EPI Newsletter

Expanded Program on Immunization in the Americas

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UNICEF Boosts Revolving Fund Capitalization

UNICEF has contributed $500,000 to the EPI Revolving Fund for the purchase of vaccines and related supplies, the first installment of a possibly larger contribution to the Fund's capitalization. This brings total capitalization of the Revolving Fund to over $2.8 million, or 70 percent of the $4 million originally estimated as necessary to cover full operations.

The Regional Director of UNICEF for the Americas announced the contribution on 29 September, during the 29th meeting of PAHO's Directing Council. It is part of a more comprehensive PAHO-UNICEF agreement providing for closer cooperation in health programs in Latin America and the Caribbean.

UNICEF has been a close partner of PAHO/WHO since the beginning of EPI implementation. This concrete support to the PAHO Revolving Fund will significantly increase the Fund's capability to assure that countries in the Region of the Americas have a reliable supply of high quality, low cost vaccines.

EPI in the Americas: A Regional Overview

All countries in the Region of the Americas are committed to the implementation of the Expanded Program on Immunization (EPI). The five major areas of PAHO's technical cooperation are related to **training**, purchase of vaccines and related supplies through the operation of a **Revolving Fund**, development and implementation of the **cold chain**, development of immunization information systems and dissemination of **information**, and comprehensive program **evaluation**. Operational **research** is promoted particularly on morbidity and mortality of the target diseases and on cost-effectiveness of different program strategies.

Training and Research

One of the main components of the EPI is the training of health workers at all levels on the various aspects of program planning, implementation and evaluation. From the time EPI training activities were launched in early 1979 to the end of 1982, nearly 10,000 health workers attended these workshops.

In 1982 the Cold Chain Regional Focal Point established by PAHO in collaboration with CIMDER (*Centro de Investigaciones Multidisciplinarias en Desarrollo*) and the *Universidad del Valle* in Cali, Colombia, started special training workshops for cold chain repair and maintenance. The first course, held in Colombia, was attended by cold chain technicians from Colombia, Honduras, and Paraguay. With the previous two cold chain maintenance courses held in Peru in 1981, the number of technicians trained in the Region is over 25.

The Regional Office has entered into an agreement with the Government of Colombia to establish the Cold Chain Regional Focal Point, and with the Government of Brazil to support a training and research institution in conjunction with the National School of Public Health (ENSP) in Rio de Janeiro and the Special Public Health Services Foundation (FSESP). The National School of Public Health in Rio de Janeiro is preparing training material, particularly for use at the local level, with emphasis on surveillance of the target diseases, and is also involved directly in the training of health workers at the state level.

A cooperative study to help determine the best age for measles immunization in Latin America has been conducted in collaboration with the Ministries of Health of Brazil, Chile, Costa Rica and Ecuador.

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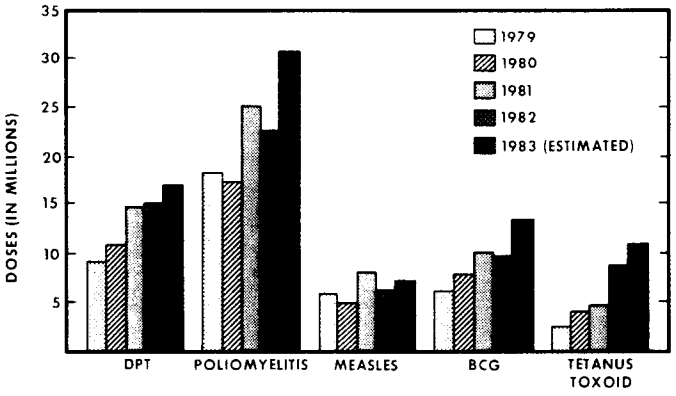
Operational research has also been initiated with regard to the morbidity and mortality associated with measles and neonatal tetanus, and the cost-effectiveness of different strategies for vaccine delivery services. Results of these studies are expected to be available in 1983.

In the field of cold chain research and development, the Regional Focal Point in Cali, Colombia, has embarked on a global testing program to identify the proper equipment for use within the cold chain.

Revolving Fund

Figure 1 shows the number of doses of each of the five vaccines procured through the Revolving Fund for the period 1979-1982 and the estimated 1983 requirements. As can be seen, there has been a substantial increase in the amount of vaccines purchased over these four years, during which the value of orders placed has been more than US$ 18 million.

FIGURE 1. Revolving Fund vaccine procurements. Region of the Americas, 1979-1983.



In spite of certain financial problems due to undercapitalization and inability to accept local currencies from several countries in 1982, the Fund's procurements have helped to control vaccine costs during a time of rapid inflation. At a time when pharmaceutical prices have risen by 41 percent, only polio and measles vaccine prices have increased (by 33-35 percent), while prices for all other EPI vaccines registered declines. The EPI Revolving Fund facilitates production planning and assures manufacturers a reliable cash flow.

By the end of 1982 the quality of the vaccines used in over 95 percent of the countries and territories in the Americas was known to conform to WHO requirements.

The Revolving Fund is presently capitalized at US$2.3 million.* However, to satisfactorily provide for the expansion of the immunization program in the Region, it is hoped to increase this amount to the authorized level of US$4 million.

* US$2.8 million including UNICEF contribution (see article on page 1).

Evaluation

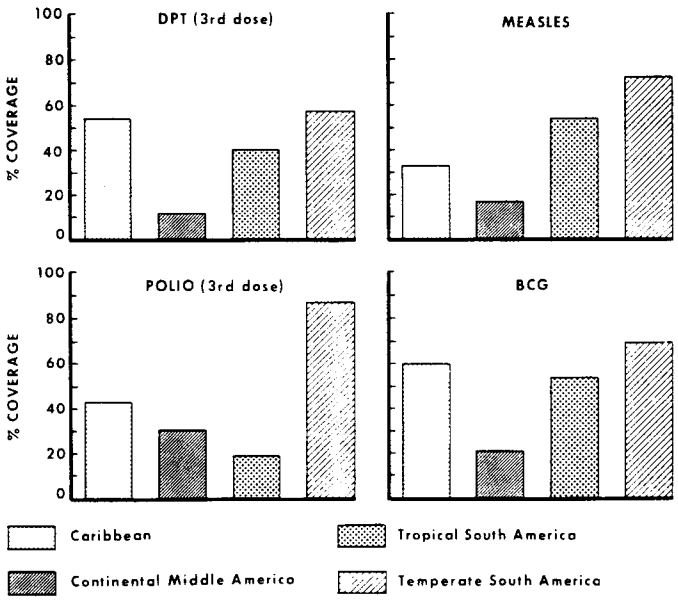
As most countries are gearing their activities toward the increase of immunization coverage, particularly to the high-risk groups of children under 1 year of age and pregnant women, program evaluation assumes increasing importance so that national authorities can identify problems that are hampering program implementation, analyze possible alternatives for solving them, and adjust their programming accordingly.

PAHO has developed and tested a **comprehensive multidisciplinary evaluation** methodology, which was first applied in Colombia and Bolivia in late 1980.

Up to the end of 1982 evaluations had been carried out in Argentina, Bolivia, Colombia, Cuba, the Dominican Republic, Ecuador, Honduras, Peru, and Uruguay. Colombia and Ecuador have already performed followup evaluations, including analysis of the degree of implementation of previous recommendations and work plans. These evaluations show that most countries have made substantial progress, particularly in the areas of staff training, vaccine supply, the cold chain, program planning and administration.

In most countries, however, the levels of immunization in children under 1 year of age have either remained the same or experienced very slight change. Figure 2 shows the **immunization coverage** for subregions in 1981.

FIGURE 2. Immunization coverage (%) in children under 1 year of age, by sub-region.* Region of the Americas, 1981.



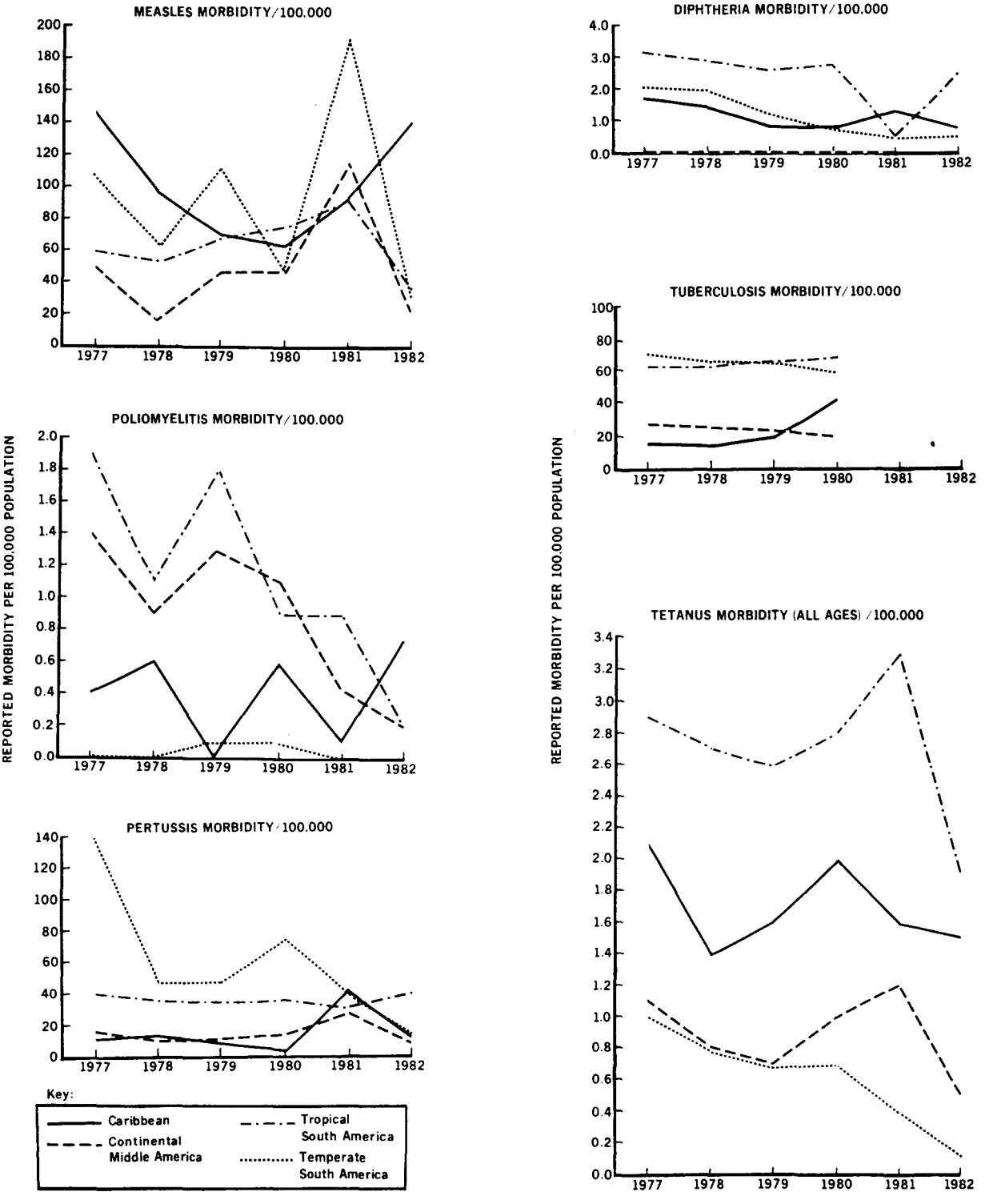
Very high dropout rates are noted from the first to the third doses of the multiple-dose vaccines such as DPT and poliomyelitis. Available data from some subregions indicate that dropout rates may exceed 50 percent.

Of great concern is the coverage with tetanus toxoid vaccine in pregnant women, to protect the newborn

against neonatal tetanus. This information is not available for most countries in the Region, and most of those for which data have been collected report levels below 10 percent.

Morbidity rates for the EPI target diseases do not show any dramatic decline in the last six years (Figure 3). This reflects the low levels of immunization coverage. Considering the early states of development of most countries' surveillance systems, these rates may be even higher than the ones shown.

FIGURE 3. Reported morbidity per 100,000 population for the EPI target diseases. Region of the Americas, 1977-1982.



* Includes only those countries which have submitted reports, and which follow a 3-dose schedule for DPT and polio vaccines.

Dissemination of Information

Information dissemination is another key to program development at all levels. The main vehicle for this purpose is the *EPI Newsletter*, which is distributed bimonthly to health workers at all levels of the health system. This newsletter publishes information on program development in the various countries of the Region, as well as epidemiological information and notes on the target diseases. It also includes information on new technologies available for program implementation. Over 6,000 health workers receive this publication, which is distributed in English and Spanish.

Source: *Weekly Epidemiological Record* **58**(37):281-284, 1983.

PAHO's Directing Council Approves EPI Resolution

PAHO's Directing Council approved a resolution on the Expanded Program on Immunization at its 29th Meeting held in Washington, D.C. from 26 September to 4 October 1983. The resolution was passed following discussion of the Director's progress report summarized in "EPI in the Americas: A Regional Overview," also in this issue.

The full text of Resolution XVI follows.

RESOLUTION XVI

THE XXIX MEETING OF THE DIRECTING COUNCIL,

Having examined the Director's progress report on the Expanded Program on Immunization (EPI) in the Americas (Document CE90/15), and recognizing the limited funds allocated to the program for the financial period 1984-1985;

Having taken note of the continuing efforts made to implement this program at country and regional levels;

Recognizing that progress of the EPI is an essential element of the strategy to achieve health for all by the year 2000; and

Recognizing that progress has been slow in most countries of the Region and if it is not accelerated the program goals will not be met by 1990,

RESOLVES:

1. To urge countries to:
   a) Set biennial targets for immunization coverage in children under one year of age and pregnant women and for the reduction of the morbidity and mortality of the diseases involved;
   b) Use immunization coverage in children under one year of age and pregnant women as an important indicator of the performance of maternal and child health services;
   c) Use morbidity and mortality data from measles, poliomyelitis and neonatal tetanus as an indicator of program development and impact;
   d) Use surveillance of vaccine-preventable diseases as another indicator of development of national epidemiologic surveillance systems;
   e) Act on the Five-Point Action Program adopted by Resolution WHA35.31 of May 1982;*
   f) Step up their evaluation of immunization programs and their implementation of recommendations emerging in the course of that process.

2. To request the Director to:
   a) Continue giving high priority to EPI at all levels of the Organization;
   b) Use the progress achieved by EPI as an indicator of the success of PAHO's technical cooperation in achieving the goal of health for all by the year 2000;
   c) Make a study of the vaccine production capacity of the Member Countries and of the quality and cost of the vaccines, with a view to their possible use in the EPI;
   d) Renew efforts to assure full capitalization of the EPI Revolving Fund;
   e) Promote evaluation of activities in the countries and assist in carrying them out in countries where he may deem this advisable;
   f) Report to the 94th Meeting of the Executive Committee in 1985 on the progress of the program and on implementation of the recommendations put forward herein.

* See *EPI Newsletter* Vol. IV No. 2.

Packing Vaccine Carriers for a Longer Cold Life

The cold chain testing center at the Department of Thermal Sciences of the *Universidad del Valle* (Cali, Colombia), has released the results of its tests on how the amount and arrangement of icepacks affect the cold life of vaccine carriers, or cold boxes.

These tests were conducted as a result of the central cold room review carried out in several countries in May 1983. The review showed that health workers responsible for distributing vaccines to the regional centers often did not know how the number of icepacks used in a vaccine carrier affects its cold life. An even greater lack of knowledge was found as to how the packs should be arranged in the carrier for maximum cold life.

Methodology

A 30-liter (net) vaccine carrier with polyurethane insulation was selected for the tests. It uses thirty-six PAHO/-WHO 540-gram icepacks and two PAHO/WHO 230-gram icepacks (19.6 Kg of water) frozen at -20°C.

A total of six tests was performed: four to determine how varying the number of icepacks affects a carrier's cold life, one to test the effect of changing the position of the icepacks within the carrier, and one to determine how the use of icepacks stored at -20°C might affect vaccines which should not be frozen (DPT, DT, TT and BCG).

All tests were carried out in an environmental testing chamber at +32°C. For each test eight thermocouples were placed at different points in the coldbox, and the test was stopped as soon as any thermocouple registered a temperature above +10°C.

Results

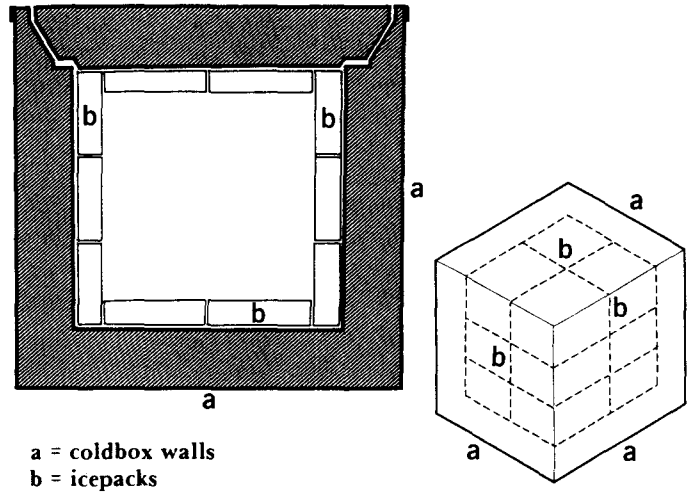
Effect of Icepack Quantity on Cold Life

Test 1 was conducted using the normal icepack configuration (Figure 1). The icepacks were arranged in the form of a cube, leaving no empty spaces to allow the formation of thermal bridges, and in such a way that there was always a layer of ice between the interior surface of the carrier and the vaccine. This weight and distribution of icepacks gives a cold life of 128 hours at +32°C.

In test 2 the carrier was prepared without using the icepacks which normally go on the bottom—equivalent to an 18 percent decrease (3.5 Kg) in the total amount of ice. The cold life in this instance was 120 hours, a reduction of 8 hours, or 6 percent as compared to test 1.

For test 3 the bottom icepacks and two icepacks from each of the four sides were removed, resulting in a decrease of 7.8 Kg of ice. This arrangement of 22 PAHO/WHO-540 icepacks (11.8 Kg of ice or 40 percent less than the weight recommended for the design) gave a cold life of 88 hours, or 32 percent less than in test 1.

FIGURE 1. Cross section and 3-dimensional view of coldbox with icepacks properly arranged for vaccine transport.



a = coldbox walls
b = icepacks

In test 4 only the top icepacks were used, leaving the vaccine in contact with the walls and bottom of the carrier. The six PAHO/WHO-540 icepacks used in this arrangement (3.2 Kg of ice) weighed 84 percent less than the icepacks used in the normal configuration. Three thermocouples reached +10°C in only one hour in this test.

Effect of Icepack Position on Cold Life

For test 5 the same number of icepacks was used as for test 3 (11.8 Kg of ice), but to demonstrate the importance of icepack position, they were all placed in layers on top of the vaccine so that both the walls and the bottom of the carrier were unprotected by a layer of ice. In spite of having the same number of icepacks as in test 3, the cold life of the carrier was only 52.5 hours, or 35.5 percent less than in Test 3.

Icepack Temperature

The object of test 6 was to determine how icepacks stored at -20°C might affect those EPI vaccines which should not be frozen: DPT, DT, TT and BCG. It was found in test 1 that the use of icepacks placed in the coldbox directly from the freezer at -20°C caused the temperature of the carrier and the vaccine to remain below -3°C for approximately seven hours, with a consequent danger of vaccine damage.

In order to demonstrate how to protect the vaccine in such cases, test 6 was performed using icepacks which had been removed from the freezer at -20°C, and left at an ambient temperature of +32°C for 25 minutes before placing them in the vaccine carrier. It was found that none of the thermocouples registered temperatures less than 0°C, therefore there was no danger of vaccine damage caused by freezing. The cold life decreased to 112 hours, as opposed to 128 in test 1 when the same quantity and configuration of icepacks was used. This amounts to a loss of only 12 percent of the cold life.

The length of time that icepacks frozen at -20°C should be left at ambient temperature is obviously a function of their size and initial temperature, the ambient temperature, and the type of coldbox (e.g., whether it has polyurethane foam or polystyrene insulation). In the absence of more precise information, the following general guidelines may be used to estimate how long icepacks frozen at -20°C should be left at the designated ambient temperatures before packing the coldbox with DPT, DT, TT or BCG vaccine:

Hot climates (32-40°C): 15 minutes
Mild climates (22-31°C): 20 minutes
Cold climates (12-21°C): 30 minutes

Leaving the icepacks at ambient temperature for the periods of time indicated above will give a reasonable degree of protection against freezing for DPT, TT, BCG and DT vaccines. However, the internal temperature of the coldbox used should be monitored to confirm its actual cold life.

Editorial note: These tests were designed to provide practical information to cold-chain instructors, supervisors, and vaccine store-keepers on packing vaccines for transport. All health personnel responsible for packing vaccines should know the proper way to arrange icepacks in a coldbox as shown in Figure 1, and this information should be incorporated into cold-chain training materials at the earliest possible opportunity.

The tests also point out the importance of selecting high quality vaccine carriers which have been laboratory tested to confirm their cold life (see *EPI Newsletter* Volume IV, Number 5 for further details on choosing a coldbox).

The importance of starting out with completely frozen icepacks should be noted. In the case of DPT, TT, DT and BCG, a thermometer or freeze watch indicator can be used to determine if the vaccines are in danger of freezing. Readers interested in further information on freeze watch indicators should write to the editor and request publication CCIS/81/10.

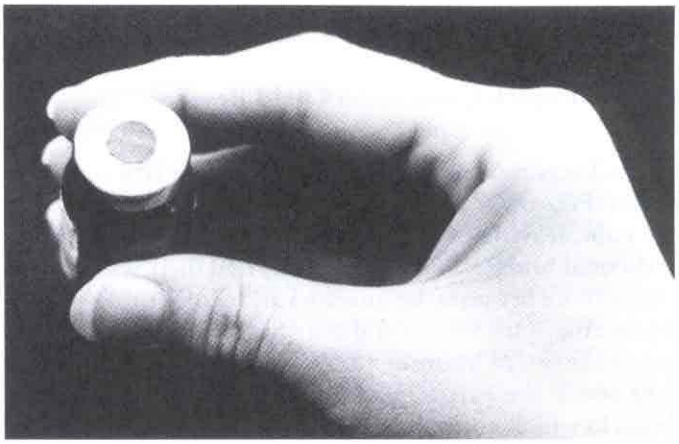
Measles Vaccine Indicator Trial in Brazil

The Special Public Health Services Foundation (FSESP) of Brazil's Ministry of Health is field testing a time-temperature indicator developed to monitor measles vaccine exposure to heat during its transport along the cold chain.

The field test is being carried out in collaboration with EPI/PAHO, PAHO's Program for Health Technology Development and the Program for Appropriate Technology in Health (PATH).*

The indicator is a red paper disk designed to adhere to the metal cap of a vaccine vial. It contains a chemical (developed by Allied Corp., USA) with thermal characteristics similar to those of measles vaccine, and changes color in accordance with the ambient temperature. A clear plastic coating on the disk protects health workers from the chemical and minimizes mechanical damage to the indicator. The color change is non-reversible.

The indicator turns darker following accumulated exposures to heat until, after seven days at +37°C (or the equivalent exposure), it turns black. This is a warning to the health worker that the vaccine may have dropped below its minimum required potency and should not be used.



If the red paper dot on top of the measles vaccine vial turns black, the health worker knows the vaccine has been exposed to excessively high temperatures and should be discarded. (Photo: PATH)

* PATH is a non-profit, non-governmental organization devoted to the development and application of appropriate health technologies for primary health care programs in developing countries.

Reported Cases of EPI Diseases

Number of reported cases of measles, poliomyelitis, tetanus, diphtheria and whooping cough, from 1 January 1983 to date of last report, and for same epidemiological period in 1982, by country

Sub-Region and Country	Date of last report	Measles		Poliomyelitis		Tetanus				Diphtheria		Whooping Cough	
						Non-neonatorum		Neonatorum					
		1983	1982	1983	1982	1983	1982	1983	1982	1983	1982	1983	1982
NORTHERN AMERICA													
Canada	6 Aug.	565	732	—	—	1	4	...	...	9	3	1,193	1,088
United States	1 Oct.	1,284	1,279	4	3	62	64	...	...	3	2	1,744	1,154
CARIBBEAN													
Antigua and Barbuda	21 May	3	—	—	—	—	—	—	—	—	—	—	—
Bahamas	1 Oct.	2,843	45	—	—	—	2	—	—	—	—	8	6
Barbados	27 Aug.	4	4	—	—	5	3	—	—	—	2	—	9
Belize	20 Sep.	10	4	...	...	1	3	—	—	—	4	1	—
Cuba	16 Jul.	2,251	21,652	—	—	13	10	—	—	—	—	208	593
Dominica	25 Jun.	—	1	—	—	—	—	—	—	—	—	10	4
Dominican Republic	30 Jul.	1,684	2,050	7	57	51	48	13	5	67	77	170	136
Grenada	17 Sep.	268	513	—	—	—	3	—	—	—	—	—	—
Haiti	31 Mar.	288	241	12	8	29	47	—	...	1	14	115	207
Jamaica	30 Jul.	1,051	2,335	—	58	1	8	2	—	9	11	60	278
Saint Lucia	30 Jul.	57	128	—	—	1	1	...	...	—	—	—	7
St. Vincent & the Grenadines	13 Aug.	58	724	—	—	...	—	...	—	—	—	...	—
Trinidad and Tobago	4 Jun.	1,181	588	—	—	8	8	—	—	—	2	—	1
CONTINENTAL MIDDLE AMERICA													
Costa Rica	17 Sep.	18	116	—	—	2	12	1	1	—	—	29	33
El Salvador	6 Aug.	1,381	2,924	39	12	31	28	22	56	10	2	297	1,195
Guatemala	6 Aug.	2,121	3,212	101	32	60	39	...	...	9	12	783	816
Honduras	17 Sep.	963	2,019	3	8	20	17	—	—	—	—	395	1,065
Mexico	*	...	...	...	...	...	...	...	...	...	...	...	...
Nicaragua	*	...	...	...	...	...	...	...	...	...	...	...	...
Panama	3 Sep.	481	3,553	—	—	4	4	9	12	—	—	126	53
SUDAMERICA TROPICAL													
Bolivia	*	...	...	...	...	...	...	...	...	...	...	...	...
Brazil	2 Jul.	18,904	15,503	13	37	1,178	1,245	176	233	2,137	1,888	14,819	28,653
Colombia	3 Jun.	...	...	43	27	...	...	...	...	...	...	...	...
Ecuador	4 Jun.	546	673	5	7	35	22	32	25	8	14	502	862
Guyana	30 Jul.	—	12	...	...	—	1	...	...	—	—	—	—
Paraguay	28 Aug.	504	311	9	53	41	44	88	72	2	12	166	343
Peru	26 Jun.	211	1,087	6	91	18	29	—	...	1	4	276	912
Suriname	18 Jun.	11	24	—	—	...	...	...	...	1	2	—	9
Venezuela	21 May	4,418	5,937	—	—	—	—	—	—	—	2	1,170	702
TEMPERATE SOUTH AMERICA													
Argentina	11 Jun.	565	1,808	...	—	78	...	...	...	14	14	846	3,463
Chile	18 Sep.	3,384	5,373	—	...	21	27	1	...	62	102	106	324
Uruguay	30 Jul.	6	76	—	—	1	12	—	1	—	—	180	358

* No 1983 reports received, therefore 1982 data not shown.

— No cases
... Data not available

Field Trials

The field trials were designed to meet the following objectives:

- to confirm the validity and reliability of the indicator;
- to confirm that color changes are correctly interpreted by health personnel;
- to evaluate the indicators's acceptability by health personnel, and
- to evaluate the indicator's mechanical performance.

FSESP is conducting the field trials in the state of Goias (Tocantinopolis County). The vaccines, which are produced nationally, are airfreighted from Rio de Janeiro to Goiana (state capital of Goias), where they are transported 1300 Km by car to the city of Tocantinopolis for distribution to health facilities.

The field tests will take six months to complete, ending around March 1984. Test results show that the 23 persons trained to use the indicator have a good understanding of how it works.

Approximately 2000 indicators will be tested. Fifty vials whose indicators have remained red will be tested for titer levels during the study to confirm the sensitivity and specificity of the indicators. Control tests will be conducted by the Oswaldo Cruz Foundation in Rio de Janeiro and the London School of Hygiene and Tropcal Medicine. All vaccine vials with black indicators are automatically tested to verify if their titers have fallen below the minimum levels established by WHO.

Further field trials of the measles indicator are also being conducted in Peru (see *EPI Newsletter* Volume V, Number 3), the Phillipines, People's Republic of China, Pakistan, Yemen Arab Republic, Egypt, Nepal, Kenya, Zimbabwe, and Argentina. The trials are supported by the Expanded Program on Immunization of PAHO and WHO, UNICEF, and the International Development Research Center (IDRC). A full report on test results should be available in 1984.

English-Speaking Caribbean to Set EPI Targets for 1985

From 21 to 25 November EPI program managers from the English-speaking Caribbean countries will hold their second subregional EPI meeting in Port-of-Spain, Trinidad. This activity was recommended as a followup to the first such meeting held in Kingston, Jamaica, in September 1981.

The general objectives of the meeting include expansion of EPI coverage as a component of primary health care to improve equity, effectiveness and efficiency; fostering and improving intersectorial linkages; and promoting regional and interregional cooperation. Specific objectives to be emphasized are the evaluation of progress achieved in each country *vis a vis* the problems and solutions identified at the 1981 meeting, and setting each country's 1985 targets for immunization coverage and disease reduction.

The latter activity is in accordance with Resolution XVI of the 29th Meeting of PAHO's Directing Council (see article on page 4), which urged countries to set biennial targets for immunization coverage and reduction of morbidity and mortality of the EPI diseases.

Participants will meet in working groups to discuss the work plans and strategies being implemented in each country. On the final day of the meeting a summary of all the work plans will be presented in a plenary session for general discussion.

In addition to discussions of country work plans, sessions will be devoted to technical topics of general interest, such as the optimal age for measles immunization, an update on cold-chain developments, reporting systems, and vaccine contraindications.

A similar meeting being organized for the Latin American countries is to take place in early 1984.

The *EPI Newsletter* is published bimonthly, in English and Spanish, by the Expanded Program on Immunization (EPI) of the Pan American Health Organization, Regional Office for the Americas of WHO. Its purpose is to facilitate the exchange of ideas and information concerning immunization programs in the Region in order to promote greater knowledge of the problems faced and their possible solutions.

References to commercial products and the publication of signed articles in this newsletter do not constitute endorsement by PAHO WHO, nor do they necessarily represent the policy of the Organization.

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