EPI Newsletter

Expanded Program on Immunization in the Americas

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EPI Vaccines: Indications and Contraindications

Introduction

Immunization is one of the most powerful and cost-effective weapons of modern medicine. Immunization services, however, remain tragically under-utilized in the world today. In developing countries one half a percent of all newborns can be expected to become crippled from poliomyelitis, one percent can be expected to die from neonatal tetanus, two percent from pertussis and three percent from measles. In all, some five million children die from these diseases each year: ten children with each passing minute. These diseases are preventable with currently available vaccines if children can be immunized early enough in childhood.

The decision to withhold the benefits of immunization from an eligible child, whatever the reason, should not be taken lightly. Unfortunately, health workers in many countries are faced with long lists of contraindications which, when followed scrupulously, result in many children remaining unimmunized. The problem resulting from deferring immunization is greatest where access to health services is limited and the morbidity and mortality from vaccine-preventable diseases are high. Immunization is frequently postponed if children are ill, malnourished, or about to be hospitalized. Yet they are the very children for whom immunization services are most needed. They are the ones most likely to die should they acquire a vaccine-preventable disease.

The purpose of this paper is to review the benefits and risks of routine immunization of children with BCG, DPT, measles and poliomyelitis vaccines, and, particularly for ill and malnourished children, to suggest circumstances in which immunization may be in the child's best interest.

Adverse reactions to immunization

Despite the high safety of the vaccines used in the EPI, complications do occur. Although their rates are difficult to estimate precisely, it is known that they are far less frequent than the complications caused by the diseases themselves. Some conditions, particularly fever and neurological syndromes, also occur spontaneously among unimmunized children. Against this background of disease, it is sometimes difficult to determine if a recent immunization is causally or merely coincidentally related to a child's illness. Convulsions, for example, may follow DPT or measles immunization, but the background rate is high. At ages 3 to 15 months, the monthly incidence rate of convulsions ranges from 0.8 to 1.4 per 1000 children.

BCG immunization

The most serious complications of BCG immunization are disseminated infection with the BCG bacillus and BCG osteitis (Table 1). Both of these complications are rare. The former is usually associated with severe abnormalities of cellular immunity, whereas the latter has been reported mainly among infants immunized in the neonatal period in the Scandinavian countries. The most common complication, suppurative lymphadenitis, has been

TABLE 1: Estimated rates of adverse reactions following BCG immunization

Adverse reaction	Estimated adverse reaction rate per 100,000 vaccinees
Disseminated BCG infection	< 0.1
Osteitis	< 0.1 - 30
Suppurative adenitis (children below 2 yrs.)	200 - 4,300 *(0.2% - 4.3%)*

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reported in 0.2 to 4 percent of immunized children under 2 years of age. The risk of adverse reactions is related to the BCG strain used by different manufacturers, the dose, the age of the child, the method of immunization, and the skill of the vaccinator.

DPT immunization

The most severe complications following DPT immunizations are neurological and are thought to be due primarily to the pertussis component of the vaccine. In a recent large study in the United Kingdom, the National Childhood Encephalopathy Study, the immunization histories of children 2 months to 3 years of age hospitalized with serious acute neurological illnesses (encephalitis/encephalopathy, prolonged convulsions, infantile spasms and Reye's syndrome) were reviewed and compared with a control group. It was estimated that a severe neurological illness attributable to DPT occurred in 1:110,000 DPT immunizations and that lasting neurological damage occurred in 1:310,000 immunizations. The hazards of DPT immunization must, however, be balanced against the risks of remaining unimmunized. Convulsions, for example, occur 100 to 3000 times more often during whooping cough than following DPT immunization and pertussis frequently causes encephalopathy or death (Table 2).

TABLE 2: Estimated rates of adverse reactions following DPT immunization compared to complications of natural whooping cough

Adverse reaction	Whooping cough complication rates per 100,000 cases	DPT vaccine adverse reaction rates per 100,000 immunizations
Permanent brain damage	600 - 2,000 *(0.6% - 2.0%)*	0.3 - 0.6
Death	100 - 4,000 *(0.1% - 4%)*	0.2
Encephalopathy/ encephalitis *	300 - 14,000 *(0.3% - 14%)*	0.1 - 3.0
Convulsions	1,000 - 8,000 *(1% - 8%)*	0.3 - 70
Shock	—	0.5 - 30

* Including seizures, focal neurologic signs, coma, Reye's syndrome.

Fever and mild local reactions following DPT immunizations are common. It is estimated that 2 to 6 percent of vaccinees develop fever of 39°C or higher and that 5 to 10 percent experience swelling and induration or pain lasting more than 48 hours at the site of injection. In studies in the United States, about 50 percent of children had local reactions.

Measles immunization

Severe reactions following measles immunization are rare (Table 3). In the United States, neurological disorders, including encephalitis and encephalopathy, have been reported once for approximately every million vaccine doses administered. However, the reported incidence rate of encephalitis or encephalopathy following measles immunization is lower than the observed incidence rate of encephalitis of unknown etiology, two per 1 million children per 28-day period. This suggests that some of the reported severe neurological disorders may not be caused by measles immunization but related only in time. In the United Kingdom, however, the National Childhood Encephalopathy Study found a statistically significant association between the onset of acute neurological illness and measles immunization given 7 to 14 days before onset of illness in cases compared with controls. The relative risk for this period was estimated to be 2.5 times the background rate.

TABLE 3: Estimated rates of serious adverse reactions following measles immunization compared to complications of natural measles infection and background rate of illness

Adverse reaction	Measles complication rates per 100,000 cases	Measles vaccine adverse reaction rates per 100,000 vaccines	Background rate of illness per 100,000 persons
Encephalitis/ encephalopathy	50 - 400 *(0.05% - 0.4%)*	0.1	0.1 - 0.3
Subacute sclerosing panencephalitis	0.5 - 2.0	0.05 - 0.1	—
Pneumonia	3,800 - 7,300 *(3.8% - 7.3%)*	—	—
Convulsions	500 - 1,000 *(0.5% - 1%)*	0.02 - 190	30
Death	10 - 10,000 *(0.01% - 10%)*	0.02 - 0.3	—

About 5 to 15 percent of measles vaccinees develop a temperature of 39.4°C or higher, beginning on the sixth day and usually lasting one or two days. Transient rash may occur in about 5 percent of vaccinees.

Measles immunization, by preventing natural measles, reduces the risk of developing subacute sclerosing panencephalitis (SSPE).

Poliomyelitis immunization

Paralytic polio is the only serious adverse reaction associated with oral poliomyelitis vaccine (OPV). The risk is increased in immunodeficient children. In a ten year

WHO Collaborative Study, the risk of vaccine-associated paralysis was estimated to be about one case per million vaccinees and the risk of a close contact of a vaccinee developing paralytic polio was one case per approximately 5 million doses of vaccine distributed. In the United States the reported risk of paralysis in vaccinees or their close contacts was one case per 3.2 million doses distributed.

Serious adverse reactions to inactivated poliomyelitis vaccines currently in use have not been reported.

Immunization of ill or malnourished children

Health personnel are understandably cautious in offering immunization to any child who is not healthy. But, as already discussed, such children may be particularly benefited by immunization. In most cases, it is safe and effective.

The most ample literature on this subject concerns measles immunization. Several studies have investigated measles immunization of malnourished or ill children. McMurray *et al.* studied serum antibody responses and reaction rates to measles vaccine in normal and moderately malnourished 10-month-old Colombian children. The children were followed for more than a year. Malnourished children had high measles antibody responses and had no more adverse reactions than well-nourished children. The authors concluded that measles vaccine is both safe and effective in moderately malnourished children.

Ifekwunigwe *et al.* studied serum antibody responses and adverse reactions following measles immunization of malnourished Nigerian children 5 months to 9 years old. Malnutrition did not impair the children's serological responses; of 111 children who were seronegative before immunization, 94 percent seronverted. There were no major adverse reactions to immunization during the 8-week followup period. The authors concluded that malnutrition should be a prime *indication* for measles immunization rather than a contraindication because antibody responses are normal and because natural measles is often severe in malnourished children.

In most other studies nutritional status appeared to have no significant effect on measles seroconversion rates when measles vaccine was administered alone or simultaneously with DPT vaccine. In one investigation, however, children with severe kwashiorkor had impaired reponses to measles immunization compared to well children.

The results of three studies of measles immunization of ill hospitalized children are shown in Table 4. The studies were conducted in hospital pediatric wards during efforts to control hospital-acquired measles, a cause of high morbidity and mortality. Children with a wide range of acute and chronic illnesses were included; reasons for exclusion were a terminal illness, a history of measles, steroid therapy or an immunologic disorder. The authors concluded that measles immunization of ill or malnourished children did not appear to adversely affect the course of the children's illnesses and that the risk of measles cross-infection in pediatric wards practicing measles immunization was diminished considerably.

In Ivory Coast a policy of immunizing sick children was introduced in 1981. All children between 9 and 35 months of age visiting health centers because of illness other than measles were screened; if unimmunized against measles, they were immunized. The introduction of the new policy resulted in a near doubling of the number of doses of measles vaccine administered, from 26,000 to 45,000 doses in comparable 6-month periods.

TABLE 4: Measles immunization of ill children in three African studies

Country	Children		Type of illness	Adverse reaction	Effect of immunization
	No.	Age (months)			
South Africa	214	6 - 60	Consecutive patients admitted to hospital	Temperature ≥ 38.9°C - 12% Koplik spot and rash - 8%	Reduced nosocomial measles compared to control wards
Zimbabwe (Rhodesia)	98	6 - 32	Hospital patients with: Gastroenteritis - 40% Bronchopneumonia - 30% Malnutrition - 12% Other resp. infection - 6% Meningitis - 3% Other - 9%	Temperature ≥ 38.9°C - 13% Rash - 4%	Reduced nosocomial measles compared to unimmunized control group
South Africa	654	7 - 36	Hospital patients with: Gastroenteritis - 35% Cardiac, renal diseases - 35% Bronchopneumonia - 17% Kwashiorkor, marasmus - 12%		Non nosocomial measles compared to 9 cases and 3 deaths noted in the previous year. Overall mortality dropped by 49%.

Limited data are available concerning the use of the other EPI vaccines in malnourished or ill children. The use of DPT, BCG and poliomyelitis vaccines in moderately malnourished children appears to be safe.

Responses to diphtheria toxoid of severely ill or malnourished adults or malnourished children do not differ significantly from the responses of well-nourished individuals.

Responses to tetanus toxoid of malnourished children also appear to be normal. Sick children with respiratory infection, gastroenteritis and febrile illness (excluding malaria) appear to respond like healthy controls to tetanus toxoid. Malaria has been shown in some studies to inhibit the antibody response to tetanus toxoid. In two of these studies, however, only one or two doses of unadsorbed rather than adsorbed tetanus toxoid was given. In more recent studies malaria had no major effect on the serological response to adsorbed tetanus toxoid, measles or DPT vaccines. There is no evidence of increased rates of adverse reaction following immunization of children with malaria.

Serum neutralizing antibody titers following a single dose of trivalent oral poliomyelitis vaccine were found to be similar in malnourished and well-nourished children. However, in malnourished children secretory IgA antibody was detected significantly less often, its appearance was delayed, and levels were significantly lower.

Considerable evidence suggests that injections, including immunizations, may provoke paralysis in the injected limb of children who are in the incubation period of polio infection. This is partly the reason that authorities in some areas without poliomyelitis immunization programs have recommended that DPT be withheld from febrile children. A small risk of injection-provoked paralysis may exist in polio endemic areas, but fever is neither a sensitive nor a specific sign of polio infection. It seems likely that withholding DPT immunization from febrile children may result in more deaths from pertussis than cases prevented of injection-provoked poliomyelitis. Concern about injection-provoked poliomyelitis provides a strong argument in favor of polio immunization simultaneously with DPT at an early age, before infants are at a high risk of exposure to wild polio virus.

Source: *Immunization of children: Indications and contraindications for vaccines used in the Expanded Program on Immunization.* WHO working paper EPI/GAG/82/WP.8/Rev. 3.

Editorial note: Due to its length, the preceding article has been divided into two parts and will be concluded in the next issue of the *EPI Newsletter*. The final section discusses national policies concerning contraindications to immunization and lists recommendations of the EPI regarding the immunization of ill or malnourished children, as well as general guidelines for health workers to use when considering the immunization of an individual child.

The sixty-six references reviewed for this paper have not been listed here, but will be made available to interested readers. Anyone wishing to obtain a complete copy of the original article, including all bibliographic references, should write to the *EPI Newsletter* editor, Pan American Health Organization, 525-23rd St., N.W., Washington, D.C. 20037 (USA).

Country Operations in the English-speaking Caribbean, 1982

All 19 countries in the English-speaking Caribbean which are members of the Caribbean Epidemiology Center (CAREC) continued active programs of routine immunization against diphtheria, pertussis, tetanus and poliomyelitis in 1982. Sixteen of the countries now offer immunization against measles and 15 offer immunization against tuberculosis as well, compared with 8 and 11 countries, respectively, in 1979.

Vaccines are purchased through the PAHO Revolving Fund by 17 of the countries. They usually receive one or two shipments per year in order to reduce costs. When vaccines are delivered more frequently, the cost of the same quantity of vaccine increases considerably due to additional charges for packing and freight. Only two shipments of vaccine, both of polio vaccine, were delayed in transit in 1982. Samples from each shipment were subsequently checked for potency by laboratory testing, found to be still potent, and the shipments were approved for use. All other vaccine deliveries arrived on time and in good condition.

Children under 1 year of age are the primary target group for immunization, although unimmunized children up to 5 years are also eligible. Pregnant women are given tetanus toxoid immunization in all of the countries.

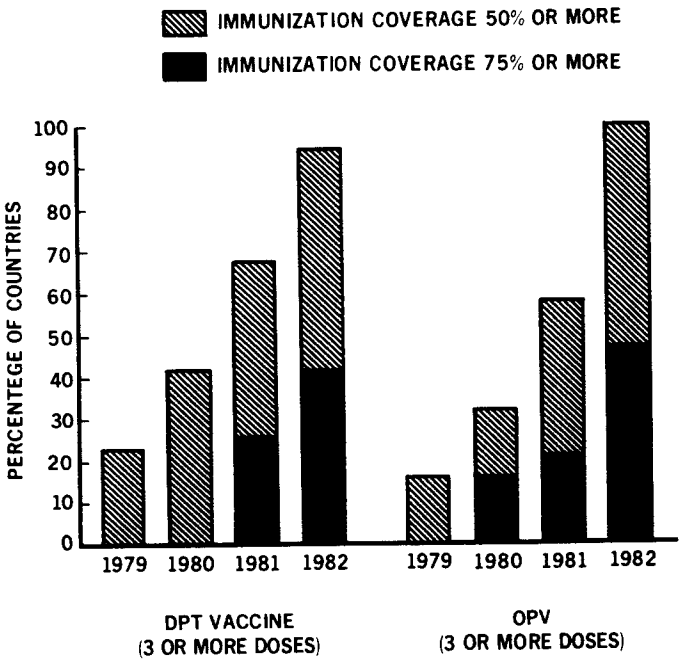
Table 1 shows the immunization coverage rates with three or more doses of DPT and trivalent oral polio vaccine (OPV) in children less than 1 year old between 1979 and 1982. The majority of countries have improved their immunization coverage rates since 1979, some dramatically. In 1982, eighteen of the nineteen countries (95 percent) had DPT coverage rates of 50 percent or more and eight (42 percent) had rates over 75 percent. All 19 countries had OPV coverage rates over 50 percent and nine (47 percent) had rates over 75 percent (Fig. 1). The overall

TABLE 1. DPT and OPV immunization coverage rates of children less than 1 year old, English-speaking Caribbean, 1979-1982

Country	Immunization coverage (%)							
	DPT (3 or more doses)				OPV (3 or more doses)			
	1979	1980	1981	1982	1979	1980	1981	1982
Anguilla	47	92	78	89	38	86	81	86
Antigua and Barbuda	65	54	79	79	17	35	47	90
Bahamas	30	40	55	69	29	38	53	67
Barbados	62	60	59	62	61	57	55	63
Belize	50	48	50	50	40	42	51	52
Bermuda	...	40	57	53	...	37	60	53
Cayman Islands	50	51	67	90	52	46	67	91
Dominica	30	63	93	99	3	53	93	73
Grenada	11	25	43	56	11	32	41	61
Guyana	30	35	45	53	33	40	40	73
Jamaica	...	34	39	34	...	25	37	72
Montserrat	...	39	76	94	...	36	76	86
Saint Lucia	...	56	64	79	...	58	65	81
Saint Kitts-Nevis	37	56	67	92	20	77	71	93
Saint Vincent and the Grenadines	7	26	32	67	10	26	33	99
Suriname	20	25	27	61	18	24	25	58
Trinidad and Tobago	...	24	52	54	...	34	46	59
Turks and Caicos Islands	...	38	29	67	...	43	25	80
Virgin Islands (British)	22	80	95	83	12	95	75	94

... Data not available.

FIGURE 1. Percentage of countries achieving DPT and OPV immunization coverage rates of 50% or more and 75% or more in children less than 1 year old, English-speaking Caribbean, 1979-1982



improvement in the area since 1979 is striking. The accomplishment is attributable in large part to effective government health services. In each country, immunization services are integrated into the primary health care program.

Special attention has been given to surveillance of the EPI target diseases in order to help assess the impact of the immunization programs and to identify outbreaks and other problems requiring special attention. Underreporting continues to hamper effective surveillance, especially in the case of diseases such as measles and pertussis that are usually not severe enough to lead to hospitalization. The incidence rates of three of the EPI target diseases—measles, pertussis and tetanus—reported by the countries between 1980 and 1982 are shown in Table 2.

Measles cases were reported by 14 of the CAREC member countries in 1982. Grenada, Saint Vincent and the Grenadines, and Saint Lucia all reported large increases in measles incidence rates. Antigua and Barbuda, where an outbreak had been under way since 1979, reported no cases.

Pertussis cases were reported by seven of the countries in 1982. The highest reported incidence rate was 16 per 100,000 total population in Jamaica, an increase in comparison with 1 per 100,000 total population reported in 1980 and 1981. The outbreak of pertussis that struck Saint Lucia in 1981 seems to have ceased.

TABLE 2. Reported incidence rates of measles, pertussis and tetanus, English-speaking Caribbean, 1980-1982

Country	Reported incidence rates (per 100,000 population)								
	Measles			Pertussis			Tetanus		
	1980	1981	1982	1980	1981	1982	1980	1981	1982
Anguilla	0	0	0	...	0	0	0	0	0
Antigua and Barbuda	3,100	330	0	...	...	0	4	1	0
Bahamas	240	21	23	8	4	4	2	0	1
Barbados	11	0.4	2	0	5	5	5	3	2
Belize	340	120	3	7	39	0	1	2	2
Bermuda	37	7	33	0	0	0	0	0	0
Cayman Islands	51	12	0	...	0	0	0	0	0
Dominica	0	36	3	1	0	8	2	0	0
Grenada	49	9	1,557	...	0	0	3	3	3
Guyana	55	6	4	10	12	0	2	1	0.2
Jamaica	1	250	127	1	1	16	0.5	0.4	0.5
Montserrat	25	42	0	0	0	0	0	0	0
Saint Lucia	27	110	1,009	15	390	7	1	3	5
Saint Kitts-Nevis	620	100	276	0	0	0	4	2	0
Saint Vincent and the Grenadines	260	16	631	0	1	0	0	0	0
Suriname	67	210	10	...	...	3	...	...	0
Trinidad and Tobago	33	330	112	1	1	0.1	2	1	1
Turks and Caicos Islands	54	210	0	54	370	0	0	0	0
Virgin Islands (British)	0	0	10	0	0	0	0	0	0

... Data not available

Tetanus cases were reported by eight of the countries in 1982. The highest rates were reported by Saint Lucia and Grenada, 5 and 3 per 100,000 total population, respectively. The majority of tetanus cases reported by the countries were non-neonatal tetanus.

Poliomyelitis cases were reported by only 2 of the 19 countries in 1982. Jamaica, where no cases had been reported in 1980 and 1981, reported an outbreak with 58 cases, a rate of 2.6 per 100,000 total population. Suriname reported a single case.

Diphtheria cases were reported rarely from five countries: Barbados, Belize, Jamaica, Suriname, and Trinidad and Tobago. Since 1980, most of the reported cases have occurred in Jamaica and Barbados.

Source: *Weekly Epidemiological Record* **58**(39):297-299, 1983.

Editorial note: EPI Program Managers from the English-speaking Caribbean met in Port of Spain, Trinidad, 21-25 November to review the progress made by each country's immunization program and to set 1985 targets for immunization coverage and disease reduction. A report on this meeting will be published in the February 1984 issue of the *EPI Newsletter*.

1984 EPI Revolving Fund Prices

The EPI Revolving Fund, now entering its sixth year of operations, continues to provide member countries with timely deliveries of high quality, low cost vaccines. Despite worldwide inflation over the past several years, the prices of vaccines purchased through the Fund in 1984 will generally be lower than in 1979 when the first vaccine contracts were placed.

Table 1 lists the 1979 and 1984 prices, and shows the percentage price change for vaccines purchased in both years. For most vaccines, 1984 prices are markedly lower.

Contracts for DT vaccine were placed for the first time in 1983. The 1984 prices of DT-10 (adult) and DT-20 (adult and pediatric) have decreased by about 5 percent, while DT-10 (pediatric) has increased by 9 percent.

The Revolving Fund has proven to be an effective mechanism for vaccine purchases. Its suppliers are reliable, and the economies of scale obtained by pooling regional vaccine requirements have helped to keep vaccine prices low. In the first five years of operations the Fund has processed over $18 million in vaccine orders. It is expected that orders worth more than $3 million will be placed in 1984.

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	26 Nov.	783	923	—	—	5	10	...	...	11	12	2,007	2,027
United States	3 Dec.	1,417	1,576	6	3	70	64	...	...	4	2	2,090	1,625
CARIBBEAN													
Antigua and Barbuda	27 Aug.	3	—	—	—	1	—	—	—	—	—	—	—
Bahamas	26 Nov.	2,858	48	—	—	—	2	—	—	—	—	8	7
Barbados	8 Oct.	4	5	—	—	5	4	—	—	—	2	—	12
Belize	15 Nov.	11	5	...	...	1	3	—	5	—	4	1	—
Cuba	22 Oct.	2,736	22,567	—	—	18	17	—	—	—	—	250	859
Dominica	15 Oct.	1	2	—	—	1	—	1	—	2	—	11	5
Dominican Republic	30 Sep.	2,326	2,656	7	122	78	63	16	5	77	102	225	182
Grenada	19 Nov.	268	1,273	—	—	—	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	8 Oct.	65	653	—	—	1	6	...	...	—	—	—	8
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	29 Oct.	23	145	—	—	2	12	1	1	—	—	37	44
El Salvador	10 Oct.	1,901	3,463	58	16	37	42	31	75	11	11	376	1,661
Guatemala	10 Sep.	2,273	3,476	126	32	66	49	...	...	10	12	930	1,046
Honduras	5 Nov.	1,073	2,305	3	8	21	22	—	2	—	—	494	1,313
Mexico	*	...	...	...	...	...	...	...	...	...	...	...	...
Nicaragua	*	...	...	...	...	...	...	...	...	...	...	...	...
Panama	1 Oct.	509	3,642	—	—	5	4	9	13	—	—	149	58
TROPICAL SOUTH AMERICA													
Bolivia	29 Jan.	63	117	1	—	9	13	...	...	3	2	82	171
Brazil	27 Aug.	28,698	22,918	20	48	1,466	1,652	298	305	2,744	2,438	18,208	37,501
Colombia	19 Jun.	4,221	4,393	58	40	196	273	160	...	46	40	2,390	2,483
Ecuador	3 Sep.	973	1,194	5	8	58	45	49	49	18	28	664	1,217
Guyana	30 Jul.	—	12	...	...	—	1	...	...	—	—	—	—
Paraguay	22 Oct.	860	518	9	62	55	52	109	94	4	13	193	407
Peru	26 Jun.	211	1,087	6	91	18	29	—	...	1	4	276	912
Suriname	13 Aug.	13	26	—	—	...	...	...	...	1	2	—	12
Venezuela	21 May	4,418	5,937	—	—	—	—	—	—	—	2	1,170	702
TEMPERATE SOUTH AMERICA													
Argentina	8 Oct.	2,374	2,895	...	—	114	...	...	...	35	14	1,963	5,199
Chile	19 Nov.	5,343	7,678	—	...	26	32	1	...	81	128	121	371
Uruguay	27 Aug.	6	83	—	—	1	12	—	1	—	—	183	373

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

— No cases
... Data not available

TABLE 1. EPI Revolving Fund vaccine prices, 1984

Vaccine	No. doses per vial	FOB price per dose (US$) 1979	1984	% price change
DPT	10	.038	.0245	-37
	20	.037	.0171	-54
Polio	10	.022	.025	+14
	20	.019	.017	-10
	50	*	.0155	—
Measles	1	.33	.24	-27
	10	.14	.057	-59
Measles with syringe	1	*	.35	—
	10	*	.114	—
BCG	10	*	.083	—
	20	.055	.0488	-11
	50	.029	.0258	-10
TT	10	.026	.0169	-35
	20	.021	.01	-52
DT (adult)	10	*	.0237	—
	20	*	.01475	—
DT (ped.)	10	*	.02086	—
	20	*	.01475	—

* No contract placed in 1979.

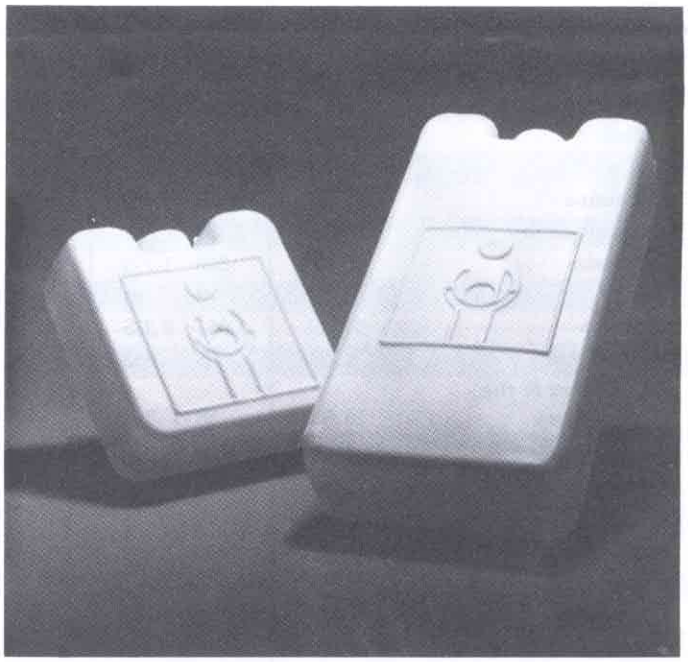
Venezuela Produces New EPI Icepacks

The PAHO/EPI cold chain focal point, located at the Department of Thermal Sciences, University of Valle, Cali (Colombia), has concluded a successful project for the production of new EPI icepacks in collaboration with Venezuela's Ministry of Health.

The cold chain focal point designed and produced the molds for the manufacture of two sizes of icepacks. The smaller one measures 9.5 x 9.5 x 4 cm and contains 230 grams of water, while the larger one measures 19.5 x 10 x 4 cm and holds 540 grams of water.

A total of 7,000 of the larger icepacks and 3,000 of the smaller ones were manufactured in Venezuela at a unit cost of approximately US$0.13 and $0.10, respectively.

Before these icepacks were produced, the Ministry of Health had been shipping vaccines in polystyrene containers with only 3 to 4 kg of ice. The availability and proper use of the new icepacks will greatly benefit Venezuela's cold chain by assuring that vaccines are kept at the proper storage temperatures during transportation from the national to the local level.



EPI icepacks designed in Cali, Colombia, and produced in Venezuela *(Photo: PAHO).*

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