects as the casein fragments. These residues seem to be important for the inhibitory effect which is due to the competition between antithrombotic peptides and the γ -chain for the platelet receptors. Effect of the peptides in vitro platelet aggregation is shown Table 4.

Peptide	IC50 (mM)
Glycopeptide	1.5
MAIPPKKNQDK	1.5
KNQDK	2.0

Table 4 Effect of the peptides in vitro ADP-induced platelet aggregation

3. Production of bioactive peptides

There are a number of methods by which peptides with biological activity can be produced. They most common rely on food processing using heat, alkali or acid conditions which hydrolyze proteins; the enzymatic hydrolysis of food proteins; and the microbial activity of fermented foods. So far, the most common way to produce bioactive peptides has been through enzymatic digestion utilizing different scales and techniques. Peptide manufacturing process for enzymatic hydrolysis:

protein \rightarrow enzymatic hydrolysis \rightarrow enzyme inactivation \rightarrow purification \rightarrow
drying \rightarrow peptide

4. Milk-derived peptides: Prospects for application

An increasing amount of data demonstrates a bioactive role of proteins and peptides beyond their nutritional impact. Some of these released peptides exert biological activities such as opioid-like, antihypertensive, mineral-binding, antioxidative, antimicrobial, immunomodulating and antithrombotic activity. Bioactive peptides can be incorporated in functional and novel foods, dietary supplements and even pharmaceuticals with the purpose of delivering specific health benefits. The potential benefits of milk protein-derived peptides have been a subject of growing commercial interest in functional foods. Due to their safe and nontoxic characteristics, bioactive peptides derived from milk protein possess potential market prospects in the field of food and drug.

Assisting to Establish the Demonstration Plants in Participating Countries:

Chongqing Sangao Dairy Co., Ltd. in China and Egerton University Dairy Plant in Kenya are identified as demonstration plants for the dairy deep-processing technology and by South-South (Beijing) Biological Technology Center, Both sides assisted by South-South (Beijing) Biological Technology Center will work on the technology and equipment cooperation.

Conclusion

The success of this project will greatly promote Sino-African dairy industry. The organizations and enterprises in China and the eastern & western regions in Africa will benefit from the economic and technical cooperation from each other. Value-added dairy products will be developed continually, these countries can raise the technical level of dairy products, and promote the development of whole dairy industry.

Annex: Breakdown of Expenditure:**Expenses covered by the PGTF Fund**

Study Travel	US\$18000
Accommodation and Food, Transportation	US\$18000
Training	US\$13,392
Accommodation and Food, Training Room	US\$9009
Local Transportation	US\$277
Training Printed Materials	US\$106
Lectures and Translation	US\$4,000
Others	US\$3258
Executive Expense 1%	US\$350
Total:	US\$35,000

Bank Information:**Organization:** 南南（北京）生物技术中心**Bank Account:** 0200207809200063863**Bank Name:** 中国工商银行北京翠微路支行玉东分理处