

BIORAT A NATURAL BIOLOGICAL RODENTICIDE
AGAINST RATS AND MICE

IDEASS ^{CUBA}

Innovation for Development and South-South Cooperation



Introduction

By Daniel Morhaim and Reinaldo Espino Llerena

BIORAT is a natural rodenticide which is highly effective against rats and mice. Since the earliest times, the development of human settlements has been accompanied by plagues of rats. These animals are detrimental both to human health and economic occupation, and, at times, have led to unsustainable situations for human habitation and activity.

It is a pest that has skilfully adapted to very different living conditions and has spread indiscriminately to all latitudes. The problem has been aggravated by the action of humans, who, in building settlements and setting up economic activities have constantly provoked ecological unbalance. This, in turn, has led to the uncontrolled growth of rodent populations all over the world.

Traditional ways of combating these pests have proved ineffectual. These have included a great variety of methods, ranging from physical persecution, to mechanical and electrical traps, to toxic chemical substances, which came into use primarily during the 20th century as an alternative means of control. These chemical substances have been indiscriminately and intensively applied for decades, causing an increasingly contaminated environment and provoking serious harm to other animal species, including humans.

In response to this problem, LABIOFAM (Biological Pharmaceutical Laboratories of CUBA) developed a biological rodenticide that makes use of a rat specific pathogen isolated at the end of the 19th century. This led to the production of BIORAT, the only product presently on the market that can guarantee:

- Highly effective and demonstrable control of rats and mice in urban, industrial and rural areas, applicable in the most varied climates and conditions
- Total harmlessness towards other animal species
- Environmental friendliness and high biodegradability
- Long time spans between repeat applications because of its multiplier effect
- Broad spectrum of action since effects are transmitted through infection.





The creators of BIORAT are doctors Reynaldo Espino Llerena, José A. Fraga Castro and Juan G. Bornote Romero.

This product has been successfully implemented in 22 different countries in Latin America, Africa, Asia and Europe. It has been successfully used in combating the pest as part of preventative health campaigns, during epidemics caused by Bubonic Plague, Leptospirosis, Hemorrhagic

Fever, Murine Typhus and Hantavirus, and controlling rat infestations in various crops, storehouses and industrial plants.

Ever since it was first used in Cuba in 1985, BIORAT has achieved numerous recognitions by national and international bodies. In Cuba, BIORAT is recognised by the Cuban Industrial Property Office and various national ministries. Abroad, BIORAT is recognised by public health and agricultural institutions, private companies and specialised agencies belonging to the United Nations, such as PAHO/WHO, FAO and UNDP.

From the point of view of industrial property, BIORAT is registered in 21 countries and the technological process is patented internationally. It has been validated by the "Pedro Kouri" Institute of Tropical Medicine, which works closely with the World Health Organisation.





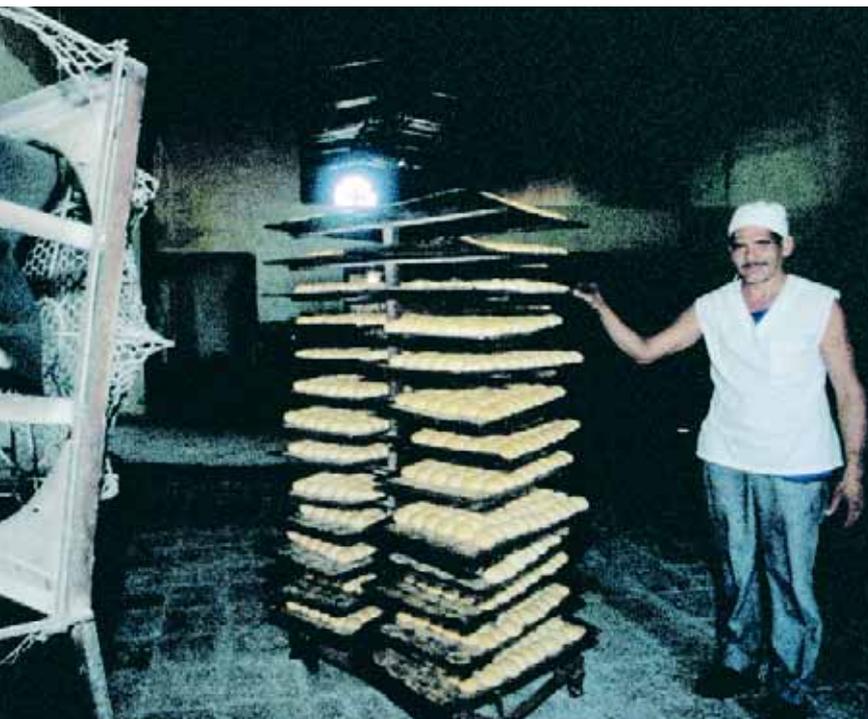
What problem does it solve?

Towards the end of the 19th century, during studies on epidemics affecting rat populations, a bacterium was isolated in Europe. This was identified as causing a lethal illness in rodents, producing a case history of abdominal typhus. Over the years, efforts were made to develop an industrial product which could exploit the effects of this micro-organism in the fight against rats and mice, but without success. At the same time, other products were developed with bacteria of the same family as the one that had been isolated, but due to the embryonic scientific knowledge of those times, the ones chosen were not specific to rats and mice, and provoked, at that time, harm and infection to other animal species.

From 1967 to 1985 studies were carried out on this agent, at first by the 'Academia de Ciencias de Cuba' and later by the 'Empresa de Laboratorios Biológico Farmacéuticos LABIOFAM', which came to a successful conclusion in 1985 with the development of Biorat. The same year, industrial production began and it was used in health campaigns conducted in Cuba.

BIORAT is a combination of three components:

- The bait is a particularly enticing mixture that induces rats and mice to consume the product. Trials were conducted on various types of grain, and it was decided to use whole rice, because it is highly palatable to these animals and can be easily obtained all over the world.
- The micro-organism in question is a specific pathogen with the following characteristics: Strain: Salmonella enteritidis; Plasmid: 59, 4, 3 MDa; Phago-type: VI; Differential biochemical characteristics: Lysine-negative. Its most distinctive characteristic is that it only affects rodents through the plasmid 59 MDa, which carries the virulence (spv) genes which are specific to rodent species. It should be pointed out that bacteria from this family causing illness in human beings and other animal species possess plasmids 30, 36 and 38, and phago-types 4, 8, 13 and 13a, none of which are present in the strain utilized in BIORAT.
- The immunosuppressive used is a substance based on coumarin, which, if used in low concentrations, weakens the pest's immune defences against attack from the bacteria contained in the product.

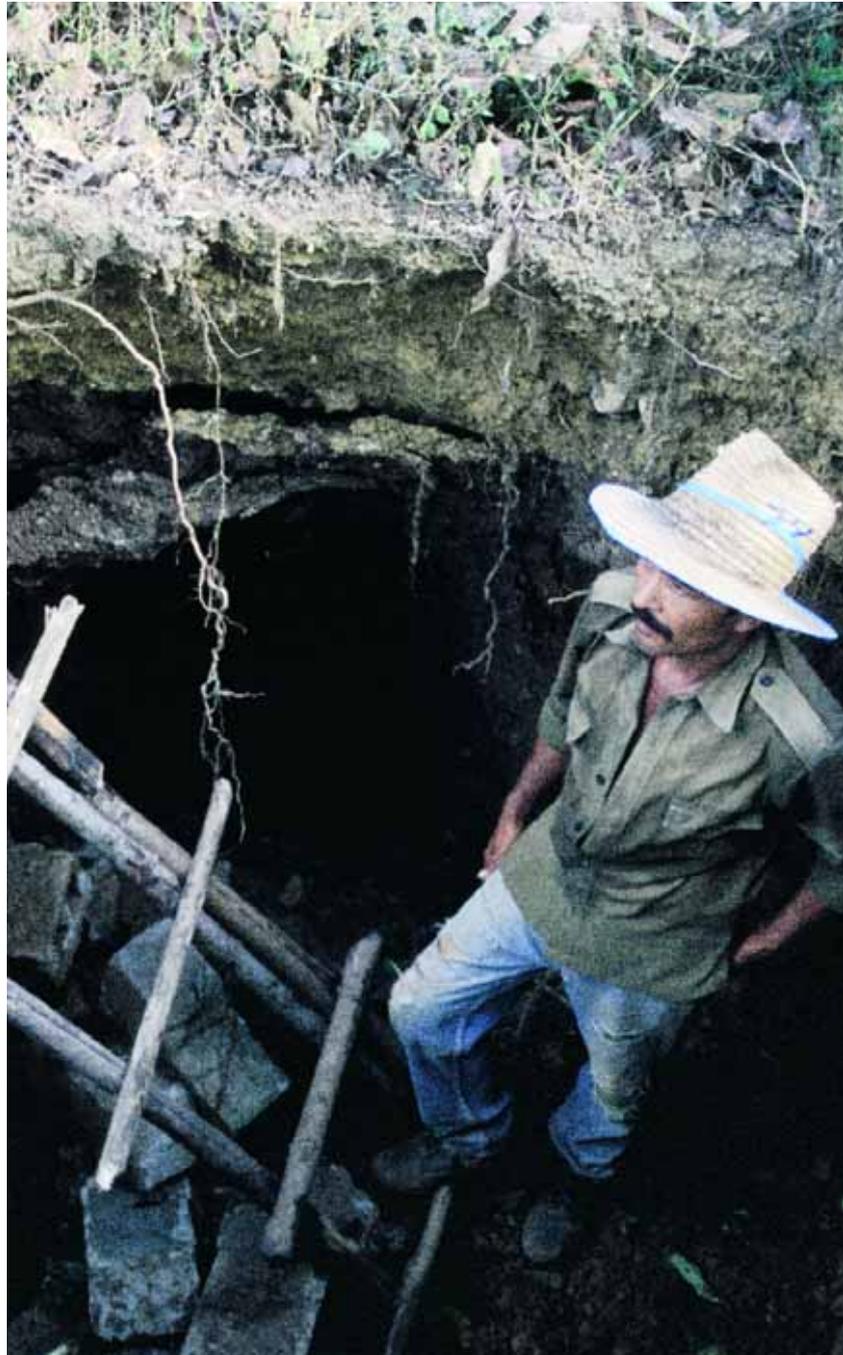


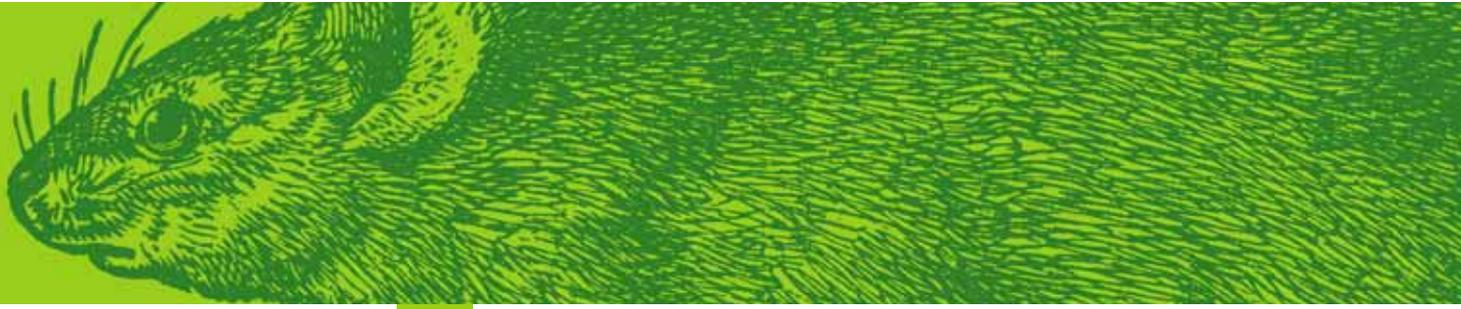
From the point of view of industrial property, BIORAT is registered in 21 countries and the technological process is patented internationally. It has been endorsed by the "Pedro Kouri" Institute of Tropical Medicine, which works closely with the World Health Organisation. A complete record of the clinical, laboratory and field tests conducted on this product is available.

Biological control of rat and mice colonies through Biorat has the following advantages:

- Rats and mice die after only one application.
- It is effective in all cases, including ones where colonies are resistant to anticoagulants
- Rats do not hesitate to take the bait
- It does not affect man or domestic animals, and no antidote is necessary if ingested accidentally
- It is more than palatable to rats and mice, which do not need to go in search of water since the BIORAT bait provides it for them
- It produces a deadly epizootic among rodents, affecting those that have not consumed it
- It is biodegradable, and does not contaminate the environment
- It does not create resistance nor rejection among rat and mice populations
- Rats and mice prefer it to other foods where alternatives are available
- Two applications a year are enough to keep the pests under control

At present, plagues of rats produce serious harm to both health and the economy all over the world. From the health point of view, rats are linked to the propagation of more than 60 different illnesses. In material terms, they account for losses amounting to more than 2,000 million US dollars, or the equivalent of about 4% of world production.





Biorat in practice

In practical terms, the Biorat pest control method is used in anti-rat campaigns. The aim of the campaigns is to reduce rat and mice populations to levels that do not represent a risk for health and the economy. Generally speaking, control involves two main types of objectives:

- Agricultural objectives, involving the protection of crops
- Urban objectives, involving residential buildings, industrial plants, warehouses, tourist facilities and other areas that can be found within the perimeter of urban areas.



INFESTATION INDEX AND CONTROL REQUIREMENTS

- Urban areas: when index is over 10%
- Agricultural areas: when index is over 10% or damage represents more than 3% of crop value

At present in Cuba, the greatest economical damage is caused in grain, coconut, sugar cane and coffee plantations.

STAGES IN AN ANTI-RAT CAMPAIGN

- **Recognition.** Technical team members conduct site visits and make sketches of the targeted area specifying, in urban areas: number of houses, warehouses, industrial plants, open areas, paths and access routes to communities, boundaries, number of inhabitants; in rural areas: crop type and area, number of houses, warehouses, industrial plants, open areas, paths and access routes, and boundaries.
- **Pest type.** The types of rats and mice in the area to be disinfested are determined.
- **Requirements.** Product requirements are calculated on the basis of the number of houses and/or facilities, the area of each locality, or crop type and area.
- **Logistics.** The necessary quantities of the product are purchased and distributed; equipment and other materials are put into place; trained personnel take part in campaigns.
- **Application.** BIORAT is applied according to a previously drawn up action plan.
- **Evaluation.** Finally, the results of the campaign are assessed and follow up phases are prepared as part of a permanent and sustainable disinfestation activity.

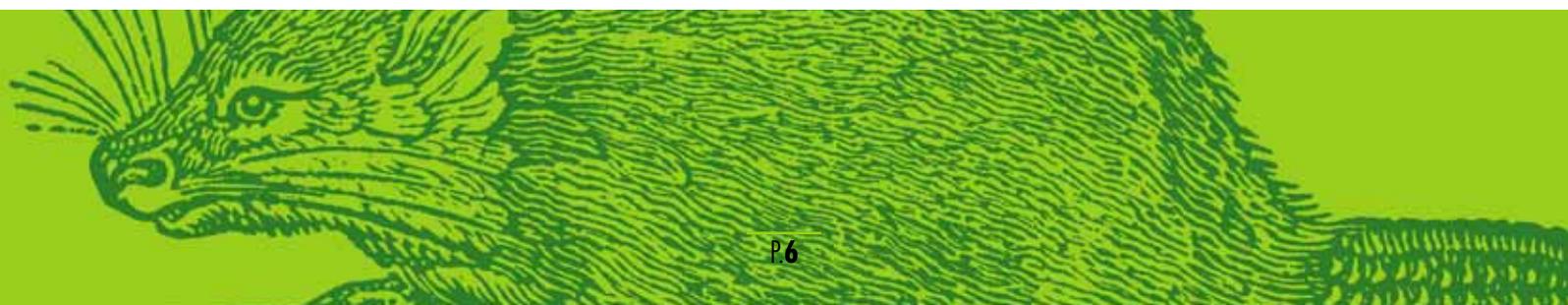
STAGES IN PROGRAMMED ACTIVITIES

ACTIVITIES	JAVET			
Urban areas				
• Coordination with regional, national and local authorities	X			
• Work meetings conducted with executive offices of areas concerned	X			
• Training of local authorities and community leaders	X			
• Damage assessment and infestation index	X	X		
• Application of rodenticide	X	X	X	
• Assessment and reports of results	X	X	X	X
Rural areas				
• Coordination with farmers' organisations	X			
• Work meetings conducted with executive offices of areas concerned	X			
• Training of selected personnel	X			
• Assessment of damage and infestation index	X	X		
• Application of rodenticide	X	X	X	
• Assessment and reports of results	X	X	X	X

The practical results that have been achieved in 18 years of experience in the utilisation of BIORAT are directly related to the specific location in which it has been applied, since this has a decisive effect on the final effectiveness of the application.

The mean average figures detailed below were recorded in different localities, and show the great effectiveness of the product.

APPLICATION AREA	EFFECTIVENESS (%)
Closed urban areas	99
Mixed urban areas	95
Industrial areas and warehouses	98
Crops	93



Results

Biorat is a registered trademark and is used in 12 Central and Southern American countries, 3 African countries and 7 countries in Eurasia. Use of this product is on the increase for the following reasons:

- It causes no harm to other species, man, or the environment.
- Its advanced technology means it can increase knowledge of biological mechanisms and modes for controlling pests both among the personnel employed in application campaigns and the people concerned, who can see the beneficial effects of the method.
- It arouses interest among health authorities and industry, because the method used sets it apart from traditional forms of pest control, which are harmful and have little effect.
- It is recognised by the competent authorities because of its beneficial effects on health.
- It quickly leads to increased economic productivity in areas where it is employed.
- It is sustainable, since it is made up of elements that are easily obtained anywhere in the world.



Cost benefits – yearlong treatment per hectare using traditional chemical products (with poor results and damage to the ecosystem) requires 150% and 300% more resources than are needed for the treatment of the same area with BIORAT, which provides effective results and does not produce secondary effects.

In practical terms, the product works as follows:

Day 1	BIORAT is applied
Day 4	First deaths
Day 14	Last direct deaths
Day 30	Deaths due to epizootic
Effectiveness	From 93 to 99 %
Repeat application	From 6 months to a year



International interest

Due to the indubitable advantages that the Biorat method brings to the control of rodent plagues, different national and international organisations have promoted the use of this rodenticide.

Within the national sphere, support has come from various health ministries in the countries where it has been applied, at the central, provincial and local levels.

Secondly, it is backed by the agriculture ministries of the different countries where this product has been used for the protection of crops.



Finally, innumerable entrepreneurs, industrialists and farmers have benefited from the product.

Internationally, the use of Biorat has received the backing of the Pan American Health Organization (PAHO), the United Nations Development Programme (UNDP), and the United Nations Food and Agricultural Organisation (FAO)

Adopting Biorat in other countries

Procedures for the utilization of BIORAT in other countries are the same as for other biological products.

IMPORTING BIORAT

Sequence of procedures for importing Biorat is normally as follows.

- An accredited local organisation for the importation and registration of this type of product is identified and agreement is reached.
- The following documents are signed by Labiofam S.A. and the local organisation:
 - Agency agreement.
 - Non-disclosure agreement.
 - Powers of attorney to represent Labiofam S.A. before the registration authorities.
- Labiofam S.A. provides the local organisation with the necessary documentation.
- Trademark registered and product included in health register. Although procedures may vary from one place to another, they generally depend on health and agriculture ministries, and the authorities responsible for receiving applications, examination and approval.
- Commercialisation of the product.

There have been occasions in which, because of urgent health requirements, the governments concerned have given temporary authorisation for the commercialisation of the product without having to go through steps 3, 4 and 5.





LOCAL PRODUCTION OF BIORAT

Another option is to produce the product locally in the country concerned, for which, once the above-mentioned steps have been completed, the creation of some form of economic partnership with a local organisation is needed. The next steps are as follows:

- A market study of the area where commercialisation is planned is carried out to define technical requirements and the size of the production plant.
- An economic feasibility study is conducted to assess the viability of the project and the capital required for investment.
- Parties negotiate and agree on the contributions that each is to make towards the establishment of the partnership.
- Legal documents establishing the partnership are discussed and drawn up, as also the norms for administration, control and management.
- Competent authorities of the countries involved approve the investment and partnership projects. This procedure generally involves institutional organs responsible for foreign investment, science and technology, construction, industrial property, and the central bank.
- Investment is carried out.
- New enterprise comes into operation.

From the cultural, scientific and technical point of view, no special conditions are required for the utilisation of the product. As a rule, LABIOFAM includes in the package not only the product itself, but also technical assistance to support representatives in the registration process and for laboratory and field demonstrations. LABIOFAM also guarantees training of personnel in the application of the product and on-site supervision of application operations.

In cases where a partnership is to be set up with the aim of producing and commercialising the product in the applicant country, specialists and technical experts would be required in the fields of microbiology, biochemistry and physical analysis, as well as laboratory chemists, mechanical and electrical technicians and workers.

A factor to take into account in some countries is that rats can form part of religious certain beliefs and must be given due regard. Special treatment is necessary in such cases, in accordance with the customs of the area.

The Cuban organisation that is at present responsible for the production and commercialisation of BIORAT is the industrial group LABIOFAM through its trading company Labiofam S.A.

As mentioned above, LABIOFAM can provide all the necessary technical assistance required in the utilisation of the product, including registration procedures, personnel training and post sales services.





To learn more

Over the years, abundant literature concerning work on Biorat has been developed by LABIOFAM S.A., consisting mainly of:

- Clinical papers regarding the innocuousness of Biorat for both man and other animal species.
- Results of laboratory tests and fieldwork carried out on Biorat.
- Results of Biorat application campaigns in different countries.
- Recognition papers from various national and international organisations.
- Scientific reports on the product.

Contacts

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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.

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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.