



STABILAK
FOR THE NATURAL PRESERVATION OF MILK

IDEASS^{CUBA}

Innovation for Development and South-South Cooperation



Introduction

Text written by Ondina Leon Diaz and Pastor Ponce Ceballo

The STABILAK product activates a system of natural defenses present in the milk of all mammals, called the Lactoperoxidase System (LPS). It is used to conserve the initial quality of raw milk for human consumption. The product allows raw milk to be stored without souring for between 8 and 24 hours after milking, in temperatures ranging from 20 to 34 degrees Centigrade. The storage time can be lengthened substantially when the raw milk is of good hygienic quality.

STABILAK can be used in many ways in different situations. Specifically, it can support the agricultural economy in the most remote areas, or where infrastructure is inadequate. It lowers the risk of diseases caused by pathogenic microorganisms, and allows for better use to be made of milk and dairy products, increasing the quantity of food available to the population and allowing for the setting up and development of new dairies without having to rely on refrigeration.

The method is a natural enzyme system approved by the Codex Alimentarius and harmless to human health.

This innovative method was invented in Cuba by the engineer Pastor Ponce Ceballo, Ph.D., of the National Centre for Agricultural Sanitation (CENSA).

The FAO has sponsored research on and promotion of the Lactoperoxidase System, and in 1998 established the Global Lactoperoxidase Programme (GLP).

Field studies have been performed with institutions and firms from more than 20

countries, among them Argentina, Bolivia, Brazil, Chile, China, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guinea, Honduras, Mexico, Nicaragua, Paraguay, Peru, the Dominican Republic, Uganda, Uruguay, Venezuela and Vietnam.



STABILAK has received important international recognition, including:

- A Gold Medal from the World Organization for Intellectual Property (OMPI), for "A practical method for conserving raw milk", Havana and Geneva, 2002;
- Gold Medal at the 24th International Inventions Congress, Geneva, Switzerland, 1996;
- Ecological Prize from the Office for Commercial Promotion on Behalf of Developing Countries (OSEC), Geneva, Switzerland, 1996.

What problem does it solve?

The situation that inspired research to develop the product was the need to solve problems created by the lack or instability of electricity in some areas of Cuba, which caused losses of milk due to souring. The problem needed a fast, simple and low-cost solution adapted to the characteristics of the sector in question.

The innovation helps confront and solve the following problems in a novel way:

- Large number of dairy herds without refrigeration infrastructure
- Power outages
- Use of inadequate means of transportation, over roads in bad condition and with difficult access
- Long distances between production site and processing centre
- Climate unfavourable for the conservation of the milk's initial quality
- The use in some countries of substances such as hydrogen peroxide, formol, alcohol, antibiotics and chlorinated products for conserving milk, which leave undesirable residues and are not even allowed for use in milk

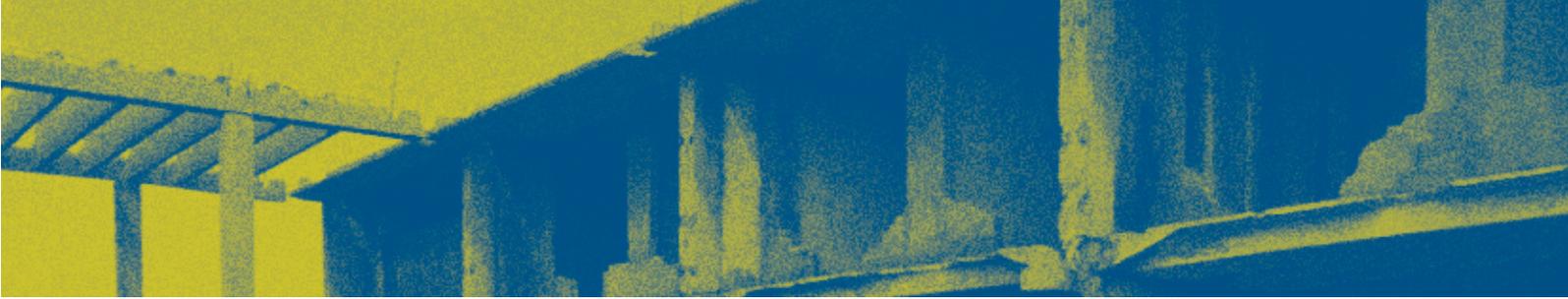


authorities responsible for food and health. In 1991 use of the system was approved; all that was needed was its practical application. All of the numerous research studies and practical applications performed during the last 12 years have reaffirmed this initial favourable judgement.

Starting during the 1960s in England, research was conducted on the Lactoperoxidase System as an enzyme system present in mammals' milk. It was the Swedes who, at the end of the 1970s, conducted the first practical experiments to activate the system and achieve an extension in the stability of raw milk.

In 1982, the Joint Committee of FAO-WHO Experts for Milk and Dairy Products, of the Codex Alimentarius, began discussing this activation as an alternative for maintaining milk quality in the absence of refrigeration, without damaging the milk itself, nor harming human health. The favourable conclusions reached on the use of the system led to a long period of research and debates with the highest

In the beginning of the 1980s, studies on the system began in Cuba at the CENSA in order to develop a commercial product capable of achieving the desired results. Regulations established in the Code of Practices of the Codex did not facilitate its use, because they indicate the use of activating substances, a difficult aspect in the daily practice of dairy production. The studies carried out in Cuba contributed an important amount of new knowledge with regard to the level of thiocyanate in milk, and they established median values, extreme thresholds, overdose criteria, physiological factors related to the system, new applications in milk, etc.

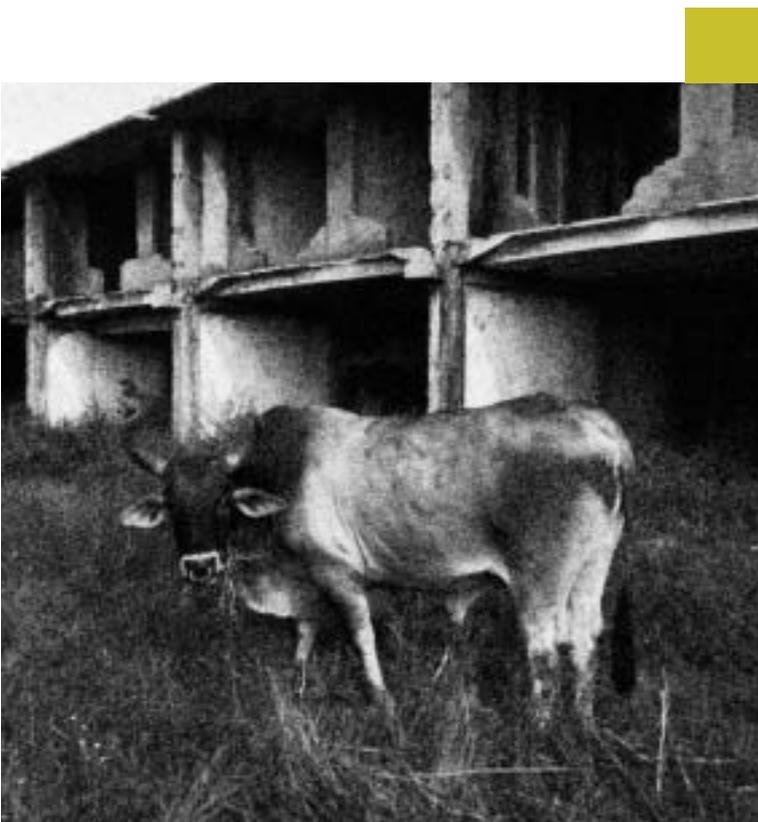


In 1988, CENSA devised an activator of the Lactoperoxidase System which came out on the market in a final version under the commercial name of STABILAK. The introduction of this product substituted the practice of using prohibited substances as inhibitors, chemical preservatives, antibiotics, etc., which harmed human health.

Since 1988 the product has been improving, with focus on the packaging, given the characteristics of one of the components. At present, studies are being conducted to introduce new ways of using it for different quantities of milk, facilitating its function and use, extending its effectiveness — and using the LPS in other liquid products and in solids.

THE PRODUCT ALLOWS FOR:

- Conservation of the initial quality of the milk in dairies without refrigeration facilities
- Conservation of the initial quality of unrefrigerated milk during transport and in industry
- Positive effects on cheese and dairy product production
- Elongation of the conservation time of the milk's initial quality for system reactivation, using STABILAK 2
- One collection of milk per day, in those areas where two collections were done previously; milking twice daily in those areas without afternoon milk collection
- Conservation of the initial quality of the milk without affecting the organoleptic conditions (odour, flavour, colour) of the milk and without modifying its chemical composition in any way
- Stimulation of the hygienic systems within the milking practices



The use and distribution of the product in Cuba has been carried out in collaboration with these institutions:

- Cuba's Ministry of Agriculture (field evaluation, approval, as well as widespread use in dairy products)
- Cuba's Ministry of Food Industries (evaluation of milk collection, effects on dairy products, control of widespread use and approval)
- Cuba's Ministry of Public Health (approval of the registry and advising on the technological components of manufacturing the finished product)
- Ministry of Science, Technology and Environment (research project funding)
- The FAO (support for validation and distribution of the product through the GLP)

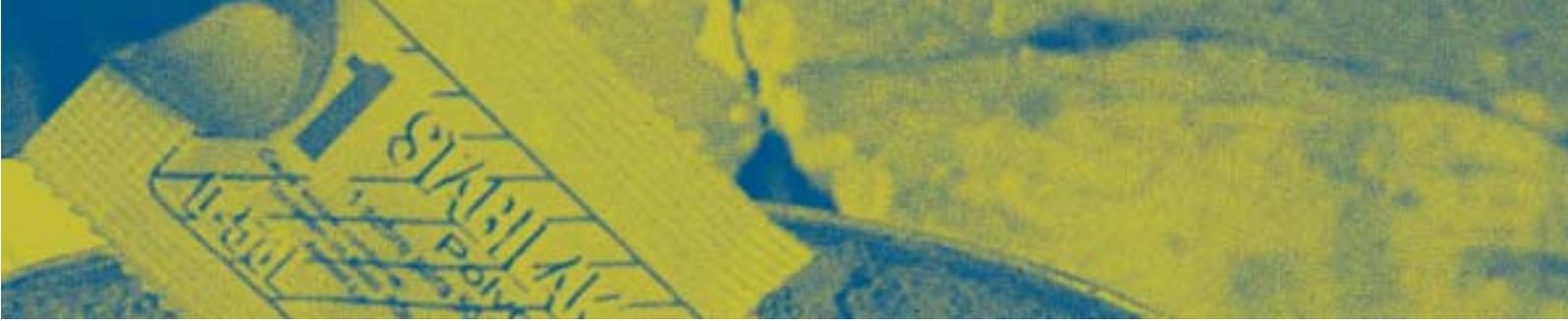


The following trials were carried out to evaluate STABILAK's capability:

- Laboratory studies to learn the effect on some indicators of the deterioration of milk over time, such as acidity and its composition as a function of the temperature and initial quality of the milk
- STABILAK's effect on the growth over time of different groups of micro-organisms present in milk
- Bacteriostatic capacity against pathogenic micro-organisms in previously contaminated milk
- Numerous studies on the presence of thiocyanate in milk and other trials for increasing the toxicological criteria and security of the product; relation between the LPS's characteristics and the physiological condition of the producing cow
- Trials for evaluating the effect of reactivation of the method, once activated a first time
- Evaluation of the effect of the technological processes on quality of the final dairy products
- Study of system's effect on goat and buffalo milk, on the milk of different bovine species, on refrigerated milk, on milk prior to pasteurisation, on time elapsed from milking to activation

In the milking barns and industries the following tests were performed:

- The ability to conserve the milk's initial quality in dairies with no refrigeration facilities.
- Quality controls on milk not refrigerated during transport and in industry.
- STABILAK's effect on the manufacture of cheeses and products made from milk.
- Prolongation of the conservation time of the milk's initial quality, through reactivation of the system using STABILAK 2.
- Test of expansion of the field — use of the commercial form of STABILAK in field conditions. Taken into account was its effectiveness in production conditions to be used simultaneously on seven dairy farms in Havana province, covering more than five million litres of treated milk that would have gone to waste without treatment.



- In Cuba in recent years more than 600 million litres of raw milk have been treated with excellent results and with no harm to human health being reported. Annually between 60 and 80 million litres of milk are protected with STABILAK; this represents a savings of the equivalent of approximately 30 000 metric tonnes of milk powder that would have had to be imported had the milk gone sour due to lack of refrigeration.
- In Havana Province there is a Centre of Goat Milk Production for children with an intolerance to cow milk. That milk, along with buffalo milk, has been treated with STABILAK.
- Cuba's Agricultural Ministry assigns an annual budget for manufacture of the product destined for businesses in the country.
- There are multiple applications in more than 20 countries with emphasis on the tropical regions.

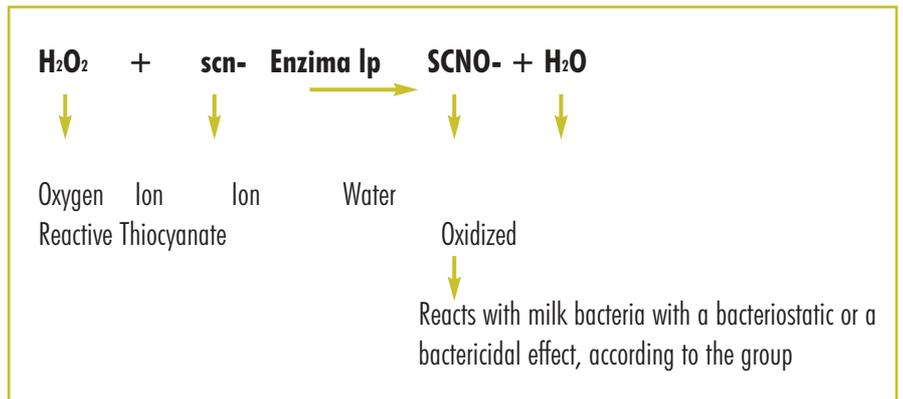


In relation to the final production, the aspects evaluated have been: active PRINCIPIOS; uniformity of doses; hermeticity; weight, hardness; organoleptic properties; evaluation of the biological activity.

Experiments as well as practice have shown the effect of activation of the Lactoperoxidase System, the possibility of reactivation lengthening the time of its effect, and characteristics of its components in the tropics. A commercial product was devised which allowed for quick, simple and economic use that does not affect the producing of dairy products and does not harm human health. Valuable experience was obtained during its extensive use over more than a decade and a control system was established. Many beneficial criteria for use in other countries were established. Ample recognition at the national and international levels was received, which culminated in having won the Gold Medal of the World Organization for Intellectual Property.

STABILAK in practice

The **lactoperoxidase** system, at the basis of Stabilak, is constituted of three components which meet in the mammary gland: the lactoperoxidase enzyme, a milk's natural protein, ions of thiocyanate, which have origin in the liver, and reactive oxygen which originates from the leucocytes, or within the white blood cells. The reaction brings about the oxidation of the ions of thiocyanate, which merge with specific components of the bacteria, generating bacteriostatic (impeding their reproduction) and bactericidal (eliminating the bacteria) effects.



The product comes in two formulas, known and identified as STABILAK 1 and STABILAK 2. Both formulas come in the form of a powder, in pre-measured hermetically sealed packets, one for an average volume of 50 litres, and another for 500 litres. The STABILAK 1 formula also comes in tablet form, in a bottle of ten tablets each, for a 50-litre dose. The same formula for 500 litres can also come in an hermetically sealed bottle, with the amount of powder for that volume.

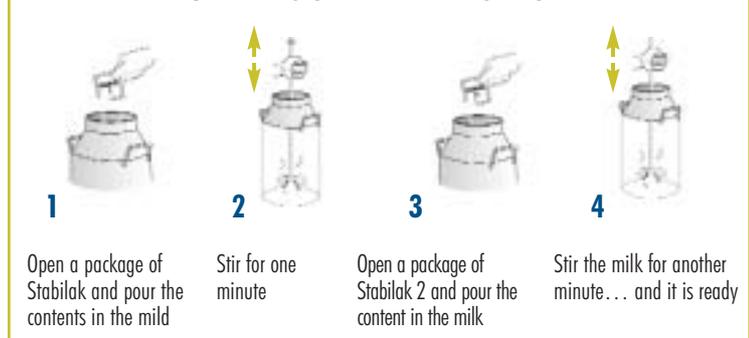
Additional doses of 50 of STABILAK 1 and STABILAK 2 for every multiple of 50 litres in the container, adjusted for every 25 litres.

- In the case of 500 litres, proceed as above, except that adjustments are made by 250-litre volumes. So for 545 litres, first the packet of STABILAK-500 is added and mixed for two minutes and immediately a packet of STABILAK-2 is added and the mixture is again mixed for two minutes.

THE STAGES OF THE METHOD ARE AS FOLLOWS:

- The volume of milk to be treated is determined by approximation.
- For every 50 litres of milk, one packet of STABILAK 1 is added, and the milk is mixed for two minutes. If tablets are used, another tablet is added. If the volume is 100 litres, two additional packets of STABILAK 1 are added, and it is mixed in a similar fashion.
- A packet of STABILAK 2 is added right away and mixed for two minutes. If 100 litres are being treated, two packets are added.
- For intermediate volumes, the adjustment made is 25 to 74 litres for every 50-litre dose.

UTILIZING STABILAK IN 4 STEPS



Both the 50-litre dose and the 500-litre activator of the LP system are packaged in boxes for 2 500 litres, stable for a minimum of 9 months at room temperature.

Results

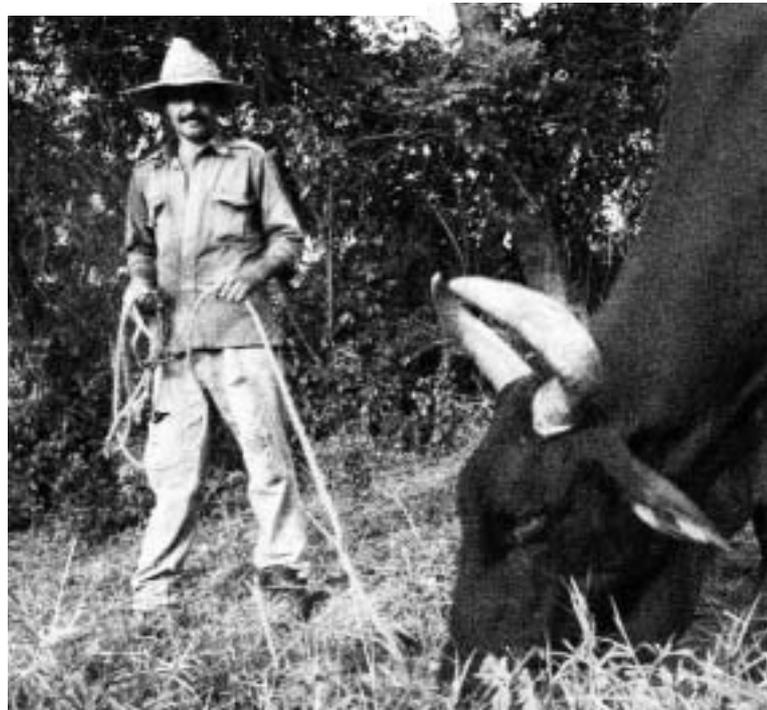
STABILAK has made it possible to treat more than 600 million litres of raw milk in Cuba, representing a third of the total annual production, with excellent results and with no reported harm to human health. Annually between 60 and 80 million litres of milk are protected with STABILAK, which means avoiding the loss of approximately the equivalent of 8.000 metric tonnes of milk powder which would have to be imported if the milk soured due to lack of refrigeration.

STABILAK is used for different types of milk: cow, goat, sheep and buffalo

The product costs less than 2% of the average price (to the producer) of a litre of milk, and its comparative cost is generally less than the cost of refrigeration.

The results obtained in Cuba coincide with those obtained in other countries in the Americas. The most important result is that with the continuous use of the activation of the Lactoperoxidase System (in Cuba since 1992 and in other Latin American countries), there have been no cases reported of harm to consumer health, nor harm to the milk's organoleptic characteristics.

The product has been used successfully in all 14 provinces of the country. There is experience in its use along the entire agro-industrial chain: small producers, dairy cooperatives, large enterprises, dairy industries. STABILAK is used in a variety of conditions: systems of collection in cans, cistern vehicles, intermediate collection centres and direct distribution of raw milk.



In terms of the product's impact, here are some other quite interesting results:

- No change has been noted in the production of dairy products, and in general it improves the quality of the products.
- It increases the amount of cheese produced, on the order of 0.5Kg per 100L of milk.
- It produces excellent results in milk cooled for long periods (48-72 hours on weekends).
- It improves the pasteurisation process of the milk that has been previously activated.
- It allows for the elimination of the use of products banned by international regulations and that harm human health due to their residue, toxicity and alterations of the milk components, which cause a decrease in the output of dairy products and always affect the intrinsic quality of the milk. The method is a natural enzyme system approved by the Codex Alimentarius and harmless to human health.
- It decreases losses of milk due to souring and conserves the initial quality of the milk.

- It does not interfere with the tests for adulteration by dilution with a lactodensimetre, nor the crioscope. It does not interfere with tests to determine if antibiotics or any other substances foreign to milk are present.
- It makes possible the development of dairies in areas without electrical power.
- It improves the quality of dairy products, with emphasis on small-scale cheese production. It does not interfere with the production of fermented products.
- It facilitates the collection and transport of milk over long distances.
- It allows for the conservation and distribution of milk to the population in disaster situations.
- It reduces the risks of illness caused by contaminating micro organisms in the milk.
- It can be used for cow, goat, sheep, buffalo and camel milk.
- It is easy to use, and with the established control mechanisms, may be used by people with no specialised technical preparation.

Under the average conditions of developing countries, the added cost to one unit of reference, in this case one litre of milk, is about five tenths of a cent (in US\$), or 0.5 cents/litre. This means that 50 litres of milk may be kept for an approximate cost of 25 cents, which at the selling price of these countries, means that for the sale price of one litre, 49 litres may be kept fresh. This is less than, or at least similar to, the cost of electrical power used for refrigeration.

For a herd that produces between 50 and 85 litres of milk, the value of one day's loss of production due to souring could cover the cost of using the activating product for one month's worth of production, with losses avoided.

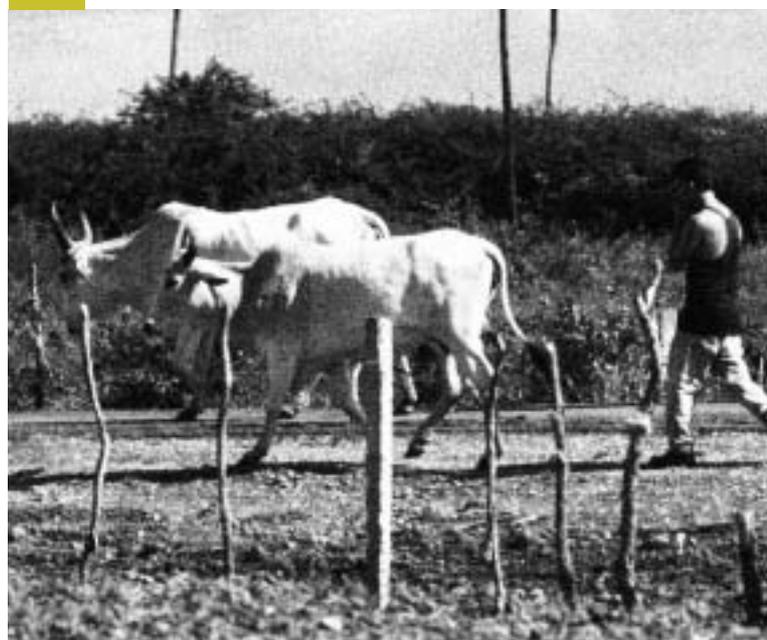
Keeping in mind that the use of the activator makes possible double milking in areas where milk is not collected in the afternoon, the increase in production in one day could cover the costs of keeping one month's worth of that second milking fresh.

The possibility of extending the shelf life of products on the market, be it raw or pasteurised milk, fresh cheeses, creams and so on, would in itself justify the use of the LPS at the commercial level.

Nevertheless, the most important advantage of STABILAK is the possibility it offers to continue or expand milk production in areas where it is currently almost impossible to do so; to improve the quality of the raw material and product derivatives; and to avoid any other method that is prohibited or harmful to human health.

The validity of the innovation has been demonstrated within the country and also internationally: there is currently a worldwide FAO programme for encouraging the use of the Lactoperoxidase System.

The many advantages associated with use of the product, as mentioned above, contribute significantly to a favourable cost/benefit balance.





International interest

With the spread of this scientific discovery throughout the country, CENSA has received very significant recognition, including:

- The National Prize from Cuba's Academy of Sciences, Havana, 1997
- Outstanding Recognition, Cuba's Seventh National Forum of Science and Technology, 1997
- The Prize to the Outcome with Greatest Economic Impact, from Cuba's Ministry of Higher Education, 1999

Field studies have been carried out with institutions and businesses from more than 20 countries, including Argentina, Bolivia, Brazil, Chile, China, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guinea, Honduras, Mexico, Nicaragua, Paraguay, Peru, the Dominican Republic, Uganda, Uruguay, Venezuela and Vietnam.



STABILAK has received extensive international recognition, including:

- A Gold Medal from the World Organization for Intellectual Property (OMPI), for the invention of "A practical method for conserving raw milk", Havana and Geneva, 2002
- A Gold Medal at the 24th Salon International des Inventions, Geneva, Switzerland, 1996
- The Prix Ecologique from the Office for Commercial Promotion Favouring Developing Countries (OSEC) Geneva, Switzerland, 1996
- A National Prize from Cuba's Academy of Sciences, Havana, 1997
- Outstanding Recognition from Cuba's Seventh National Forum of Science and Technology, 1997
- The Prize to the Outcome with Greatest Economic Impact, from Cuba's Ministry of Higher Education, 1999

The FAO has sponsored research and the promotion of the use of the Lactoperoxidase System with the creation in 1998 of the Global Lactoperoxidase Programme (GLP). In the framework of the programme, extensive trials on the product have been run in Venezuela, Colombia, Mexico and Honduras, with the support of other sponsors.

Adopting STABILAK in other countries

Cuba's National Centre for Agricultural Sanitation (CENSA) is willing to lend technical assistance for the installation of the STABILAK production plant, for correct use of the product, for implementing integrated programmes for improving milk production and quality, reorganising of milk collection systems, and so on. Support can be provided also for negotiation activities with the local interested parties, always in compliance with the local laws.

STABILAK may be produced or marketed by, among others, a government or private organization, the dairy industry or producers' organizations, as well as by international development programmes.

One of the basic elements of this innovation is its social impact, as it is directed at a group which requires a great deal of support for starting or maintaining a dairy at a competitive level,

something that would benefit the family and the community immensely. At the cultural level, the product involves several training activities for producers that reinforce better milking practices and hygienic handling of the milk. Consumers get a product which is safer and of higher quality. At the financial level production is relatively simple and does not require a high investment to set up or run.

Use of the activating product of the LPS is very simple and designed for any person, even with a low level of scholarization; it can be used without major risks of committing errors. STABILAK's design allows for the quick and safe identification of each formulation and volume. Nevertheless, each user always requires practical instruction. It is preferable to use it within a programme for improving the production and quality of the milk, one which reinforces good handling and hygienic practices while milking and afterward. It must be emphasised that the effects are better and longer-lasting if the milk used is of better quality.

THE FOLLOWING EQUIPMENT IS NEEDED FOR PRODUCING STABILAK

1. A sealing machine
2. A stove, to dry the raw material
3. A sieve
4. A rapid, digital and automatic scale
5. A digital weighing machine (up to 15 KG)
6. A dehumidifier
7. Air conditioning



In Cuba, the innovation is managed by the National Centre for Agricultural Sanitation, which is part of the Republic of Cuba's Ministry of Higher Education. The Ministry produces and markets the product. National legislation regulates types of marketing with other countries and allows for the production and marketing of this product in other countries.



It is advisable to involve the following institutions for producing and using STABILAK in any country:

- The Ministry of Agriculture
- The Ministry of Food Industry
- Cuba's Ministry of Public Health
- The Ministry of Science, Technology and Environment
- The FAO, which has a project that includes several countries on every continent (the Global Lactoperoxidase Programme).

It may be useful to consult the following regulations:

- Code of Principles Regarding Milk and Dairy Products (FAO-WHO Document CX-5-70, 1991)
- Global Lactoperoxidase Programme (GLP) documents, from the FAO

To obtain the adequate authorizations from the health departments, within each country, is a necessary condition for utilization and commercialization purposes.

The necessary costs for production and use of STABILAK should be subject to careful analysis in each country and situation, depending on the means available to each country/situation (for example, product import, setting up a factory in the country in question, technical assistance, etc.).



To learn more

For more information about the different aspects of production and use of STABILAK, you may contact directly:

Ing. Pastor Ponce Ceballo, Ph.D.
Centro Nacional de Sanidad Agropecuaria, CENSA
Apdo. 10, San José de las Lajas, La Habana, Cuba
Email: pastor@censa.edu.cu

Information is also available on the FEPALE web page: INFOLECHE; see www.fepale.org

BIBLIOGRAPHY:

- Ponce P., López, M. G. and Martínez E. 1987. Conservación de leche cruda mediante la activación del sistema Lactoperoxidasa. *Revista Salud Animal*, 9:120–128.
- Ponce P., Capdevilla J., Alfonso A., López M.G., León R., and Taguada A. 1992. Conservation of raw milk through activation of Lactoperoxidase system in Cuba; *World Animal Review*, 73:31–41.
- Ponce P. 2001. National and international experience of Cuba in the application of the Lactoperoxidase system for the conservation of raw milk. Abstract of the Third International Meeting of the Global Lactoperoxidase Programme. Havana, Cuba, 26–29 March 2001.

Who to contact

Centro Nacional de Sanidad Agropecuaria (CENSA), Cuba

Ms. Lydia M. Tablada Romero
Director
San José de las Lajas, Apdo. Postal 10. La Habana, Cuba
Tel. (53) 64 - 63206
Fax. (53) 64 - 98104
E-mail: lydia@censa.edu.cu

Mr. Ondina Leon Diaz
Shop Director
San José de las Lajas, Apdo Postal 10. La Habana, Cuba
Tel. (53) 64 - 63677
Fax. (53) 64 - 98104, 63897
E-mail: ondina@censa.edu.cu

Mr. Pastor Ponce Ceballo (Ph.D.)
San José de las Lajas, Apdo Postal 10. La Habana, Cuba
Tel. (53) 64 - 63145
Fax. (53) 64 - 98104
E-mail: pastor@censa.edu.cu



The IDEASS Programme – Innovation for Development and South-South Cooperation – is part of the international cooperation Initiative ART. IDEASS grew out of the major world summits in the 1990s and the Millennium General Assembly and it gives priority to cooperation between protagonists in the South, with the support of the industrialised countries.

The aim of IDEASS is to strengthen the effectiveness of local development processes through the increased use of innovations for human development. By means of south-south cooperation projects, it acts as a catalyst for the spread of social, economic and technological innovations that favour economic and social development at the local level. The innovations promoted may be products, technologies, or social, economic or cultural practices. For more information about the IDEASS Programme, please consult the website: www.ideassonline.org.

ideass

Innovation for Development and South-South Cooperation



ART - Support for territorial and thematic networks of co-operation for human development - is an international co-operation initiative that brings together programmes and activities of several United Nations Agencies. ART promotes a new type of multilateralism in which the United Nations system works with governments to promote the active participation of local communities and social actors from the South and the North. ART shares the objectives of the Millennium Development Goals.

In the interested countries, ART promotes and supports national co-operation framework programmes for Governance and Local Development - ART GOLD. These Programs create an organized institutional context that allows the various national and international actors to contribute to a country's human development in co-ordinated and complementary ways. Participants include donor countries, United Nations agencies, regional governments, city and local governments, associations, universities, private sector organizations and non-governmental organizations.

It is in the framework of ART GOLD Programmes where IDEASS innovations are promoted and where cooperation projects are implemented for their transfer, whenever required by local actors.