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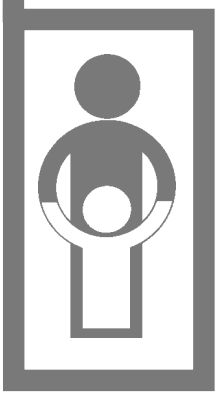
Technet Consultation

Harare, 6-10 December 1999



DEPARTMENT OF VACCINES AND BIOLOGICALS

World Health Organization
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Preface

The Technical Network for Logistics in Health, or Technet, was established in 1989 to provide a forum for experts in logistics who are involved in the management of immunization and other primary health care operations at the country and international levels. The second major purpose of Technet is to serve as an informal adviser, to its founders the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) particularly, on matters of logistics management.

The 1999 Technet consultative meeting was held in Harare, Zimbabwe, from 6 to 10 December 1999. Approximately 80 participants attended, representing global organizations, nongovernmental organizations, industry, academic institutions, consulting groups and individuals.

We would like to express our thanks to the WHO Regional Office for Africa (AFRO), which hosted the meeting and whose staff assisted both with the organization of the meeting and with its management.

Abbreviations

A-D	auto-disable
AFP	acute flaccid paralysis
AFRO	WHO Regional Office for Africa
AIDS	acquired immunodeficiency syndrome
ATT	Access to Technologies Team (WHO)
BASICS	Basic Support for Institutionalizing Child Survival
BCG	bacille Calmette-Guérin (vaccine)
BCT	Department of Blood Safety and Clinical Technology (WHO)
CC	cold chain
CDC	Centers for Disease Control and Prevention (USA)
CFC	chlorofluorocarbon
CLM	Commodities and Logistics Module (software)
CRL	Consumer Research Laboratory
CSIR	Council of Scientific and Industrial Research
DMU	De Montfort University
DT	diphtheria and tetanus toxoids (vaccine)
DTP	diphtheria-tetanus-pertussis (vaccine)
EMRO	WHO Regional Office for the Eastern Mediterranean
EPI	Expanded Programme on Immunization
FBA	Feilden Battersby Associates
GAVI	Global Alliance of Vaccines and Immunization
GNP	gross national product
HFC	hydrofluorocarbon
HC	hydrocarbon
HepB	hepatitis B
Hib	*haemophilus influenzae type B*
HIV	human immunodeficiency virus
HTP	Health Technology and Pharmaceuticals cluster (WHO)

IATA	International Air Transport Association
ISO	International Standards Organisation
MDVP	multi-dose vial policy
MMR	measles, mumps and rubella (vaccine)
NIDs	national immunization days
NIH	National Institutes of Health (USA)
OPV	oral polio vaccine
PAHO	Pan American Health Organization
PATH	Programme for Appropriate Technology in Health
PIS	Product Information Sheets
SIGN	safe injection global network
SOS	Sustained Outreach Services
SNIDs	subnational immunization days
TBAs	traditional birth attendants
Technet	Technical Network for Logistics in Health
TST	time, steam, temperature
TT	tetanus toxoid
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UP	Uttar Pradesh (India)
USAID	United States Agency for International Development
VAB	Department of Vaccines and Biologicals (WHO)
VAR	vaccine arrival reporting
VVM	vaccine vial monitor
WHA	World Health Assembly
WHO	World Health Organization
WPRO	WHO Regional Office of the Western Pacific
WPV	wild poliovirus

Chapter 1: An introduction and a summing up

A statement by J. Lloyd

The proceedings of Technet 1999 gave the clear message that management and implementation of known technologies, rather than the development of new ones, must be the priority of health services logistics during the next 10 years.

Many of the technologies that will improve immunization and other health services are known today. The means exist for safer, easier injections for all children in the world, but execution lags behind. vaccine vial monitors (VVMs) and more stable vaccines mean that more children can be reached, but only when managers and management systems use them. Similarly, communication tools exist to streamline supply and distribution, equipment maintenance and transport, but they must be introduced to those who need them.

Technet is already well positioned to lead in the implementation of change, as it has done in the past. It has an electronic forum through which technical and logistic problems and policies are discussed and which has influenced decision-making at all levels. Managerial tools have been developed, field tested and exchanged through Technet and are ready for global dissemination. These include zero-breakdown vehicle management, computer stock control and various quality and resource assessment tools. With the Global Alliance of Vaccines and Immunization (GAVI), an association of organizations and individuals committed to the building of infrastructure as well as immunization services themselves, Technet can continue to guide countries toward excellence in logistics.

Which issues emerged as the highest priorities for action at this Technet meeting?

1) Service delivery in less accessible areas can be ensured only by efficient transport management systems. These already exist and need to be adapted and replicated.

2) Safe injection and safe disposal management systems must be installed in every country beginning with national demonstrations implemented under the safe injection global network (SIGN) initiative.

3) Vaccine distribution must be transformed by computer assisted stock control; vaccine management must be driven by vaccine vial monitors; and storage and transport of vaccines and drugs must be centralized and integrated.

4) Particular emphasis must be placed on training managers and users of new technologies directly rather than relying on "trickle-down" principles, which have caused performance to lag far behind changes in policies, strategies and technologies.

5) Finally, there is an over-arching need for a plan that relates the recommendations and action points that result from Technet meetings to the organizations and individuals expected to fulfil them. The Technet plan should relate specifically to the plans of WHO and other partners and be in harmony with the priorities envisaged by GAVI.

Technet members can contribute most effectively to the Technet plan in four ways:

- As the "mother" agencies of Technet, WHO and UNICEF can, with government partners at country level, initiate and support the assessment, planning, training and implementation activities recommended by Technet.
- Technet member institutions and individuals in developing countries can guide and provide long-term support to the testing, fine-tuning, adaptation and dissemination of new management tools.
- Technet members, individually or in groups, can identify and quantify resource needs for the rehabilitation and installation of logistics systems and bring these needs to the attention of Interagency Coordinating Committees at country and regional level.
- Finally, Technet members can "seed" small-scale activities that tackle large-scale problems. Even a small success in a key area can overcome the inertia caused by large, complex or old problems.

Technet is a powerful instrument for the practical realization of the lofty ambitions of equity and sustainability in all health services for children. To fully use this power, Technet must broaden its horizons beyond immunization operations to include all primary health care services. A more formal organization may also be needed, with WHO as the secretariat and a board of institutional members. It may be time also to develop a global strategic plan for Technet. In this way, the recommendations and actions proposed at meetings of Technet members are more likely to be supported, pursued and eventually achieved.

Chapter 2: Summary of sessions

Opening session

Chair: J. Lloyd, WHO

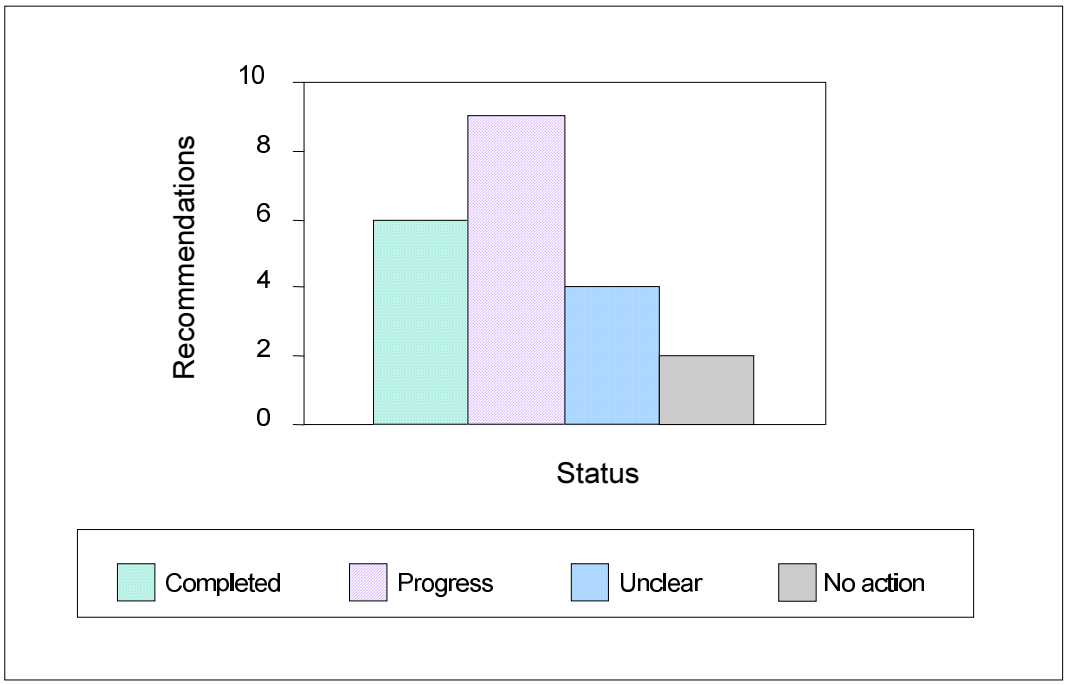
Session summary

In the opening session, Doctors A. Kabore of WHO/AFRO, S. Sakai of UNICEF, and S. Landry of the United States Agency for International Development (USAID) gave recognition to the work of Technet and its members in developing and introducing technology that solved immunization service delivery problems. Now they urged Technet to turn its attention to problems of stagnation of immunization coverage and decline in service quality, especially through further work on technological solutions and implementation of systems for managing change. The introduction of new vaccines, new strategies, new priorities and health sector reform pose particular challenges in this regard.

Mr A. Bass, moderator of the Technet Forum, described its activities since the last Technet meeting in March 1998 in Copenhagen. The most active topics in the network have been vaccine vial monitors and injection safety, followed by cold chain and sharps waste disposal.

Mr J. Lloyd summarized the action taken on the 21 recommendations and action points made by Technet 1998 and described the results he hoped to achieve in Technet 1999, particularly specific, action-based recommendations for the management of change in immunization services in the 21st century.

Figure 1: Summary of progress since 1998 Technet;
implementation of Technet recommendations since 1998



Session 1: Reaching the unreached

Chair: *S. Sakai, UNICEF*
Rapporteur: *K. Engstrom, WHO consultant*
Presenters: *M. Ngoma, WHO*
S. Nancollas, Transaid
M. Moshoeshoe, Riders for Health
K. Kagaruki, WHO
C. Nelson, PATH

Session summary

Presenters in this session addressed the problems that countries have in reaching populations that for geographical, social, political, economic or other reasons have hitherto not had access to immunization services. In general, people with no access to immunization services have no access to other health services. Hence, any attempt to reach the unreached with immunization services should include other health services that meet the needs of the population, depending on the availability and transportability of supplies and equipment and the capabilities of the staff. As with many of the issues discussed in the 1999 Technet meeting, reaching the unreached is a multi-intervention problem that depends on an integrated service solution.

Presenters described several models for "multi-intervention packages" in this session, as summarized below. None of these models seems to have been tested with populations living far from any health services, populations that have been historically excluded from government services, or people whose beliefs prevent them from using otherwise accessible services.

Providing health services through outreach can mean that health workers travel to remote, difficult-to-reach places, and lack of transport is often given as a reason for not going. Technet members have learned, however, that the problem is not necessarily lack of transport *per se* but lack of transport management. Management tools exist and are in use but not widely enough. Experience with transport management systems needs to be collated, adapted and disseminated; cost studies must continue; and operations managers need management skills, as Technet has recommended.

Discussion of efforts to reach the unreached with immunizations and other health services raised for the first, but not the last, time in this Technet meeting the importance of health information systems and communications for managers, logisticians, epidemiologists and health workers. Information systems were discussed by Ms Nancollas with respect to transport management and raised later in presentations on surveillance, stock control and other aspects of immunization operations as seen in the summaries and recommendations.

Summaries of presentations

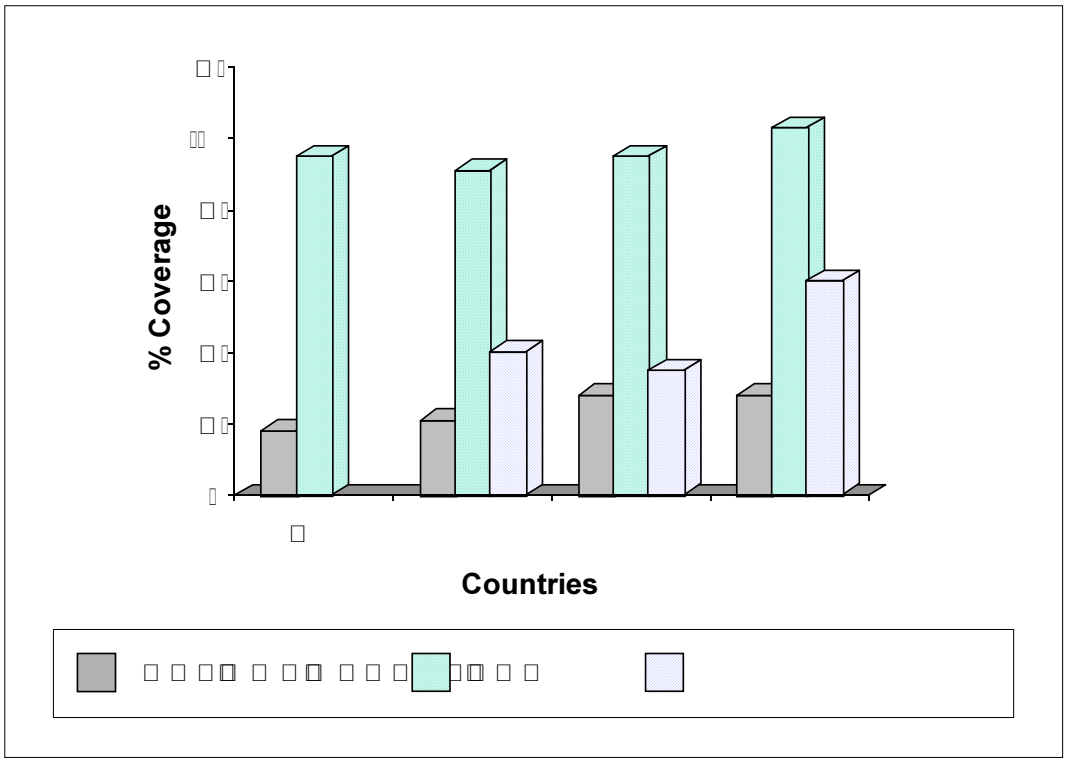
1. Sustained outreach services: status – M. Ngoma

Sustained outreach services (SOS) is a strategy designed to provide services to people who would not otherwise have access to them. The concept of accessibility includes both geographic and socioeconomic access. The need for accessibility comes from the great disparity observed between coverage achieved during national immunization days for polio eradication and the reported coverage of routine immunization services (see Figure 2). The concept also encompasses service quality: people are reluctant to use services lacking in quality.

In Africa, SOS projects have included other interventions besides immunization services, including education, medical treatment, vector control and cattle immunization. Disease surveillance activities have also been conducted during outreach. Most SOS projects work from fixed health centres or health posts.

As its name implies, the SOS strategy is supposed to be integrated into routine services and continued indefinitely on a routine basis. For this to happen, members of the public and government planners and decision-makers need to understand and support the strategy. District-level and other managers need to be sure that health workers understand what their responsibilities are and have the requisite skills, supplies, equipment and transport.

Figure 2: Comparison of coverage achieved by polio eradication NIDs compared to routine immunization coverage



2. *Efficient transport systems – S. Nancollas*

As the experience of Transaid Worldwide and other organizations has shown, transport management systems can have a significant impact on the delivery of health care.

The first requirement for a transport system to work is effective management, which includes policy-setting, operational management, fleet management and management information systems.

The second requirement is sufficient funding. The variety of sources for transport funding is a major constraint in effective planning. To overcome this problem, transport should be reduced to an all-inclusive cost, either per kilometre travelled or, preferably, per health service unit delivered. This cost would include all running and capital costs. The transparency of a health service unit cost encourages the provision of funding by donors and ministries. Money paid into a "trading account" each time a kilometre is travelled is then used for fuel, maintenance and replacement as planned.

The document, "From camels to aircraft", provided to meeting participants, details the experience of Transaid Worldwide in improving health service delivery through efficient transport management. The paper describes the organization's experience in a number of countries, including Eritrea, Ghana, Namibia, Pakistan and South Africa.

Reference: Nancollas *S. From camels to aircraft: The development of a simple transport management system designed to improve health service delivery*, WHO/ATT/TECHNET.99/Session 1/WP.1 (SN).

3. *Impact of locally-managed zero-breakdown transport systems – M. Moshoeshoe*

The critical role of transport in raising immunization coverage and in reaching the unreached with immunization and other health services has been proven. Good transport management systems can result in "zero-breakdowns" of vehicles, which means that vehicles can constantly be in use. These systems have been tested and are now being followed in those places that have the interest and financing to install them. What is needed is to persuade governments and donors that an investment in these systems will result in savings in the medium term and immediate impact on transport availability for service provision. Transport is one problem that money can solve.

4. *Tanzania village health days – K. Kagaruki*

In Tanzania, the Ministry of Health, the United Nations Children's Fund (UNICEF), and a number of nongovernmental organizations have been collaborating in a project to reduce child mortality and morbidity, increase child growth and development, and improve maternal health and nutrition through "village health days". Village health days, held in selected villages every three months, include health education, immunization, growth monitoring, and clinics for mothers and children.

People where village health days are held participate by collecting, analysing, and reporting data through a hierarchy of committees.

To date, the programme for the integrated management of childhood illnesses (IMCI) operates separately from village health days in Tanzania. In the discussion after the presentation, Technet participants suggested that policy-makers in Tanzania coordinate the two strategies. The most important revelation of this presentation was that it showed the great importance of community involvement, social organization and good communications in managing multi-intervention health service delivery. It suggested that this might be the best way to achieve high immunization coverage in rural communities that have relatively strong social organizations.

Reference: Kagaruki K. *Tanzania, village health days* (WHO/ATT/TECHNET.99/Session 1/WP.3).

5. "Healthy Start" programme: Indonesia – C. Nelson

Improvement of child survival in regions where traditional health practices predominate requires innovative strategies. In the Healthy Start programme in Indonesia, trained midwives conducted neonatal home visits in an area of high infant mortality. Working closely with the community, the midwives provided neonatal care, health education, micronutrient supplementation, and immunizations during the home visits. They taught traditional birth attendants (TBAs) safe birthing practices. People in the community formed a village-level surveillance system for births, deaths and pregnancies.

As a result of this programme, antenatal care, birthing practices and immunization coverage improved. Midwives cited the home visits and working with TBAs as good strategies for gaining community acceptance as well as for improving health care.

The programme has been continued and expanded under local funding since donor funding ended. The Indonesian government has recently incorporated key elements of Healthy Start into policy, including postpartum home visits and hepatitis B vaccination at birth. Several new donor-funded programmes in Indonesia are also incorporating the Healthy Start model.

In response to questions after his presentation, Mr Nelson attributed the lack of logistics problems to the existence of good infrastructure and effective supply distribution systems where Healthy Start operated. The major issue in these areas was overcoming the lack of experience of members of the public and health care providers by working together to solve health problems. In remote areas, where people have never had health services, logistics would probably become more of a problem.

Session 2: Logistics of disease control

Chair: *S. Okiror, WHO, Nigeria*
Rapporteur: *P. Carrasco, WHO*
Presenters: *M. Haghou, WHO*
M. Gatton, Riders for Health
M. Birmingham, WHO
J. Welsch, WHO
J. Andrus and P. Abeykoon, WHO
G. Larsen, WHO

Session summary

Current eradication and control activities against poliomyelitis, measles and tetanus require the following activities at minimum:

- Provision of vaccines and immunization-related materials.
- Transportation.
- Collection and transport of specimens (reverse cold chain).
- Data collection for analysis and feedback.

Implementing these activities requires training, supervision, communications, management and funding. Planners and policy-makers hope that the investments made and experience gained in polio eradication will contribute to other disease-control activities.

Experience with surveillance activities in Afghanistan and Nigeria and other disease control and eradication efforts highlight the need for good logistics. To be effective, logistics planning and management need four kinds of information:

1) Classification of sentinel sites by location.
2) Geographic profile of areas with low coverage, confirmed disease reports, or both.
3) Schedule of places and dates for arranging transportation.
4) Ice-making requirements for supplying every vaccination team during national immunization days (NIDs).

The presentation on acute flaccid paralysis (AFP) surveillance underscored the principle that support is more likely to be obtained when there is a defined surveillance structure with clearly delineated tasks at each level.

Presenters emphasized the need to train immunization programme managers and logistics officers and to monitor the quality of logistics. For monitoring logistic support during polio eradication activities, the following indicators have been used with good results:

- Percentage of AFP cases investigated within 48 hours.
- Percentage of AFP cases with adequate stool samples collected within 14 days.
- Percentage of AFP samples collected that have non-polio enterovirus isolated in the laboratory.

Issues still to be addressed by Technet and the WHO secretariat include:

1) To determine whether the budget for recurrent costs of all types of transport should include an element to enable transport to be replaced at the end of its economic life.
2) To document how and when the use of VVMs simplifies logistics and supports the "fast cold chain".
3) To provide a checklist for supervisors to rapidly assess whether immunization activities are being supported logistically and whether objectives are being achieved. These objectives should include at a minimum:
   - adequate transportation is available for all programme activities, including disease surveillance and delivery of stool samples to laboratories;
   - the cold chain operates effectively, including vaccine collection and delivery;
   - vaccine vial monitors are used and interpreted properly;
   - safe injection policies are practised;
   - contaminated equipment is disposed of properly.

A summary of the individual presentations is given below.

Surveillance systems

1. Supervision tactics in Nigeria – S. Okiror

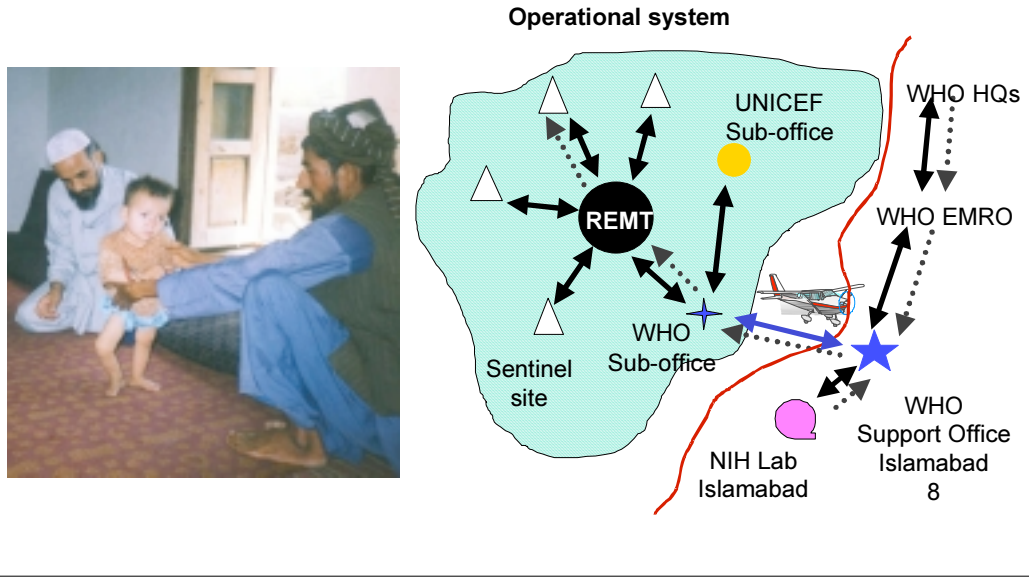
Nigeria has created a system for supervising AFP surveillance activities that begins with health workers, goes through primary health care directors in local government areas (LGAs) and state epidemiologists, and ends with WHO zonal surveillance officers. Supervisors are supported with a variety of management tools, a "zero-breakdown" transport system and salary incentives. The emphasis on supervision has resulted in a significant increase in the number of AFP cases investigated – almost double the number expected – and improvements in the number and condition of stool specimens delivered for laboratory analysis.

Although polio eradication funds have been used to finance the new supervision system, it is hoped that the system can be extended to all facilities and continued where it has been introduced and that another source of funding can be found.

2. *AFP surveillance in difficult conditions: Afghanistan – M. Haghou*

Acute flaccid paralysis surveillance, one of the essential strategies in the eradication of polio, was established in Afghanistan in September 1997. The AFP surveillance system in Afghanistan consists of nine steps or levels, from the time specimens are collected in 86 sentinel sites until they reach the laboratory in Islamabad, Pakistan. Because of the difficulty in collecting two specimens 24 hours apart in some areas, patients and their parents are sometimes sent to sentinel sites where the patient is hospitalized for 24 hours until specimens are collected.

Figure 3: Surveillance for acute flaccid paralysis in Afghanistan



In 1999 up to 30 November, 80% of non-polio AFP cases were detected with a total of 51 laboratory-confirmed polio cases. Two stool specimens were collected, 24 hours apart, within 14 days from the onset of paralysis, from 60% of cases. This achievement may be attributed in part to the reimbursement to parents of transportation costs and the incentive payments given for cases detected.

To improve the system further, ethnographic studies will be conducted to identify the routes AFP cases travel before they reach the health system. In addition, surveillance will be expanded to detect all non-polio AFP cases in the country.

The collection and delivery of specimens need to be monitored to ensure that cold chain conditions are maintained throughout the journey, particularly where specimens must be sent to another country for analysis. A crush-proof, leak-proof, sealed and safe container for storing stool and blood specimens is needed. This reverse cold chain equipment, initially used for AFP surveillance, can eventually be applied to meet the specimen collection and transport needs of other diseases.

3. Fleet management for surveillance in Nigeria – M. Gatton

The fleet management system recently introduced in Nigeria operates in five phases:

1) Assess needs.

2) Find the best, local people.

3) Train, based on local information and involving supervisors as well as drivers and maintenance technicians.

4) Do it!

5) Don't stop. Replicate.

The contract hire system, now in its early days of implementation, needs to be monitored continuously to calculate actual costs. Similar cost assessments, as well as effectiveness data, are needed for other fleet management systems in Africa to assist managers in designing fleet management strategies.

4. New module on surveillance logistics – M. Hodge, M. Haghgou, M. Birmingham

At the Technet Consultation in Copenhagen in 1998, a priority activity related to "logistics management in surveillance" was identified. The Technet members' view at that time was that specimens were not always being transported safely and that practical guidelines on surveillance logistics were needed for national staff. On the basis of that recommendation, a first draft of a Surveillance Logistics Module was developed.

Surveillance logistics is defined as obtaining, managing and moving human resources, specimens and data. The aim of the new module is to describe in simple and practical terms the logistic needs within a framework of the six universal functions of surveillance:

1) Detection and notification of a health event;

2) Data collection and consolidation;

3) Investigation and confirmation – clinical, laboratory and epidemiological;

4) Data analysis and reports;

5) Feedback of information;

6) Feed-forward of information.

The annexes cover major practical issues such as AFP surveillance, resource management, data analyses and reports, a supervisory checklist for surveillance, the IATA regulations, documentation and packaging requirements, and surveillance logistics in emergency situations. This module will be part of a series on surveillance; an accompanying module on data management is under preparation.

The next step for this module is a critical review. The draft module was made available to Technet members in Harare, and they were asked to provide comments to Marcus Hodge *mhodge@hn.vnn.vn* (lead developer); Mojtaba Haghgou *mojtaba@mh.sdnpk.unpd.org* (codeveloper); or Maureen Birmingham *BirminghamM@who.int.*

Reference: Birmingham *M. New logistics for surveillance module* (WHO/ATT/TECHNET.99/Session 2/WP.4).

Rapid assessment of the cold chain and house-to-house campaigns

1. Pakistan – R. Hafiz

In 1999, house-to-house campaigns were held in areas determined to be at high risk because of poor routine services, the number of known polio cases, and/or poor polio surveillance systems. The success of the house-to-house strategy in 1999 has led to a decision to expand its use in 2000.

Supplemental activities in 2000, including the house-to-house strategy, will require the following:

- Continued good planning.
- Continued good surveillance, which provides not only epidemiological information but motivation to decision-makers to support supplemental campaigns.
- Use of a variety of social mobilization techniques to engage the public in the polio eradication effort.
- Funds – costs are estimated at 60% for "incentives" (described as payments for health workers, community leaders, and supervisors) and 40% for logistics.
- Continued good supervision.
- Continued use of the vaccine vial monitor.

2. Bihar and Uttar Pradesh, India, 1999 – J. Andrus, T. Hart, R. Hossaini, P. Abeykoon

The objective of this presentation was to provide a synopsis of the rapid assessment in the second semester of 1999 of the cold chain in Bihar and Uttar Pradesh (UP) for polio eradication activities and the actions taken as a result of the assessment. These states have the lowest immunization coverage rates in the country.

For several years there has been abundant information, although anecdotal, to indicate that the cold chain in Bihar and UP needed urgent attention, but it was not until accurate surveillance information was available that health authorities took action.

Those surveillance data showed that, while the transmission of wild poliovirus in all states has been dramatically reduced, wild poliovirus type 2 is still widely circulating in Bihar and UP. Surveillance data revealed that vaccine efficacy of three doses of oral polio vaccine (OPV) nationwide was 65% but only 40% in UP and 25% in Bihar.

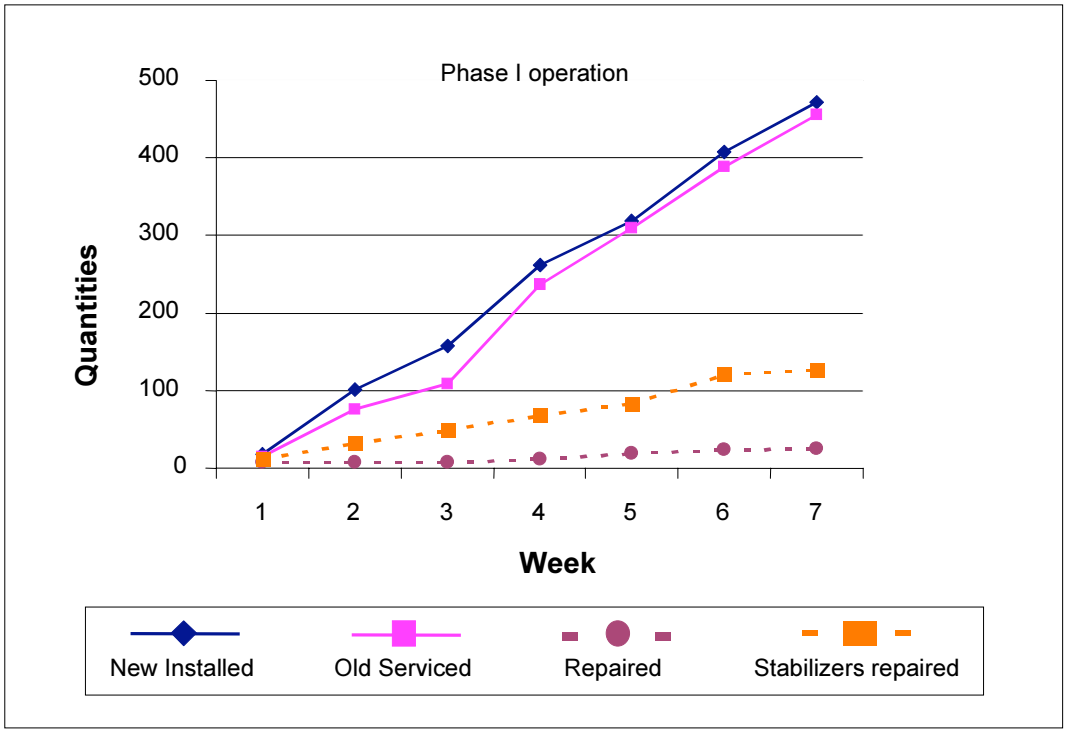
The strategy to address the widespread virus circulation in Bihar included the addition of two extra rounds of NIDs and two extra rounds of subnational immunization days (SNIDs) in eight high-risk states. Given these plans, the effectiveness of the cold chain took on added importance. A partnership including government, partners, UN agencies and private enterprise was created to assess the quality of the cold chain and vaccines at all levels and to identify the support and maintenance requirements and mechanisms needed to facilitate change in cold chain management.

The quality of the cold chain in both states was found to be poor:

- 65% of large cold chain equipment was not working.
- 40% of small cold chain equipment was not working.
- Storage capacity for OPV was inadequate.
- Freezing capacity for ice packs was inadequate.

Clearly, immediate improvement was needed. In Bihar, where more than 50% of the cold chain equipment was found to be non-functional, a maintenance training programme was implemented by IT Power, a private firm in India, beginning in October 1999. Four mobile teams, each comprising a refrigeration technician and electricians, give the 10-week course in two phases. By week 7 more than 500 new refrigerators and freezers were installed, 500 existing systems serviced and repaired, and 150 stabilizers repaired. Major equipment maintenance will be the focus of the remaining weeks of intervention.

Figure 4: Rapid assessment and corrective action in Bihar



This presentation suggested strongly that, with the necessary human and financial resources, the cold chain in areas with very poor infrastructure could be upgraded in a short time. It was less clear how these activities would be sustained and monitored in the future.

Vaccine distribution and sample collection

1. The "fast cold chain" and eliminating "leftovers" – G. Larsen

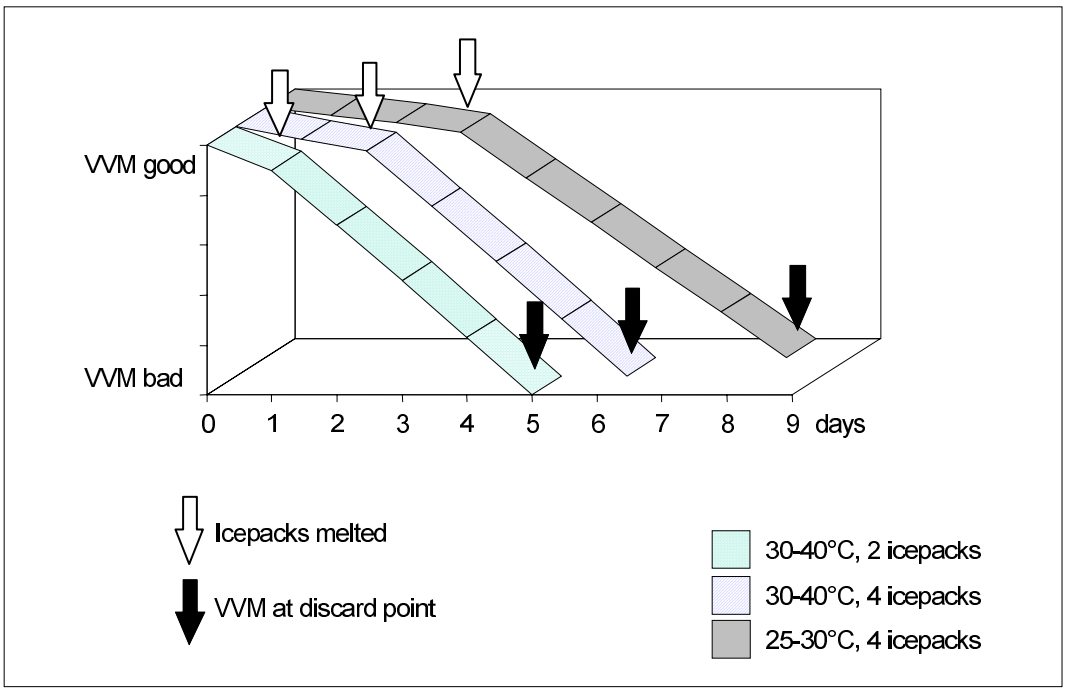
The cold chain, appropriately managed, has been able to ensure vaccine potency from manufacturer to vaccination site; but now, with today's equipment, technology and management systems, the cold chain can also be flexible.

Vaccine vial monitors are the first step toward that flexibility. Vaccine vial monitors on oral polio vaccine (OPV) allow health workers to take the vaccine from the central store directly to health facilities and outreach locations without renewing icepacks on a daily basis.

- In a cold box, OPV can maintain its potency for five days without renewal of icepacks.
- In a vaccine carrier, OPV can maintain its potency for 48 hours without renewal of icepacks.

This application, sometimes called the fast cold chain, has been used in difficult settings, such as Democratic Republic of Congo, Nigeria, Sierra Leone, Somalia and Sudan.

Figure 5: VVM experience from the field



Technet meeting participants, during the discussion after this presentation, suggested that the difficulty for health workers and managers in accepting the "fast cold chain" and using it to solve access and other problems is the name itself. Work is needed to teach people that they are not "getting out of the cold chain" when they combine VVMs with cold boxes and vaccine carriers; rather, they are using new techniques to keep vaccines within it.

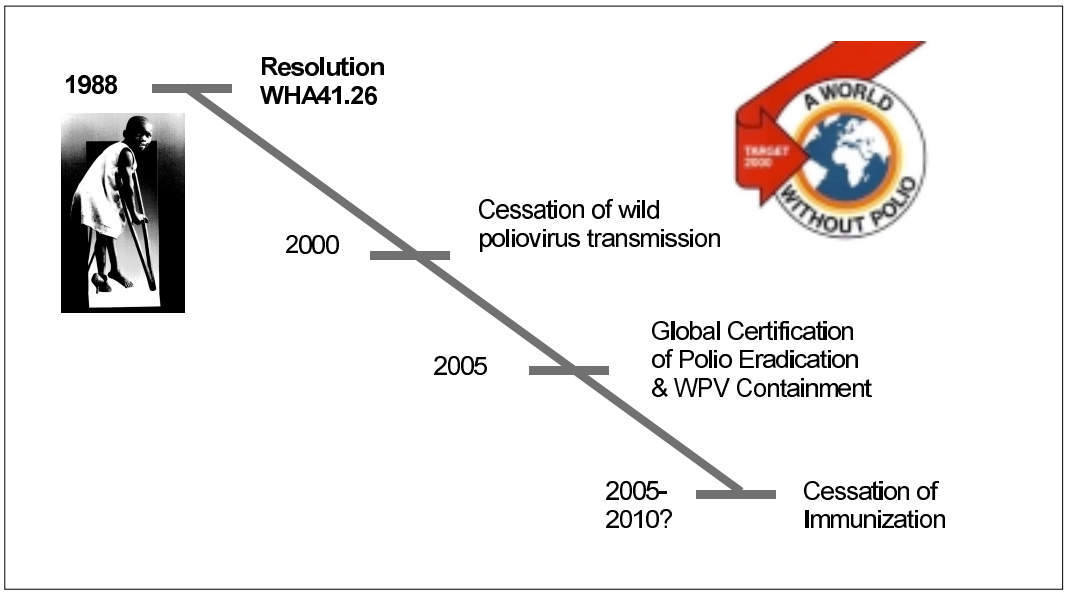
2. Polio vaccine forecasting and the "end game" – G. Larsen

As occurrence of wild poliovirus is reduced to fewer areas, this presentation raised questions of what should we do next. Among them:

- How should we stop polio immunization?
- What presentation of vaccines should be used in the "end game" as eradication is approached?
- What vaccination strategy should be implemented in case of an outbreak after immunization stops?
- How should immunodeficient patients who excrete polio be managed?
- How will we identify mutants with increased neurovirulence?
- How should we plan to stockpile polio vaccine?

The first, second, third and last of these questions, which are being debated at the international level, have great implications for the planning of the cold chain at national level in the future. The presentation therefore underlined the responsibility of Technet, both to influence the international debate from a logistics point of view and to assist countries with planning national logistics systems accordingly.

Figure 6: Polio eradication – what constitutes success?



Session 3: Safety of injections

Chair: *S. Landry, USAID*
Rapporteur: *M. Catlin, PATH*
Presenters: *Y. Hutin, WHO*
M. Birmingham, WHO
G. Larsen, WHO
R. Feilden, Feilden Battersby Associates (FBA)
A. Battersby, FBA
A. Schnur, WHO
W. Sopwith, Liverpool School of Tropical Medicine
M. Koska, Star Syringe
F. Garin, Becton Dickinson
P. Kellogg, Health Care Products Plus
C. Nelson, Programme for Appropriate Technology in Health (PATH)
J. Lloyd, WHO
L. Diaz, CalRecovery
D. Rogers, Council of Scientific and Industrial Research (CSIR), and D. Phillips, Department of Health, South Africa
D.J. Picken, DeMontfort University
M. Brookman, Consumers' Association

Session summary

This session included presentations on injection safety policies and their implementation. The following topics were included:

- Injection safety policies and economics.
- Sterilizable syringes.
- Auto-disable syringes and pre-filled injection devices.
- Managing sharps waste.
- Sharps disposal technology.

1. *Injection safety*

The importance of safe injections is not matched by the availability of country and donor funding and other efforts. Despite promotion by WHO, many national programme managers are not monitoring adverse events associated with vaccination.

Injection safety interventions must be tailored to specific countries and the impact of interventions monitored using both process and disease indicators. Integration of behaviour change and the provision of equipment were recommended both to reduce transmission and to attract funding.

The role of the Safe Injection Global Network (SIGN) in coordinating research, promotion, and planning on injection safety in curative as well as preventive settings was warmly endorsed by Technet members. The SIGN approach is to deal with injection safety as a systems' issue rather than as something to solve by training, supervision, provision of equipment or other interventions in isolation.

2. *Injection equipment*

Many countries continue to use sterilizable injection equipment for curative and preventive purposes – even those that have introduced auto-disable equipment into their immunization programmes continue to give BCG vaccine, as well as injectable drugs, with sterilizables. The problem of sterilizing needles and syringes (and other equipment) will not go away.

Participants agreed that countries vary widely in their infrastructure and that Technet needs to support a strategy that recognizes the diverse requirements of more than 150 countries. Discussants were divided over whether that strategy should include all technologies that might be safely used or whether a strong unambiguous statement in support of a particular technology, such as auto-disable syringes, would aid programme managers in decision-making and lobbying for outside funds.

Some participants questioned whether overburdened rural health facilities could sustain dual systems for steam sterilizing one type of injection equipment and immediately disposing of another type. Others pointed out that facilities that provide curative services must have dual systems to sterilize or disinfect reusable medical equipment used in invasive and diagnostic procedures.

Progress was reported on efforts in three countries to evaluate the system-wide costs and benefits of three types of injection technology. Discussants underlined the importance of seeking such data and reminded that its interpretation depends on the definitions, protocol and methods used.

Lack of cost data for single or multi-dose jet injectors is a stumbling block in getting vaccine manufacturers involved in their development and introduction. A protocol is needed for determining the cost-benefit and cost–effectiveness of available injection technologies.

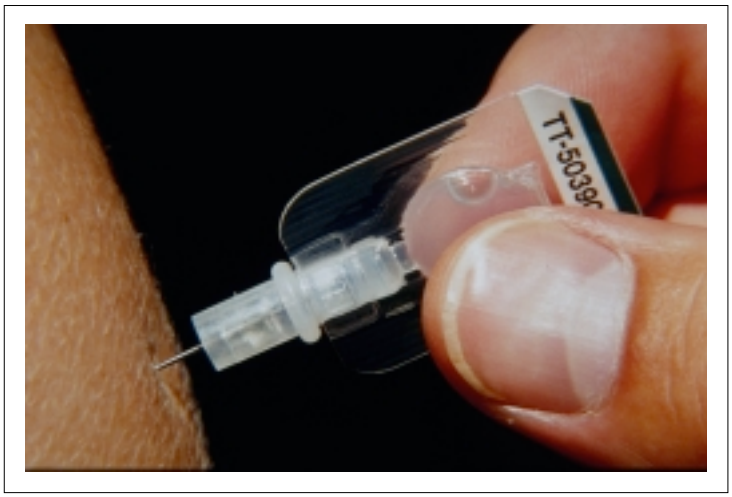
In discussions regarding technology transfer of syringe production, participants recalled the lessons learned from the experience of public sector vaccine production, viz., that availability of funds and technical assistance do not guarantee success. Regulation of the production process and product quality monitoring remain ongoing needs, although it was undecided whether these standards should be international.

3. Pre-filled injection devices

Despite successful trials and UNICEF–Becton–Dickinson funding commitments to use UniJect in 27 countries to eradicate neonatal tetanus, countries should increase demand for producing other vaccines in UniJect by combining their orders.

Data on the operational research, system-wide impacts and costs (including cold chain and wastage) of mono-dose UniJect presentation should be given to Technet where available.

Figure 7: UniJect Pre-filled injection device



4. Managing waste and waste disposal technology

Managers generally seem to lack information they need to make good choices among waste disposal technologies and to manage the waste disposal procedure itself (e.g. audit trails, transport optimization). Managers need to know all the facts; even the best technology can have undesirable aspects and misperceptions about equipment capabilities can cause good solutions to be abandoned. Despite ongoing trials, there is a need for solutions for rural areas that lack adequate energy and water. Equipment that does not use wood was requested to avoid deforestation and improve ease of use.

There is admittedly no perfect technology for destroying medical waste; current environmental air quality regulations may be too onerous for low-volume incinerators; and there are not many solid waste experts. However, participants felt that action must still be taken:

- Management assistance should be provided for the selection of appropriate waste technologies and their implementation and monitoring, as well as supply and fuel provision.
- National planners should plan holistically and address as a single problem the prevention of blood-borne pathogen transmission through blood transfusions, injection safety, and other nosocomial exposures.
- Technology relating to incineration, needle-destruction and thermal processing, even though still in the developmental stage, should be listed in WHO Product Information Sheets (PIS).
- Experience on the use of emerging technologies should be shared through the PIS, Technet, and other networks.

Information was presented on devices designed to prevent the reuse of syringes and the prevention of needle-sticks. Participants were interested in combining safety boxes with low-tech devices to destroy used needles. Health workers in Indonesia enthusiastically endorsed the use of one such device, but they and others with experience in similar technologies mentioned disadvantages:

- The smell from some models is bad.
- The devices did not reduce rates of needle-sticks in staff (which often occur post-use, pre-destruction).
- The devices must be available wherever injections are given, including outreach.
- The devices dependent upon energy sources may cause syringe and needle stockpiling and a surge in needle-stick injuries when power sources fail.

Summaries of the individual presentations are given below:

Injection safety policies and economics

1. Safe Injection Global Network (SIGN) – Y. Hutin

Unsafe injection practices are increasingly recognized as a major source of infection caused by blood-borne pathogens. The prevention of blood-borne pathogen transmission and other adverse events associated with injections will require collaboration among interested organizations and individuals.

The seven steps of a safe injection

A safe injection does not harm the recipient, does not expose the provider to any avoidable risk, and does not result in any waste that is dangerous to the community.

It is the result of seven activities:

1) Clean work space
2) Hand washing
3) Sterile syringe and needle
4) Sterile vial of medication and diluent
5) Skin cleaning
6) Appropriate collection of sharps
7) Appropriate waste management

To achieve the goal of safe and appropriate injections throughout the world, a voluntary association has been established called the "Safe Injection Global Network" (SIGN). The network is supported by a permanent secretariat located in the Blood Safety and Clinical Technology (BCT) department of WHO.

SIGN's current draft aide-memoire recommends that national strategies for safe and appropriate use of injections include three components or axes:

1) *Behaviour change*. The foundation of safe and appropriate use of injections is behaviour change on the part of consumers and health care workers at all levels to reduce the over-use of injections and to practice injection safety.
2) *Availability of adequate equipment and supplies*. A reliable flow of equipment and supplies, including needles and syringes, sterilization equipment, infection control supplies, and waste disposal supplies, is needed to eliminate the re-use of needles and syringes.
3) *Management of sharps waste*. Syringes and needles must be handled in a totally safe manner and maintained in a totally safe environment from the moment that they are used until they are destroyed by incineration.

Reference: Hutin Y. *The Safe Injection Global Network (SIGN)* (WHO/ATT/TECHNET.99/Session 3/WP.1).

2. *Immunization safety priority project – M. Birmingham*

By 2003, the Department of Vaccines and Biologicals (VAB) of WHO intends to have established a comprehensive system to ensure the safety of all immunizations given by national immunization programmes. The strategies to be used will address the three axes of SIGN described by Dr Hutin in the previous presentation: namely behaviour change, availability of equipment and supplies, and management of sharps waste.

The activities to be included in the planned VAB project are:

- Ensuring vaccine safety from clinical trials, through vaccine distribution, to the point of use.
- Broadening access to safer and more efficient systems for vaccine delivery and sharps waste management. This is an area of concerted action within the common strategic framework of SIGN.
- Establishment of efficient mechanisms that detect serious or potentially serious adverse events following immunization and enable prompt and effective response.
- Communication of the importance of injection safety among health workers, managers, and the public to overcome the common lack of interest in the issue (at least until a crisis occurs).

3. *Assessing the whole costs of injection technologies: case studies in Africa – G. Larsen*

The choice of injection equipment for immunizations is often based on purchase price alone, but this is only a fraction of the total cost that is actually incurred. A mathematical model has been developed to enable managers to compare the whole costs of different equipment, including purchase price and the cost of treating the subsequent diseases or infections that may be associated with using each.

In mid-1999 a study using this model was initiated in three African countries where different types of injection equipment are used:

- Côte d'Ivoire – disposable syringes
- Ghana – auto-disable syringes
- Uganda – sterilizable syringes

Data are still being analysed but preliminary findings are that when both direct and indirect costs, including the cost of treatment of infections, are taken into consideration, auto-disable syringes are eight times cheaper than sterilizable syringes and six times cheaper than disposables. The data also show that current injection practices pose serious risks to patients, health workers, and the public. Immediate action must be taken to ensure safe disposal of syringes, improve sterilization practices, and stop the practice of re-capping used needles.

Reference: Larsen *G. Assessing the whole cost of injection technologies: case studies in Africa* (WHO/ATT/TECHNET.99/Session 3/WP.3).

The use of sterilizable syringes

1. Life of sterilizable syringes in Zambia – R. Feilden

Sterilizable syringes still play a major role in vaccinations and other injections:

- More than 50% of children globally are immunized with sterilizable equipment.
- Auto-disable equipment is not yet available through UNICEF for bacille Calmette-Guérin (BCG) vaccinations, so sterilizables must be used.
- Sterilizable equipment is used in providing many other health services.

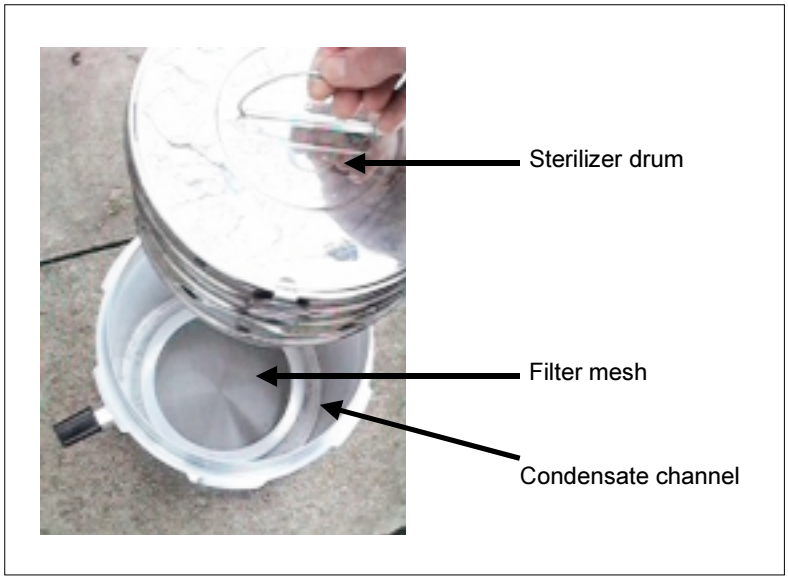
For these reasons, extending the life of sterilizable equipment is cost-effective. Reduction of the problem of hard water alone can contribute to the longevity of syringes. A trial of the Vapour Purifier filter in Zambia showed that costs could be reduced from US$ 22.46 per 1000 injections in very hard water to US$ 1.46.

The same Zambian study also revealed serious problems in sterilization practices that could be solved through better training, follow-up and provision of equipment.

Problems included:

- Timers were not used during the sterilization process.
- Time, steam, temperature (TST) indicators were not used.
- Sterilizers were in poor repair.

Figure 8: The vapour purifier



Reference: Feilden R. *Life of sterilizable syringes in Zambia* (WHO/ATT/TECHNET.99/Session 3/WP.4).

2. Sterilization success story in Bangladesh – A. Battersby

In Bangladesh, central re-processing and sterilization of injection equipment by dedicated sterilization technicians has improved the sterility of devices used in outreach. It has also reduced the workload of vaccinators and reduced variability in the quality of equipment, use of TST monitoring, staff training and techniques used to sterilize. Other advantages include:

- The sterilization process has been "industrialized". Expert technicians run it, using the best equipment available. Every step is monitored continuously.
- All sterilizable items, including dressings and instruments as well as syringes, are sterilized in the health complexes.
- Equipment maintenance is systematic.
- The unit cost is low. The cost of sterilizing syringes in sterilizer drums for every 100 injections is US$ 1.45: the cost of auto-disable syringes per 100 injections is US$ 11.78, or eight times more.
- Health workers can sterilize equipment during working hours instead of after hours.

Reported disadvantages include the initial need for more syringes, need for design improvements in drum sterilizers, and the need to transport equipment to the centre from a sometimes distant site. The endorsement of UNICEF and other large donors of an auto disable-only policy may result in this successful project being abandoned. However, Bangladesh hopes to install the system in all districts by the end of 2000.

3. Compliance in China – A. Schnur

The 1997–2000 injection-safety plan of the Chinese Ministry of Health applies to immunization injections only, not to injections given for preventive care. It covers both disposables, which tend to be used in more prosperous areas, and sterilizables, which are used in poorer areas. The government asks donors to provide sterilizables to ensure future availability of equipment.

International partners have been active in high-risk provinces where they have supplied steam sterilizers as well as syringes and needles. However, fundamental safety problems continue, including:

- The re-use of injection equipment, especially syringes.
- Lack of operating sterilization equipment, including a lack of TST indicators.
- Lack of guidelines and equipment for waste disposal.

With 20 million neonates per year and 11 injections to vaccinate each child, these problems cannot be ignored.

4. Sterilization under the microscope – W. Sopwith

Many items of medical equipment, including needles and syringes, are subject to reuse. To ensure safe delivery of an injection or other procedure with such equipment, it must be decontaminated.

Decontamination is defined as a process that destroys contamination and thereby prevents microorganisms and other contaminants from reaching a susceptible site in sufficient quantities to initiate infection or another harmful response. Three processes of decontamination are commonly used: cleaning, disinfection and sterilization.

A key consideration in decontaminating equipment is deciding which procedure is most practical to use. Inconsistencies in recommendations among WHO and the Joint United Nations Programme on HIV/AIDS (UNAIDS) documents are just one of the difficulties that programme managers have in setting sterilization policy.

A protocol for a search of the literature for experimental evidence of effective decontamination procedures is now under development. The protocol will enable users to examine the evidence with respect to the nature of the infection risk and the efficacy and practicality of various procedures.

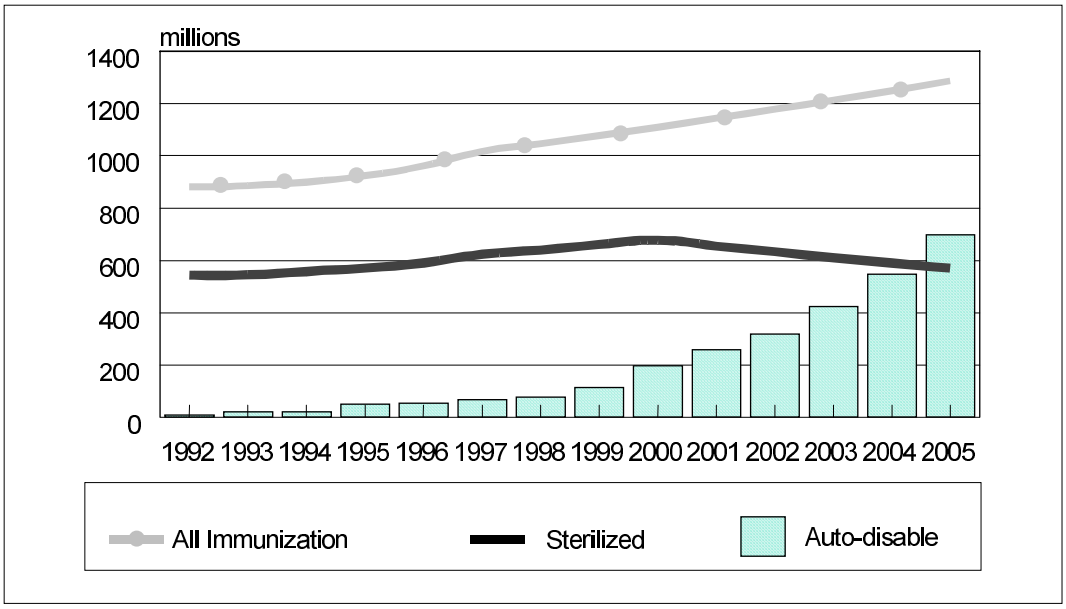
Reference: Sopwith W, Garner P, Hart T. *Sterilization under the microscope: a systematic review of procedures to ensure the sterility of reused equipment* (WHO/ATT/TECHNET.99/Session 3/WP.8).

The use of auto-disable syringes and pre-filled injection devices

1. Global capacity and technology transfer – G. Larsen

Demand for auto-disable syringes has risen steeply in recent years (see Figure 9) and sources of supply have therefore also increased. Seven manufacturers currently manufacture auto-disable syringes. Three offer technology transfer to other countries: Pharmaplan (Germany), Star Syringe (UK), and Univec (USA). Organizations at the global and national levels must determine what they will do to ensure the quality of syringes made by any of these manufacturers.

Figure 9: Demand for immunization syringes 1992–2005



2. *Industry statements*

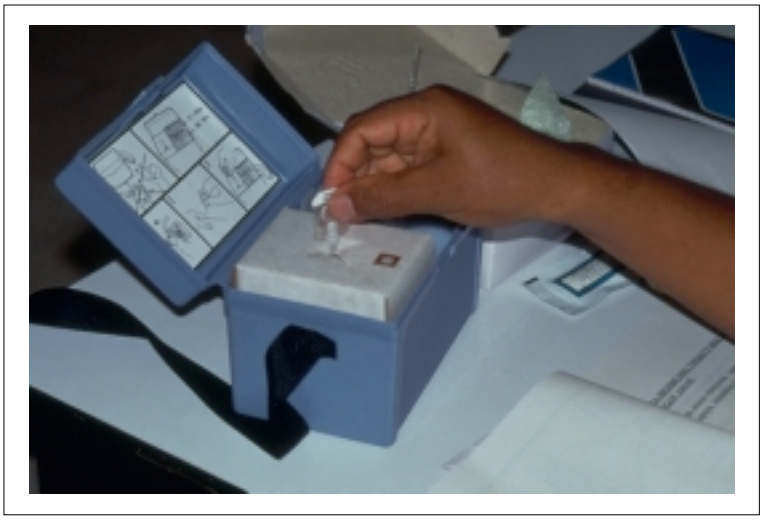
Star Syringe – M. Koska
Becton Dickinson – F. Garin
Health Care Products Plus – P. Kellogg

After the industry representatives presented their products, participants requested manufacturers to publicize the requirements for technology transfer and provide more information about how they can help countries with waste management, inventory management, advocacy, and training.

3. *UniJect update – C. Nelson*

UniJect is a pre-filled, single-dose, auto-disable injection device. Field study results presented at the 1998 Technet meeting showed that UniJect was enthusiastically endorsed by vaccinators and enabled the extension of outreach for delivery of tetanus toxoid (TT) and hepatitis B (HepB) vaccines. It was also cost-effective, particularly when used with expensive vaccines.

Figure 10: UniJect being disposed after use in Indonesia



Since the last Technet, significant progress has been made toward making vaccine-filled UniJects commercially available. Becton Dickinson has installed state-of-the-art UniJect manufacturing facilities in Singapore with production capacity that will soon reach 250 million units per year. Thirty-seven pharmaceutical companies are now evaluating UniJect; several are conducting stability and regulatory studies; and three are installing UniJect filling lines.

A joint UNICEF and Becton Dickinson tetanus elimination project, Partnership for Child Health, will provide nine million TT-filled UniJects for neonatal tetanus elimination programmes starting in mid-2000[1]. Indonesia is licensing the use of HepB and TT UniJects produced by Bio Farma, Bandung and plans to integrate both into programmes starting in 2001.

[1] Subsequent information indicates some delay in the availability of these TT UniJects, pending the results of stability tests.

Although availability is increasing, many vaccine manufacturers are hesitant to invest in a product for which there is no demand. Countries, in turn, do not ask for the UniJect product because they believe that it is not available. To break this cycle, country programmes are being encouraged to assess the role of pre-filled syringes in their programmes and to make their interests known to procurement agencies such as UNICEF and the Pan American Health Organization (PAHO) Revolving Fund. Those agencies need to hear that there is a demand for this technology.

Managing sharps waste

1. Report of the Technet subcommittee on sharps disposal – J. Lloyd

In April 1999, a Technet subcommittee met in Almaty, Kazakhstan, to address the worldwide problem of mismanagement of health care waste, particularly sharps but also infectious waste. Subcommittee members at the Almaty meeting were guided in their discussions by three principles:

1) Duty of care: The individual or organization that generates waste has a duty to society to ensure that it is effectively and safely processed and finally disposed of.

2) The polluter pays. The individual or organization that generates waste must pay for its processing and disposal.

3) The precautionary principle. All waste generated in the health care setting must be considered infectious *unless it can be proven otherwise.*

Poor management of health care waste poses risks to patients, health workers, ancillary staff and the public. While it is basically a health sector problem, it affects environmental and other sectors and thus demands systemic solutions. In addition to solving the immediate problems of waste processing and storage equipment, therefore, designers and planners need to consider:

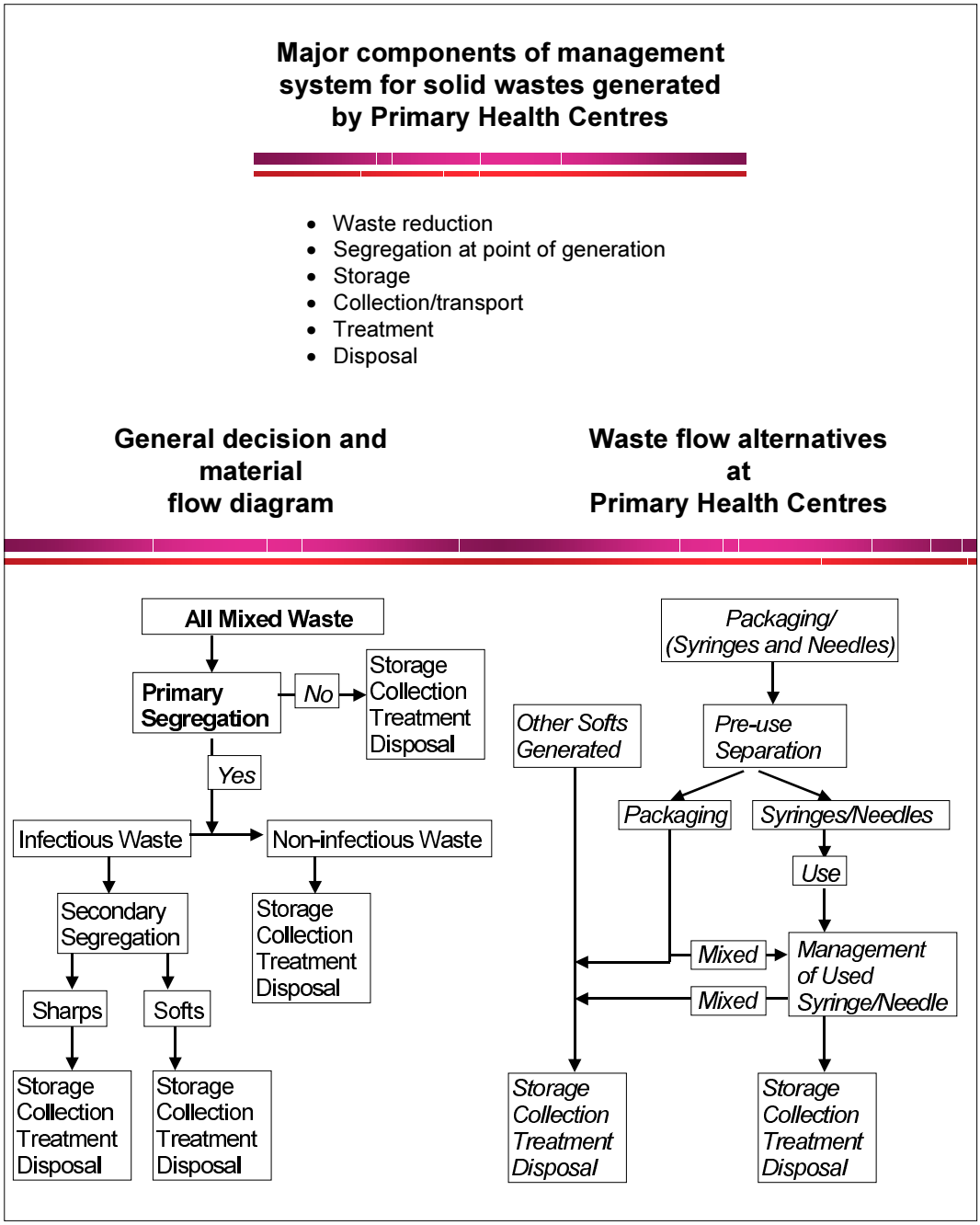
- Developing non-parenteral modes of delivery of injectables to avoid the release of blood-borne pathogens.
- Encouraging the continued use of sterilizable injection equipment, which poses less of a disposal problem but has practical implications.
- Increasing the awareness of health workers about needle-stick injuries and other dangerous practices and teaching them how to avoid them.

Incineration issues also need to be resolved and a variety of incinerators and other technologies are being tested.

Reference: Lloyd J. *Technet sub-committee meeting on the disposal and destruction of sharps and other infectious waste: Almaty, Kazakhstan, April 1999* (WHO/ATT/TECHNET.99/Session 3/WP.20).

2. *Decision-making tool for waste planning – L. Diaz*

Figure 11: Decision-making in waste management at Primary Health Centres



Among the recommendations of the Almaty Technet subcommittee on waste management was to develop guidelines on the management of health care waste generated in primary health care centres.

CalRecovery, Inc has drafted guidelines for decision-makers at the district level. These guidelines describe the decisions that need to be made and the alternatives available for dealing with a variety of waste management issues, including: waste reduction, segregation at point of generation, storage, collection and transport, treatment, and disposal. The guidelines make distinctions between: (1) the handling of "sharps" (e.g. needles and syringes) and "soft" waste (e.g. dressings): and (2) the needs of health centres in rural, peri-urban and urban settings.

3. Medical waste disposal activities at PATH – C. Nelson

PATH is evaluating methods of destroying syringes and needles immediately after use, particularly the "defanging" of the needles on used syringes, which could significantly reduce the disposal hazards of sharps. PATH intends to evaluate some of the commercially available electric needle destroyers from performance, market and impact perspectives. Simple technologies, such as needle clippers, are being investigated as well as more complicated ones.

PATH is also evaluating a plasma-enhanced melter system. Using a high-temperature anaerobic process, this approach may be shown to produce extremely low emissions and eliminate the need to segregate waste streams. Although the melter system is more sophisticated and expensive than incinerators, it may offer significant advantages in performance and acceptability. A device is currently being built that will be evaluated in South Africa in mid-2000.

Sharps disposal technology

1. Programme on small-scale medical waste incinerators for primary health care clinics in South Africa – D. Rogers and D. Phillips

To enable the South Africa Department of Health to obtain equipment for waste disposal in primary health care clinics, technical criteria for tender specifications were needed. As part of the development process, experts evaluated four incinerators:

- C&S Marketing electric
- Molope gas
- Molope auto-combust
- Pa-Hu Oy's auto-combust

In the laboratory trials, all four units rendered medical waste non-infectious, destroyed syringes, and rendered needles unsuitable for re-use. The results of smoke and soot emissions tests were mixed. The Pa-Hu Oy incinerator was declared unsuitable for field testing on this basis.

The field test evaluated safety, destruction capability, ease of use, and community acceptability. In these tests, Molope gas ranked first and C&S Marketing electric second.

South Africa is now ready for the final step, the development of specifications.

Reference: Phillips D, Kluge JF, Rogers D, Brent A, Raubenheimer HT. *Programme on small-scale medical waste incinerators for primary health care clinics in South Africa* (WHO/ATT/TECHNET.99/Session 3/WP.21).

Table 1: Results of testing and field trials in South Africa

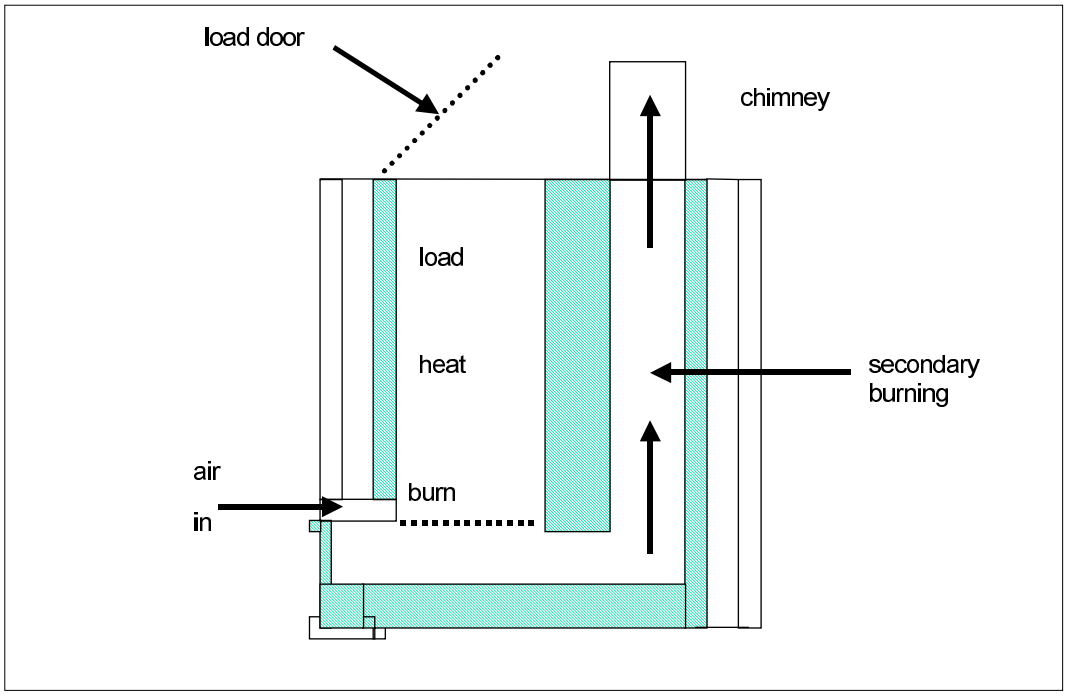
Incinerator	Safety	Destruction capability	Usability	Cimmunity acceptability
Molope gas	Good	Good	Good	Good
C&S Marketing Auto-combustion	Good	Good	Good	Good
Molope auto-combustion	Unacceptable	Unacceptable	Unacceptable	Unacceptable

2. The De Montfort University incinerator – D.J. Picken

De Montfort University (DMU) has developed and tested a prototype incinerator that meets the following specifications:

- It can reach temperatures above 800°C.
- It can operate without electric power.
- It is inexpensive to build and operate.
- It is easy to build on site with locally available materials.

Figure 12: Diagram of DMU incinerator



Tests of the incinerator in Zimbabwe and Nepal were positive, and improvements in the design are being made. Meanwhile, plans are progressing to develop guidelines for hospitals and manufacturers that wish to build the incinerators.

Reference: Picken DJ. *The De Montfort University Incinerator: Lessons from the field* (WHO/ATT/TECHNET.99/Session 3/WP.22).

3. Thermo-processing progress – M. Brookman

The thermo-processing of sharps is a method of rendering used needles and plastic syringes safe by heating them in an oven to a sufficiently high temperature to disinfect them, melt the syringes, and encase the needles in the resulting cake of plastic. The plastic cakes still must be incinerated but can be safely stored in a suitable container until transported to a central incineration site.

A series of tests was carried out to determine the optimum oven temperature and heating time needed to make a satisfactory syringe and needle cake and to assess any potential safety and environmental hazards such as high oven surface temperatures and toxic gas emissions.

Small ovens for the disposal of medical waste exist but their cost is high, so the tests of the thermo-processing technique were carried out using a less expensive and far simpler domestic oven.

A test load consisting of 100 Becton Dickinson 2 ml syringes fitted with 23 gauge 1 inch needles were placed randomly in a modified single rack Prestige sterilizer. During each test, the air temperature inside the melting pot, the surface temperature of the oven, and energy consumption were measured. The level of carbon monoxide in the fumes being vented from the melting pot was also monitored.

When the oven had cooled down after each test, the resulting plastic cake was carefully inspected for the presence of loose or exposed needles. The results are shown in the table below.

Table 2: Summary of test results

Oven temperature °C	Heating time Hours	Time that pot temperature was above 170°C	All syringes fully melted?	Number of needles loose or protruding from cake	Bacterial capsule disinfected
170	1.0	0.0	No	No cake	Yes
170	2.0	0.7	Yes	7	Not tested
200	4.0	3.8	Yes	None	Not tested
240	1.0	0.5	Yes	3 to 7	Yes
240	1.5	1.2	Yes	4 to 5	Yes
240	2.0	1.6	Yes	2 to 6	Not tested
240	2.5	2.2	Yes	3	Not tested
280	2.0	2.0	Yes	5	Not tested

In all of the tests carried out at 170°C and 240°C, where a bacterial capsule was included in the test load, subsequent tests at the Central Public Health Laboratory showed that the bacteria had been killed and therefore, the syringe load disinfected.

The cakes produced in all but the last test had a few needles protruding around the top edge or loose needles resting on the top of the cake. The last test carried out at 200°C for a four-hour heating period produced a cake in which all the needles were enclosed.

Further work is needed to determine if thermo-processing of syringes and needles can be successfully, safely and reliably carried out using modified domestic ovens and to develop a test protocol. In particular, the problem of toxic gas emission needs to be investigated before further testing is done to measure performance characteristics of the ovens such as processing larger loads, energy efficiency and the use of alternative power sources.

Safety and durability testing of the ovens are also needed before this promising technology can be recommended.

Reference: Brookman M. *Thermo processing progress* (WHO/ATT/TECHNET.99/Session 3/WP.23).

Session 4: Cold chain update

Chair: *D. Phillips, Ministry of Health, South Africa*
Rapporteur: *A. Bass, University of Queensland*
Presenters: *S. Muziki, WHO and O. Hazemba, WHO Consultant*
J. Lloyd, WHO and M. Catlin, PATH
M. Dicko, WHO and J. Lloyd
R. Davis, UNICEF
S. Kone, WHO and B. Jacquet, WHO
P. Carrasco, WHO
G. Larsen, WHO
T. Hart, IT Power and M. Dicko
S. Hart, Crown Agents

Session summary

This session included updates on policies concerning the cold chain, analyses of new and continuing cold chain issues, and assessments of tools for the management of vaccine supply, distribution, and storage.

1. Vaccine vial monitors

The vaccine vial monitor (VVM) technology is virtually ready for use on most liquid vaccines, and development work is almost complete on VVM labelling of freeze-dried vaccines. In spite of the success in VVM development and increasing availability, however, managers and health workers are just not using them.

The problems include added costs that VVMs place on vaccines, inconsistency of manufacturing and lack of standards, confusing messages concerning the "fast chain" and other concepts, and the inability of health workers and others to interpret and make decisions with them. The benefits of using the VVM, such as in extending outreach, have not been made clear to managers.

VVM training must be given very high priority beginning with the development and dissemination of VVM training materials and their incorporation into routine training. VVM use should be monitored by all district and other visitors to health facilities.

2. *Multi-dose vial policy*

The multi-dose vial policy is not being implemented. Possible reasons begin with the change in the name from "opened vial policy" to the "multi-dose vial policy". Other issues include:

- Changing a fundamental behaviour, i.e., discarding opened vials, that has taken 20 or more years to instill.
- Recognizing the increment of recent changes that health workers have been expected to adopt.
- Addressing the complexity of the policy itself.

Technet members cited many examples of the problems with interpretation of the policy as written:

- The lack of emphasis on keeping opened vials under cold chain conditions.
- Confusion about the length of time that opened vials with VVMs can be used – Technet members proposed that they should be kept no longer than four weeks and then only if they are maintained in cold chain conditions.
- Confusion about when reconstituted *haemophilus influenzae type B* (Hib) vaccines must be discarded.

Changes in the policy should be tested at the district level to ensure that guidelines are clear.

3. *Information systems for vaccine management*

The quality of data relating to immunization and other health services is generally unsatisfactory. Tools for planning and management of vaccines, including arrival, supply and distribution are in the process of development but not yet ready for use.

Tools to estimate vaccine requirements, developed in response to a Technet 1998 recommendation are not complete. They need to be linked to drug management and procurement and to include vitamin A. UNICEF, WHO, and other developers should resolve the differences among their tools for estimating vaccine requirements and vaccine forecasting and eventually replace current multiple systems with one.

WHO is developing a Windows version of the commodities and logistics module to support the same inventory and logistics management functions as the current DOS-based software application. A Technet subgroup on computerized logistics management (CLM) development was proposed.

The implementation of vaccine arrival reporting (VAR) forms was agreed upon in Technet 1996 in Manila to monitor the quality of international shipments of vaccines to national immunization programmes. Like other information systems, implementation has been slow and even resisted by some agencies.

Support is needed to improve the quality of data, to computerize vaccine and other supply-planning and management at the district level, and to use health information systems networks for the movement of information.

4. CFC-free equipment

One of the recommendations of the Technet 1998 meeting was to begin the transition to CFC-free refrigeration equipment. WHO Regional Office for Africa (AFRO) reports little progress in implementing this recommendation. The United Nations Environment Programme (UNEP), the United Nations Industrial Development Organization (UNIDO), UNICEF, WHO and other partners need to provide funding and technical support if the transition is to made. Training is still a critical need.

The Technet 1998 meeting participants adopted R134a as the preferred refrigerant gas. The 1999 meeting proposed that CFC-free refrigerant options should be reconsidered in the light of global experience and the more widespread use of other CFC-free refrigerants.

Training

Throughout the session on cold chain, as in other sessions, problems in implementation of new technologies, strategies, and policies were traced to the lack of knowledge or skills of staff. It seems obvious that new technologies will not work if health workers are unable to use them, or do not know that they are supposed to, yet problems of unskilled staff persist.

Technet members see training as an essential part of the answer to problems with the Multi-dose Vial Policy, WMs, CFC-free equipment, information management, and other logistics issues. They agree that training excellence must be required at the levels where services take place, in most cases the district and peripheral levels. The assumption that "cascade training" will work has been proven wrong. Training national staff about a new procedure and expecting them to train others at more peripheral levels does not ensure skilled performance.

National and subnational managers need skill training of their own. As the goal of integration of health care systems is implemented, for example, managers must learn how to integrate vaccines into medical supply systems and deal with problems of resource control and space allocation in cold rooms. Decentralization also poses new management problems. Experience on how managers have solved them needs wider dissemination through training and through networks of Technet members and national managers.

Summaries of the individual presentations are given below:

Cold chain management

1. Integrated distribution of drugs and vaccines in Tanzania – S. Muziki and O. Mazemba

Many countries are undertaking health sector reforms that involve decentralization of some functions and integration of services that have hitherto been strictly vertical. For various reasons, those who must implement the new sector-wide approaches (so-called SWAPs) often resist it. Muziki and Mazember reported on a study carried out in Tanzania to identify what was needed to integrate the distribution of vaccines and drugs and to evaluate the steps taken to date to achieve this integration.

Historically, medical supplies and vaccines were procured, stored and distributed by separate departments. To integrate these functions required:

- Agreement among stakeholders at the policy-making level.
- Transfer of personnel functions as well as procurement, storage and distribution activities.
- Rebuilding of infrastructure, notably storage space.
- Implementation of quality control systems for inventory, stocktaking process and temperature monitoring.
- Training of personnel.
- Coordination of donors.

As a result of the integration, logistics management has improved and distribution costs have been reduced. The situation is still new, however, and there are difficulties to be overcome, such as the continuing disbelief among immunization specialists that the medical stores personnel are taking adequate care of their vaccines.

2. Vaccine vial monitors: update – J. Lloyd and M. Catlin

When used correctly, vaccine vial monitors have proven their worth. The imminent availability of VVMs on all vaccines, means that all children, wherever they live, can be given potent vaccine. More VVM suppliers are needed, some technical problems associated with vaccine in freeze-dried form must be solved, and there is still reluctance in some quarters to use VVMs. However, the major challenges now involve implementation.

Training of managers. Managers need to learn how to use VVMs for planning and management, for example, to investigate cold chain failures, to include vaccine wastage in ordering new supplies, and to plan outreach to hitherto unreachable places.

Training of health workers. In spite of the presence of VVMs on OPV vials for several years, many health workers do not know what the VVMs signify or how to use them. A PATH survey found that the difficulties could be attributed to the following:

- Training materials were not available.
- Available materials were not translated.
- Skilled trainers were not available.
- VVM training was not incorporated into routine EPI training.

WHO/HQ has been developing training materials that should begin to fill some of these needs as soon as they are disseminated.

3. Multi-dose vial policy – M. Dicko and J. Lloyd

Unlike the VVM, which is a new technology, the multi-dose vial policy is a change in a policy that has been in effect for 20 years. This changed policy has caused confusion, and some managers and health workers are reluctant to adopt it. A continuing educational effort is needed to ensure that staff understand the policy and apply it.

The multi-dose vial policy has the elements summarized in Table 3 below.

Table 3: Components of the multi-dose vial policy (MDVP)

1. Vaccine in opened vials of OPV, DTP, TT, DT, and HepB may be used for up to four weeks, provided that: • The expiry date has not passed. • The vaccine is kept in the cold chain. • The vial septum has not been submerged in water. • Aseptic technique has been used to withdraw doses. • The VVM, if attached, has not reached the discard point.	2. Opened vials of measles, yellow fever, BCG, and freeze-dried Hib vaccines must be discarded within six hours of reconstitution, at the end of the immunization session, or according to the manufacturer's instructions, whichever comes first.	3. If sterile procedures have not been fully observed or if any contamination is suspected, the vial must be discarded immediately.

Implementation of the policy can result in substantial savings from reduction of vaccine wastage, as shown in the example from Côte d'Ivoire (Table 4).

Table 4: Potential benefit from implementing MDVP, Côte d'Ivoire 1998

Antigen	Waste (%)	Savings (US$)
OPV	31	85 074
DTP	32	86 918
TT	29	39 334

US$ 211 326 could be saved if wastage rates were reduced to 10% as predicted by implementing MDVP.

These savings could in turn be used to reach new populations, introduce new vaccines and new equipment, or pay for the higher vaccine wastage expected from reconstituted vaccines, which must be discarded at the end of each session.

Reference: *The use of multi-dose vials of vaccine in subsequent immunization sessions: WHO Policy Statement* (WHO/ATT/TECHNET.99/Session 4/WP.6).

4. National experience with multi-dose vial policy and vaccine vial monitors in Eastern and Southern Africa – R. Davis

Multi-dose vial policy. Madagascar is one of the few African countries that has documented its experience with the impact of the MDVP on vaccine wastage. The policy was implemented there in 1997: DTP wastage fell from 32% in 1996 to 20% in 1998.

Despite this record, the policy is not universally understood and applied by health staff in Madagascar. Written guidelines have been issued and training given to some health staff members, but these have not been sufficient. The "cascade" strategy, in which people in a trained group supposedly transfer their training to others, was found to be ineffective.

In other countries of the region, resistance to the multi-dose vial policy has come from national immunization programme managers. They believe that the policy is too complex, cannot be understood by health workers, and if implemented, will lead to misuse of vaccines. They also express the desire, for safety's sake, to wait until VVMs are available on all vaccine vials before policy implementation.

Vaccine vial monitors. The absence of vaccine vial monitors (VVMs) from measles vaccine vials has not prevented some programmes from including measles vaccine in polio national immunization days (NIDs). Results have been positive. In six of seven regions in Tanzania, the inclusion of measles vaccine increased OPV acceptance as shown below.

Table 5: Comparison of polio vaccine acceptance during NIDs with and without the inclusion of measles vaccine

Percentage of change in OPV coverage		
Regions*	**Measles vaccine and OPV**	**OPV only**
Arusha	+6.6	-0.7
Kagera	+2.7	+2.0
Kigoma	-20.1	-5.7
Lindi	+5.6	-0.1
Mbeya	+2.1	-0.4
Mtwara	+3.5	-3.2
Rukwa	+1.6	-0.5

* Only mainland regions with both polio NIDs districts and polio + measles NIDs districts are shown.

Some programmes are still reluctant to include another vaccine in polio NIDs until VVMs are available on those vaccine vials. In addition, many health workers are reported, e.g. in Kenya, to have difficulty turning their backs on the policy they have practised for 20 years: these workers do not use vaccine that has been outside of the cold chain for more than an hour, even if the vials have VVMs.

Vaccine supply and distribution

1. Computerizing stock control – spreadsheet systems – S. Kone and B. Jacquet

Recent assessments in Africa have found that vaccine supply and distribution tends to be unsystematic. Data are often not available for planning and managing vaccine, injection supplies, cold chain equipment, spare parts, and other supplies. Some management tools are unnecessarily complicated and difficult to use.

Some management tools are useful, however. A simple stock management spreadsheet in Burkina Faso and Niger resulted in improvements in vaccine storage and distribution operations, including: reduction of vaccine wastage, faster identification of and response to logistics problems, and increased use of vaccine stock information in planning.

In the future, AFRO intends to:

- Introduce this tool in more countries, including Nigeria and Ethiopia.
- Develop training materials for using and interpreting stock data.
- Adapt the tool for transport and maintenance operations.
- Investigate possibilities for integrating this tool with other systems, such as the computerized logistics management (CLM) system that is now being developed.

2. *Computerized logistics management update – P. Carrasco*

WHO is working on development of a Windows version of the Commodities and Logistics Module (CLM) to support the same inventory and logistics management functions as the current DOS-based software application. A Technet subgroup for CLM development was proposed.

Countries need support to improve the quality of their data, to use their data in planning at district level, and for the extension of health information system networks. External funding is needed to enable national logisticians to become connected to electronic mail and other computerized management systems.

3. *National vaccine supply planning – G. Larsen*

In the 1998 Technet meeting in Copenhagen, members recommended that all countries make reliable vaccine forecasts to ensure an adequate supply of vaccines, eliminate shortfalls, minimize wastage, and perform forward budgeting.

Since then, WHO/HQ has developed and field-tested draft guidelines for use by country managers and staff, for planning vaccine and other immunization supply requirements. The guidelines are in the form of a questionnaire consisting of three components:

Table 6: Components of vaccine supply planning guidelines

Section 1: Forecasting needs for vaccines and other immunization supplies for:	**Section 2: Identifying supply sources:**	**Section 3: Identifying financing sources and mechanisms:**
• routine immunization	• source and cost data	• budget and payment processes
• supplementary immunization	• vaccine ordering and supply system	• existing funding mechanisms
• introduction of new vaccines	• proposed sources and costs for future supplies	• prospective funding mechanisms

Technet members were asked to review the draft document and provide their comments.

Reference: Larsen G. *National vaccine supply planning* (WHO/ATT/TECHNET.99/Session 4/WP.4).

Vaccine storage

1. CFC-free training progress – T. Hart and M. Dicko

The African Region continued to train national technicians and to provide them with kits for repairing chlorofluorocarbon-based (CFC) refrigerators, instead of purchasing new CFC-free kits, as recommended in the 1998 Technet.

All national technicians who participate in the courses have been asked to submit proposals for national training, to buy CFC-free repair kits with funds provided, and to make inventories of the CFC status of district cold chain equipment. National immunization programme managers have been briefed on the problem.

The results are disheartening:

- Only one country (Swaziland) has organized a CFC-free course.
- No inventories have been made of CFC status.
- No training has been given to private technicians, even though much cold chain equipment repair work is carried out privately (70% according to a survey in Côte d'Ivoire and Niger).
- In 10 African countries, no technicians have been trained in CFC-free repair at all.

UNEP and UNIDO could be more fully utilized as sources of technical and financial support, and other partners can also contribute more. Efforts to further engage these partners in training and to set up regional training institutions are planned for 2000.

2. Cold room inspection certification: inspection protocol – S. Hart

As reported in the 1998 Technet meeting, the managerial and technical quality of central vaccine cold stores in much of the world is very poor. A proposal was thereby made in the meeting that WHO develop a cold room inspection protocol that it could use in certifying quality.

That inspection protocol is now in its final stage of development, and a joint WHO-Crown Agent trial is planned for early 2000.

The protocol is ISO9000 series-based, covering:

- Staff competence.
- Quality of building and plant.
- Transportation of vaccine to store.
- Storage management.
- Procedures and records.

The protocol calls for the completion of a pre-visit assessment questionnaire by local

authorities to be followed up by a technical study of the facility by an expert. The expert will be expected to treat this assessment as a teaching–learning experience, hoping to build an atmosphere of interest and concern in solving any problems identified.

The benefits of this scheme include:

- Independent assessment with a common protocol.
- Increased efficiency within and between stores.
- Reduced vaccine wastage.
- Capacity-building of local staff.
- Improved communication between the field and head office.

Session 5: Integration of HepB, Hib and vitamin A

Chair: *J. Wenger, WHO*
Rapporteur: *R. Steinglass, Basic Support for Institutionalizing Child Survival (BASICS)*
Presenters: *J. Wenger*
P. Carrasco, WHO
A. Schnur, WHO
D. Phillips, Department of Health, South Africa
T. Goodman, WHO
A. Gassasira, WHO
R. Hossaini, WHO
S. Landry, USAID
K. Engstrom, WHO consultant

Session summary

The introduction of new antigens and vitamin A presents an opportunity to strengthen immunization services in terms of interagency and interdepartmental coordination, policy review, cold chain assessments, injection safety and training. Numerous presenters expressed their concern about the poor functioning of immunization services in many countries, irrespective of the adoption of new vaccines. Immunization coverage has stagnated or declined, cold chain systems have collapsed, and workers have not been trained.

Without political and financial support, the integration of new vaccines and other innovations and improvement of basic services will not happen. For these reasons, national decision-makers and planners need to understand various financial matters such as the function of the Global Fund for Children's Vaccines, in turn, need to learn how to generate additional resources within countries, avoid displacement of existing partner support, and promote medium- and longer-term solutions over immediate ones that don't last. Technet encourages partners to engage nationals level staff in the current global discussions regarding new vaccine introduction, infrastructure needs, multi-year planning, and country assessments. Partners in each country should also examine how they can increase collaboration and, as individual organizations, improve their own internal processes, structure and communications.

Technet members also discussed the contributions of multilateral and bilateral agencies in re-building the "hardware" (transport, refrigerators, etc) of immunization services. They felt that recurrent costs (the "software") should be increasingly covered through national finances: for example, countries should establish repair workshops and cover costs of repairing broken equipment.

Summaries of presentations

1. Introduction of new vaccines into the developing world: obstacles and solutions – J. Wenger

Successful introduction of new vaccines into immunization services depends on the following factors:

- Effectiveness of the vaccine as shown in efficacy studies in the country or similar countries.
- Disease burden as shown in studies measuring disease incidence, the importance of the disease to the public and physicians, the severity of the disease, and the cost–effectiveness of controlling or eliminating the disease through immunization.
- Availability of adequate supply sources and financing.
- System capacity and readiness, including cold chain, transport, storage, handling, wastage, and training.

To facilitate the introduction of new and underused vaccines in developing countries, WHO has designated five stages of vaccine introduction:

1) Vaccine efficacy
2) Disease burden, cost–effectiveness
3) Production and control
4) Financing
5) Introduction

Hepatitis B and Hib vaccines have passed through most stages and are ready for introduction in many countries. Other vaccines, such as pneumonia, rotavirus, and shigella, are still being studied for efficacy and disease burden in many countries.

2. Cold chain and safety: Experience in the Americas – P. Carrasco

The immediate impact of the introduction of new vaccines (Hib, HepB and MMR) in the Americas has been the increase of cold storage capacity required at central level warehouses. Thus, the major area of technical cooperation of the Pan American Health Organization (PAHO) in the cold chain in the last three years has been in the area of cold room design and construction.

In the last three years, PAHO countries have experienced savings of up to US$ 0.50 per child when they switch to the pentavalent presentation of DTP, Hib and HepB as compared to the monovalent presentations of these vaccines. Other benefits of pentavalent vaccines are that they reduce the number of injections needed for each child and decrease the amount of injection equipment needed.

3. *Cold chain and safety: Experience in the Western Pacific – A. Schnur*

All countries in the Western Pacific Region have now integrated Hepatitis B vaccine into routine immunization services, except for Lao People's Democratic Republic and Cambodia. China and other countries have only recently introduced it – the major constraint to region-wide adoption is the cost of the vaccine.

Although Hib disease is a problem in several countries in the region, including China, Hib vaccine has not been integrated into most immunization services. Expense, again, is a problem, particularly with the problems of maintaining services with the traditional vaccines:

- Cold chain equipment, much of which was acquired in the 1980s is now breaking down.
- Injection safety is a major concern.
- Vaccine and equipment supply is not always adequate.

The Regional Office of the Western Pacific (WPRO) plans to solve many of these problems with the introduction of new vaccines like Hib, for example encouraging countries to order new vaccine storage equipment that can accommodate both old and new vaccines and reviewing injection safety procedures as they orient health workers to the new vaccines.

4. *Hepatitis B and Hib in South Africa – D. Phillips*

The introduction of Hepatitis B vaccine in 1995 and the introduction of Hib vaccine in 1999 were two different experiences for historical, organizational and other reasons. In both cases however, similar factors had to be considered, including:

- The amount of the initial vaccine order – depending on introduction strategy (e.g. introduced with a catch-up campaign for all children or only those born after the date of introduction).
- Timing in advance to make the initial order.
- Amount of cold storage space needed.
- Stock to have on hand – two months? one month?
- Additional syringes and needles needed; other supplies needed, e.g. sharps boxes.
- Equitable distribution of vaccines and supplies to all facilities.
- Training and management.
- Information system.

5. *The logistics of integrating vitamin A – T. Goodman, A. Gasasira, R. Hossaini*

The provision of high-dose vitamin A supplements (in capsule or liquid form) every four to six months not only protects against blindness but has been shown to have a dramatic impact on the health of children ages 6 to 59 months. Vitamin A supplements reduce the risk of mortality from all causes by approximately 23% (35% in Asia), measles mortality by 50%, and diarrhoeal disease mortality by 33%. Vitamin A is essential for the functioning of the immune system and the healthy growth and development of children. Overall, the impact of vitamin A supplementation on reducing child mortality is comparable to – *if not greater than* – that of any single childhood vaccine.

Immunization services offer an established delivery infrastructure and unparalleled access onto which the provision of vitamin A supplements can be "piggy backed". Combining vitamin A and NIDs makes good sense:

- The target population of under-five year olds is the same.
- Nationwide campaigns reach the "unreached", who are also those most at risk of vitamin A deficiency.
- Financial and human resources are used for two purposes and therefore more efficiently.
- Cost-effectiveness and impact are increased. At just $0.02 a dose, vitamin A supplements are one of the most cost-effective child health interventions available.
- Because vitamin A requires no refrigeration or special storage and can be administered with a minimum of training and equipment, vitamin A supplementation is logistically the easiest intervention to add to NIDs.

However, adding vitamin A supplements to an NID, especially the first time, adds logistic and managerial complications:

- A partnership with the national nutrition programme needs to be established.
- Extra supplies (including scissors) must be ordered and distributed.
- Additional training is needed, and more volunteers must be found.
- The organization and client flow of the session has to be adapted.
- A system of additional screening and integrated tallying must be introduced.
- Vitamin A information needs to be included in social mobilization and advocacy efforts.
- Finally, vitamin A should be included in evaluation and reporting exercises, lessons learned shared and coverage documented.

These added complexities are manageable, as experience in more than 60 countries has demonstrated. But when dealing with a weak and already stressed management, careful planning and organization are paramount, and additional technical support often is needed.

Liberian experience. Liberia included vitamin A for the first time in the second round of NIDs held in February 1999.

Planning for the logistical requirements of vitamin A and the NID campaign was integrated. Vitamin A capsules in two sizes (100 000 and 200 000 IU) were packed at the central store and, with OPV supplies, were dispatched to all counties a few days before the NIDs. All vaccination teams and supervisors underwent training in vitamin A with special emphasis on screening for age, colour coding and opening capsules, giving the correct dose, and tallying. Each team had an extra volunteer to cope with the additional workload of administering vitamin A. An integrated tally sheet was used which recorded both OPV and vitamin A.

The community response was overwhelming: 70 000 more children turned out for the second NID round than for the first. Strong social mobilization that included messages about vitamin A contributed to this success.

Following the successful implementation of vitamin A with NIDs, Liberia's EPI 2000 Plan of Action now includes the following vitamin A supplementation strategies:

- Include vitamin A with measles vaccination at 9 months and for post-partum mothers immediately after birth or up to 6 weeks after birth (BCG-DPT1);
- Include in all supplementary immunization activities;
- Organize "National Micro-Nutrient Days" that include vitamin A supplements.

India experience. India has been conducting NIDs since 1995, vaccinating about 130 million children in each round. Concerns about safety and overdosing due to the delivery of vitamin A as part of routine immunization services meant that vitamin A was not included in NIDs until 1999 when Orrisa State, with support from UNICEF, decided to include it. In the 1 October round of NIDs, about two million children aged between 12 and 42 months received vitamin A.

In order to document this experience and provide the benefit of vitamin A to other children in India, WHO, the state health department, and the National Institute of Nutrition conducted a rapid process evaluation and safety studies. The preliminary result of the study indicates that integration of vitamin A with NIDs is logistically feasible and does not compromise the quality of NIDs. In addition, the study clearly demonstrated that there are no side-effects or toxicity associated with the use of vitamin A.

6. *The Global Alliance for Vaccines and Immunization – S. Landry*

The Global Alliance for Vaccines and Immunization (GAVI) is an organization consisting of countries, foundations, industry, global organizations, individuals and others who have joined in partnership "to save children's lives and protect people's health through the widespread use of vaccines". The objectives of this alliance are:

- To improve access to sustainable immunization services.
- To expand use of all existing cost-effective vaccines.
- To accelerate the introduction of new vaccines.
- To accelerate research and development efforts for vaccines and related products specifically needed by developing countries, particularly HIV/AIDS, malaria and tuberculosis vaccines.
- To make immunization coverage a centrepiece in the design and assessment of international development efforts.

The GAVI organization includes a governing board, a secretariat, a working group, the Global Fund for Children's Vaccines, and task forces of limited duration to address specific issues. The three current task forces are: financing (World Bank and USAID lead), advocacy (UNICEF lead), and country coordination (WHO lead).

The Global Fund for Children's Vaccines provides grants to procure underutilized and new vaccines, develop vaccine delivery infrastructure, and accelerate vaccine research and development. To be eligible for grants from the Fund, countries must have:

- GNP per capita of less than US$ 1000.
- Population of less than 150 million.[2]

The Fund's criteria for assessing applications for grants for the introduction of new or underutilized vaccines (e.g. HepB, Hib and yellow fever) and safe injection equipment are:

- Evidence of disease burden;
- DTP3 coverage > 50%;
- Evidence of national government commitment;
- Functioning national coordination mechanism;
- Existence of assessment of immunization services;
- Multi-year plan for immunization services.

Current plans are to begin the application process in mid-2000 for grant awards beginning in late 2000.

[2] With special arrangements being made for India, China and Indonesia.

The application process hinges in large part on country assessment, for which guidelines are now in the process of development. These guidelines, scheduled for field testing in February 2000, are described in the next presentation.

7. Assessment guidelines – K. Engstrom

The impetus for the development of immunization services assessment guidelines came from the GAVI, particularly its Global Fund for Children's Vaccines, as described in the previous presentation on GAVI by Dr Landry. WHO, with UNICEF, was appointed as the responsible party for the design of the assessment process to review immunization service systems and infrastructure. The World Bank and the Centers for Disease Control and Prevention (CDC) contributed to the financial and new vaccine epidemiology content areas.

For the assessment process, the requirement was to develop a common tool that can be used by national managers and by organizations (particularly GAVI partners) that provide financial, technical and other resources. The objectives of the assessment tool are to enable its users:

1) To identify needs for improving immunization operations and recommend strategies for improvement.

2) To assess the appropriateness of introducing a new vaccine or major technological innovation and identify what changes would have to be made.

3) To decide how existing and potential resources can be allocated for improving immunization services and supporting health system development.

Among the major features of this assessment that distinguishes it from other immunization service assessments are:

- Every assessment has its own specific purpose set by the ministry of health, the country's interagency coordinating committee, and development partners, as appropriate.
- The focus is on performance at the point of service delivery, not paperwork at the administrative level.
- Problems are traced to their point of origin. Local problems may have local solutions. Shared problems must be traced to their origins, which may be at the central level.
- Immunization operations and the environment in which they are carried out are assessed.

Scope of the assessment process

Immunization operations. Cover the organization and implementation of immunizations, including the following functional areas:

- Immunization services: provision of vaccinations to clients
- Disease surveillance: measurement of disease incidence, record-keeping, and reporting
- Logistics: delivery of vaccines and other equipment in good condition to place of use; transport, maintenance of cold chain, vaccine management, and waste disposal are included
- Vaccine supply and quality: procurement of vaccines from manufacturers; ensuring that vaccines are of assured quality
- Communications: health education, social mobilization, advocacy

In addition to these functions, an assessment of immunization operations may include costs of services and financing and the capacity of the system to integrate an innovation, such as a new vaccine.

Health system. Includes financing, regulation and provision of all health services.

- Policy development: strategic planning, performance assessment and change management
- Financing: collecting revenues, pooling contributions and phasing services
- Human resource: education and training, health personnel performance and management strengthening
- Service delivery: health facility performance, accountability mechanisms and support services logistics

External environment. The context outside of the health system that has an impact on services. These include:

- Forces and trends: political, economic, social, and technological
- Stakeholders' expectations and needs.

The process also fully involves the major stakeholders at all levels, most particularly health workers and their clients, throughout the process.

The draft document was to be tested in Tanzania in February 2000, after which it will be revised and disseminated for use.

Session 6: Brainstorming change: subgroup work

Chair: *A. Bass, University of Queensland, Australia*

In this session, each participant chose one topic from three suggested topics for one 1½ hour meeting and a second topic from another three for a second 1½ hour meeting. Each time, they joined with others in a small group to discuss issues pertaining to the topic and develop recommendations and action points. After the small group meetings, they presented their proposals to the plenary and eventually agreed what the Technet 1999 recommendations would be.

The subgroups and their leaders were:

First group

A.	Safety of injections: Making SIGN work at country level	Y. Hutin, WHO
B.	Indicators of logistics performance	J. Lloyd, WHO
C.	Alternative transport management systems for outreach	M. Gatton, UK

Second group

D.	Introduction of new vaccines: Planning the best process	J. Wenger, WHO
E.	Integration of vaccines and drugs: What to recommend?	O. Oni, WHO
F.	Cold chain: How to manage the cold chain with VVMs and the MDVP	M. Catlin, PATH

The recommendations and action points are presented in Chapter 3.

Closing session

Chair: *J. Lloyd, WHO*
Rapporteur: *G. Larsen, WHO*

Session summary

In this session, Lloyd shared his conclusions about the meeting and the future of Technet, the final list of Technet 1999 recommendations was presented, and the meeting closed.

Chapter 3: Technet 1999 recommendations

The following recommendations were agreed in a plenary session of the Technet members meeting in Harare in December 1999. They grew from recommendations suggested by those that made and heard presentations during the five technical sessions, by the subgroups that met during Session 6, and at other times throughout the meeting. Most of the recommendations are presented under the session headings, except for those that are more general in nature, which are placed at the end of this chapter.

Session 1: Reaching the unreached

Technet members have learned that failure to reach remote populations attributed to lack of transport is usually not lack of vehicles *per se* but lack of transport management. Management tools exist and are in use but not nearly widely enough. Experience with transport management systems needs to be collated, adapted and disseminated; cost studies must continue; and operations managers need management skills, as recommended below.

1. A Technet Transport subgroup should be established by March 2000 to:

- Collect and evaluate existing transport management tools, modify them where necessary, and disseminate them to Technet members and national managers.
- Document experience in using these tools and disseminate achievements and problems.
- Prepare transport system indicators and a survey instrument that can be used on its own and also be integrated into the new Immunization Services Assessment Guidelines for those instances where an in-depth transport assessment is warranted.
- Conduct transport availability and cost studies in areas of different population density, both for routine outreach and supplementary immunization activities, to better define the basis for transport infrastructure budgeting.

Session 2: Logistics of disease control

Experience with acute flaccid paralysis (AFP) surveillance has underscored the principle that support for logistics is more likely to be obtained when there is a surveillance system. Much of that system relies on logistics, including:

- Storage of vaccine in appropriate cold chain conditions at all levels.
- Distribution of vaccine, syringes, and other equipment and materials.
- Collection and transport of specimens (reverse cold chain).

Planners and policy-makers hope that the investments made and experience gained in polio eradication will contribute to other disease control activities. One benefit that could be realized relatively quickly is to expand surveillance supervisory visits to include logistics activities.

2. A simple checklist to be used during supervisory visits for AFP, neonatal tetanus, or measles surveillance would be useful for the assessment of vaccine supply and cold chain in health facilities. Such a checklist should be disseminated to countries for their review and adaptation.

Session 3: Safety of injections

Safety of injections is a growing concern for the public, as well as for health care providers and those who advise and support them. Among the many technical and management issues that need further work before injection safety can be ensured are:

- Development of effective yet inexpensive equipment for disposal and destruction of sharps and other infectious waste;
- Development of decision-making tools for selection of injection technologies;
- Evaluation of sterilization practices;
- Research and development of auto-disable syringes for curative use.

Technet members agreed that the Safe Injection Global Network (SIGN) should play the major role in coordinating research, promotion, and planning on injection safety in curative as well as preventive settings. It should participate in or take the lead in implementing the four Technet recommendations below.

3. Technet endorses the recommendations of the Almaty Technet subcommittee, 28–30 April 1999, on the disposal and destruction of sharps and other infectious waste.
4. On the basis of the WHO three-country study (Ekwueme, Larsen, et al.), the Technet secretariat should develop, field test, and disseminate a generic protocol for countries to use to compare the cost–benefit of available injection technologies.
5. The prevalence of the use of time–steam–temperature (TST) sterilization indicators and of adequate sterilizer maintenance in each country using sterilizables should be urgently evaluated. The evaluation should identify the causes of good and bad performance and should be followed by plans of action to ensure sustainability of injection safety.
6. SIGN should convene a working group to define specifications for auto-disable (A-D) syringes for curative injections and then evaluate the potential of A-D syringes for curative settings in two stages:
    - First, studies should be conducted under ideal circumstances to evaluate the safety and effectiveness of A-D technology for curative syringes in these settings.
    - Subsequently, A-D syringes should be evaluated in the field to evaluate their effectiveness in preventing reuse where resources and supplies are limited.

Session 4: The cold chain

Policies concerning the cold chain, cold chain supplies and equipment, and tools for the management of vaccine supply, distribution and storage continue to be topics of discussion for Technet members. As with transportation, injection safety and other logistics issues, the technology may be available but the execution is not. In their recommendations for the cold chain, Technet members focused on filling gaps in technology and management tools and in providing training that ensures high quality performance. Problems of implementation are addressed more globally in the last section on "Other recommendations".

7. The current guidelines on the introduction of CFC-free refrigerators into the cold chain should be revised to include hydrofluorocarbon (HFC) and hydrocarbon (HC) gases, which are now more widely used.
8. Technet should convene a working group in collaboration with PAHO to guide the revision of the commodities and logistics management software, including the transition to the Windows platform by March 2000.
9. A guide should be prepared on the management and supervision of vaccine distribution using vaccine vial monitors by July 2000. Existing training materials should be included in this guide as appropriate. Special efforts should be made to disseminate these materials widely and to promote their use in training.
10. Technet should conduct more country studies on the integration of the distribution of drugs and vaccines by the end of 2000.

Session 5: Integration of HepB, Hib & vitamin A

Just as decision-making tools are needed for the selection and implementation of transport systems, waste disposal systems and injection equipment, they are needed for the selection of vaccines and different renditions of the same vaccine, especially when new vaccines are becoming available for integration into immunizations services. Technet recommendations focused on these needs.

11. Technet should produce guidelines for managers that will help them compare advantages, disadvantages, and costs of different vaccine products. Guidelines should include information on monovalent and polyvalent presentations, single-dose and multi-dose presentations, requirements for syringes, training needs, and cold chain requirements at each level.
12. By June 2000, a Technet subgroup should be prepared to advise WHO and UNICEF on procurement specifications for different vaccine presentations, so that work with vaccine manufacturers to optimize the storage volume and packing of vaccine can commence.
13. By June 2000, should request vaccine manufacturers and national regulatory authorities should be required to include data in their inserts on the shelf life at designated tropical temperatures for the more stable vaccines that are supplied with VVMs.

Other recommendations

Technet members made other recommendations that apply generally to all of the topics of interest or that address Technet itself.

14. A Technet subgroup should be formed to develop a strategic plan for Technet activities, linked to the WHO/V&B strategic plan, and to identify the appropriate process and modalities of engagement with GAVI by the end of February 2000.
15. GAVI should consider forming a Logistics Task Force to complement the work being carried out by its other task forces (currently, on financing, advocacy and country coordination). The Logistics Task Force would focus on the revitalization of immunization services, participating in design, field-testing and implementation of country assessments and introducing new vaccines.
16. Technet should set up a subgroup to collaborate on the development of the instrument for GAVI country assessments by February 2000.
17. Technet recognizes the importance of training in improving service performance and introducing new policies, strategies, technologies and vaccines. Considering the poor record of previous training efforts, new training strategies that assure quality and are targeted to those who need the training to do their jobs should be designed, implemented and evaluated.
18. Extending the scope of the recommendation of the 2nd Technet meeting, Technet should request ministries of health to allow national logisticians and managers to communicate with Technet members and the Technet secretariat on technical issues. Official communications would continue to be conducted through normal channels.

Chapter 4:
Action points

During the subgroup meetings in Session 6 and thereafter in plenary, participants agreed on actions that they could undertake to support the implementation of the 1999 (or previous) recommendations and to contribute to the improvement of primary health care operations. Some of these actions are new; those that have been brought forward from earlier Technet meetings are so indicated.

1. Injection safety

Injection safety continues to be of major concern to Technet members and others working in the health sector.

1.1 National injection safety planning

In 1998, the Copenhagen meeting of Technet included as a priority activity that:

> …Every country should devise or update a national plan of action for injection safety aimed at achieving 100% safe injections by 2000. WHO will continue to monitor the status of these plans and will report to Regional EPI Managers' meetings and the next Technet consultation.

At the end of 1999, it was clear that many countries were still not treating injection safety as a high priority. They had not implemented safety measures, such as ensuring that reusable needles and syringes were sterilized; had not developed injection safety plans; and were not monitoring injection and syringe disposal practices.

Action point 1.1. Technet members should continue to remind their colleagues, partners and clients of the importance of this activity, promote plan development, and provide assistance in monitoring of plan implementation.

1.2 Integrated approach to solving the injection safety problem

Although auto-disable syringes offer close to 100% protection against reuse, this protection can never be totally guaranteed. This and other considerations (such as that reusable syringes will continue to be needed) mean that the provision of auto-disable syringes alone will not work. Health workers need to integrate safe practices into their daily behaviour. They must have adequate supplies of auto-disable syringes at all times. They must have adequate disposal facilities to ensure that syringes are rendered harmless after use and then completely destroyed. These points, made in 1998 and earlier, must be continuously emphasized.

Action point 1.2. Technet members should help national managers and partners understand that no guarantees can be made against reuse of auto-disable syringes. Members should help managers plan to provide good training and supervision for health workers, to monitor needle and syringe use, and to install adequate storage and disposal facilities.

1.3 Extending the life of sterilizable syringes

In a study in Zambia, where 50% of injections are given with sterilizable syringes, the life of syringes was significantly lengthened when a vapour purifier filter was used. Hard water pads were useless. TST spots were enthusiastically received because they helped prove that leaking sterilizers were not sterilizing the equipment.

Action point 1.3. Technet members should encourage sponsors to continue the trials of the filters and should continue to promote the use of TST spots and monitor sterilization in practice.

1.4 Technology transfer

Availability of funds and technical assistance will not guarantee successful transfer of syringe production to new manufacturers any more than they guaranteed problem-free transfer of vaccine production. Regulation of production and continued monitoring of product quality are also needed.

Action point 1.4. Manufacturers of auto-destruct syringes, such as Becton-Dickenson, should provide information about what is needed to transfer syringe production technology and what assistance they can provide in setting up the production process itself and in dealing with connected issues, such as waste management.

2. Indicators of logistics performance

WHO and UNICEF staff, national staff and international partners have been conducting assessments, evaluations and reviews of logistics, the cold chain and other aspects of immunization operations for many years; and good assessment tools have been developed. Now, new tools are needed to examine the impact of changes in technology and the introduction of new vaccines as well as to continue the review of the performance of health workers in meeting existing standards. They have also called for a common tool that all staff and partners can use.

This tool, which includes indicators for all aspects of immunization operations, is now under development. In keeping with Recommendation 16 (see Chapter 3), Technet members have played and will continue to play a role in this development.

3. Transport for outreach

Most people involved in the planning and provision of health services are now convinced that it is not how many vehicles you have that counts but how you use them. Recognizing that help in transport systems development is widely needed, participants in this Technet meeting recommended that a working group be formed to select the best management system tools and disseminate them, with recommendations for technical assistance and training, to national managers. See Recommendation 1 in Chapter 3.

4. Introduction of new vaccines

With the availability of new vaccines (HepB and Hib) and revived interest in old ones (yellow fever), national managers are faced with new kinds of decisions:

Should we put our resources into improvements in the existing immunization programme or into the introduction of new vaccines?

To make these decisions, managers need to know:

- The extent of improvements that are needed.
- The capacity of the existing programme to integrate a new vaccine.
- The operational requirements of the vaccine, e.g. how it is administered and what its storage requirements are.

The new Immunization Service Assessment Guidelines will help managers assess their programmes' performance and capacity for expansion. Manufacturers of new vaccines can help by providing information about the new vaccines. WHO, in turn, can continue to collect this information from manufacturers and from regional offices such as PAHO, organize, package and disseminate this information to national managers.

Action point 4.1: Manufacturers of new vaccines should be asked to provide the following:

- *For each vaccine and diluent and each presentation, the size of box in which it comes and its volume in refrigeration.*
- *For each vaccine and each presentation, the number of vials included in the inner package and the number of inner packages in each box.*
- *Description of diluent packaging – included in the vaccine box or packed separately.*
- *Photocopies of the labels that the manufacturers place on vials, ampoules, diluents and boxes.*
- *Photocopies of inserts.*

5. Integration of vaccines and drugs

In some countries, vaccines and drugs are now being stored, packed and shipped from a single central-level store. Similarly, integrated transport management is being re-instituted or tried for the first time. Other aspects of operations are also being considered for integration. Logisticians can help managers examine the benefits and constraints of integrating other operational functions, such as maintenance and repair of equipment and supervision, in their efforts to improve services. Technet members particularly, because of their knowledge, experience and ubiquity, are in an excellent position to provide this assistance.

Action point 5.1: Technet members should help managers to systematically consider the short-term and long-term impacts of decisions to integrate and decentralize operational functions.

6. Cold chain

The cold chain recommendations of the 1998 Technet addressed requirements for refrigerators to be used for vaccine storage and the activities that were needed to plan for the purchase or repair of equipment that met these requirements. Most of these activities are long-term and were endorsed again in the 1999 meeting.

Renewed emphasis was placed on facilitating the integration of VVMs and the multi-dose vial policy (formerly called the "opened vial policy") into daily practice by health workers and managers. Technet members can help by promoting their use and providing training and technical assistance.

Action point 6.1: Technet members should take every opportunity to explain how VVMs work and describe their benefits to health workers, managers, and the public. Similarly, the multi-dose vial policy needs to be explained and promoted. In addition, Technet members should monitor the use of VVMs and the application of the policy in health facilities.

Annex 1: Agenda

Monday 6 December

Opening session

08.30-09.00	Registration Welcome remarks by: Dr Antoine Kabore, WHO/AFRO, Director, Disease Control Dr Suomi Sakai, UNICEF Dr Steve Landry, USAID	
09.15-09.30	Appointment of the Chairmen & Rapporteur Introductions Review of the agenda Administrative announcements	Ms Kristina Engstrom
09.30-09.45	Vision of immunization in the 21st century "White Paper" on Immunization Technologies	J. Lloyd, WHO
09.45-09.55	Summary of Technet Forum debate 1998-99	A. Bass, WHO
09.55-10.05	Overview of progress since 1998 Technet	J. Lloyd, WHO
10.05-10.15	Questions	
10.15-10.30	*Coffee break*	

Session 1 – Reaching the unreached

Chair: Dr Suomi Sakai, UNICEF New York
Session rapporteur: Ms Kristina Engstrom, WHO Consultant

Objective: Update on status and plans for rehabilitation and extension of outreach services to "hard-to-reach" populations and define logistic requirements and tools.

10.30-11.00	Sustained Outreach Services (SOS): Status	M. Ngoma, WHO

Monday 6 December *(continued)*

11.00-11.30	Transport management for outreach services	
	Efficient transport systems	S. Nancollas, Transaid
	Impact of locally-managed zero-breakdown transport systems	M. Moshoeshoe, Riders for Health
11.30-12.15	Multi-intervention packages Tanzania, village health days	K. Kagaruki, WHO
	Benin	J. Tossou, EPI Manager
	"Healthy Start" programme: Indonesia	C. Nelson, PATH
12.15-12.30	Plenary Discussion	
12.30-14.00	*Lunch*	

Session 2 – Logistics of disease control

Chair: Dr Sam Okiror, Nigeria
Session rapporteur: Mr Peter Carrasco

Objectives: to review experience of the logistics of the polio specimen reverse cold chain and other aspects of surveillance and supplementary immunization strategies for disease control

Surveillance systems:

14.00-14.15	Supervision tactics in Nigeria	S. Okiror, WHO
14.15-14.30	AFP surveillance in difficult conditions: Afghanistan	M. Haghou, WHO
14.30-14.45	Fleet management for surveillance in Nigeria	M. Gatton, Riders for Health
14.45-14.50	New logistics for surveillance module	M. Birmingham, WHO
14.50-15.15	Plenary discussion	
15.15-15.30	*Tea break*	
15.30-16.15	Rapid assessment of cold chain for house-to-house campaign:	
	Pakistan	J. Welsch, WHO
	India	J. Andrus/P.Abeykoon, WHO
	Plenary discussion	
16.15-17.30	Vaccine distribution and sample collection:	
	The "fast cold chain" and eliminating "left-overs"	G. Larsen, WHO
	Polio vaccine forecasting – and the "end game"	G. Larsen, WHO
	Plenary discussion	

Tuesday 7 December

Session 3 – Safety of injections

Chair: Dr Steve Landry, USAID
Session rapporteur: Ms Mary Catlin

Objective: To debate evolution of policies on injection safety and to agree on plans for implementation

08.30-08.35	Introduction	S. Landry, USAID
08.35-09.15	Injection safety policies and economics	
	Safe Injection Global Network (SIGN)	Y. Hutin, WHO
	Immunization safety priority project	M. Birmingham, WHO
	Comparative costs of injection policies	G. Larsen, WHO
09.15-09.30	Plenary discussion	
09.30-10.15	Supporting the sterilizables policy	
	Life of sterilizable syringes in Zambia	R. Fielden, FBA
	Sterilization success story in Bangladesh	A. Battersby, FBA
	Compliance in China	A. Schnur, WHO
	Sterilization under the microscope	W. Sopwith, UK
10.15-10.30	*Coffee break*	
10.30-11.00	Plenary discussion	
11.00-12.30	Availability and tech-transfer of A-D syringes	
	Global capacity and tech-transfer	G. Larsen, WHO
	Industry statements	
	Star Syringe	M. Koska
	UNIVEC	J. Schoenfeld (in absentia)
	Becton Dickinson	F. Garin
	Health Care Products Plus	P. Kellogg
	UniJect update	C. Nelson, PATH
	Plenary discussion	
12.30-14.00	*Lunch*	
14.00-15.15	Managing sharps waste	
	Report: Subcommittee on sharps disposal	J. Lloyd, WHO
	Decision tool for waste planning	L. Diaz, CalRecovery
	PATH activities on sharps waste management	C. Nelson, PATH
	Plenary discussion	
15.15-15.30	*Tea break*	

Tuesday 7 December *(continued)*

15.30-17.00	Sharps disposal technology	
	CSIR incinerator testing progress	D. Rogers, D.Phillips, CSIR/S.A
	DeMonfort incineration project	D.J. Picken, DMU
	Thermo-processing progress	M. Brookman, CRL
	Plenary discussion	
17.00-17.30	Status on needle-free and UniJect technologies	
	Safety of multi-dose jet injectors: update	J. Lloyd, WHO

Wednesday 8 December

Session 4 – Cold chain update

Chair: Dianne Phillips, Ministry of Health, Pretoria
Session rapporteur: Mr Allan Bass

08.30-08.35	Introduction	Dianne Phillips, South Africa
08.35-10.15	Cold chain management	
	Integrating vaccines and drugs in Tanzania	S. Muziki, O.Hazemba, WHO
	VVMs, polio & other vaccines: update	J. Lloyd, WHO M.Catlin, PATH
	Multi Dose Vial Policy (MDVP)	M. Dicko, WHO J. Lloyd, WHO
	Madagascar – Impact of VVMs on wastage	R. Davis, UNICEF
	Plenary discussion	
10.15-10.30	*Coffee break*	
10.30-11.45	Vaccine Supply and Distribution	
	Computerizing stock control: Spreadsheet systems	S. Kone/B. Jacquet, WHO
	CLM update	P. Carrasco, WHO
	National vaccine supply planning	G. Larsen, WHO
	Plenary discussion	
11.45-12.30	Vaccine Storage	
	CFC free training progress	T. Hart, IT Power, M. Dicko WHO
	Cold Room Certification	S. Hart, Crown Agents
	Plenary discussion	
12.30-14.00	*Lunch*	

Session 5 – Integration of HepB, Hib & vitamin A

Chair: Dr Jay Wenger, WHO
Session rapporteur: Mr Robert Steinglass

Objective: To review country experience of the implementation of new vaccines, to consider the impact and to determine optimal processes for introduction

14.00-14.30	Overview of obstacles and solutions	J. Wenger, WHO

Wednesday 8 December *(continued)*

14.30-15.15	Impact on the cold chain & safety	
	Country experience in the Americas	P. Carrasco, WHO
	Country experience in the Western Pacific	A. Schnur, WHO
	Hib/HepB: South Africa	D. Phillips, South Africa
15.15-15.30	*Tea break*	
15.30-16.35	The logistics of integrating vitamin A	T. Goodman, WHO
	Liberia	A. Gassasira, WHO
	India	R. Hossaini, WHO
	Plenary discussion	
16.35-17.30	GAVI Round Table – *Chair: Dr Jay Wenger*	
	The Global Alliance, the Trust Fund	S. Landry, USAID
	Draft assessment tool	K. Engstrom, WHO consultant
	Plenary discussion	

Thursday 9 December

Session 6 – Subgroup work: "Brainstorming change"

Chair: Mr Allan Bass

Objective: To identify barriers to and opportunities for managing change.

08.30-08.45	Plenary subgroup briefing	A. Bass, WHO
08.45-10.15	Subgroup work:	
	A) Safety of injections: Making SIGN work at country level	Y. Hutin, WHO
	B) Indicators of logistic infrastructure performance	J. Lloyd, WHO
	C) Alternative transport management systems for outreach	M. Gatton, UK
10.15-10.30	*Coffee break*	
10.30-12.00	Subgroup work:	
	D) Introduction of new vaccines: Planning the best process	J. Wenger, WHO
	E) Integration of vaccines and drugs: What to recommend?	O. Oni, WHO
	F) Cold chain: How to manage the CC with VVMs/MDVP	M. Catlin, PATH
12.00-14.00	*Lunch*	
14.00-15.30	Report and plenary discussion of the subgroup work (15 minutes each):	
	A) Safety of injections: Making SIGN work at country level	
	B) Indicators of logistic infrastructure performance	
	C) Alternative transport management systems for outreach	
	D) Introduction of new vaccines: Planning the best process	
	E) Integration of vaccines and drugs: What to recommend?	
	F) Cold chain: How to manage the CC with VVMs/MDVP	
15.30-16.00	*Tea break*	
16.00-17.00	Plenary discussion	
18:30-20:30	Closed session on the recommendations (Conference Room 5)	

Friday 10 December

Closing session

Chair: Mr John Lloyd, WHO
Session rapporteur: Mr Gordon Larsen, WHO

09.00-10.15	Conclusions and the Future of Technet
10.15-10.30	*Coffee break*
10.30-11.30	Summary of recommendations by session
11.30-12.00	Any other business
12.00-12.15	Closing
12.15-14.00	*Lunch*

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Annex 3: List of documents

Title	Author	Document number
Opening session		
Vision of immunization in the 21st century (WHO/UNICEF) "White Paper"	J. Lloyd	WHO/ATT/TECHNET.99/Opening Session/WP.1
Summary of Technet Forum Debate 1998–99	A. Bass	WHO/ATT/TECHNET.99/Opening Session/WP.3
Session 1		
From camels to aircraft: The development of a simple transport management system designed to improve health service delivery	S. Nancollas	WHO/ATT/TECHNET.99/Session 1/WP.1
Tanzania, village health days	Mr Kagaruki	WHO/ATT/TECHNET.99/Session 1/WP.3
Session 2		
New logistics for surveillance module	M. Birmingham	WHO/ATT/TECHNET.99/Session 2/WP.4
The "fast cold chain" & eliminating "left overs"	H. Everts	WHO/ATT/TECHNET.99/Session 2/WP.8
Session 3		
Safe Injection Global Network (SIGN)	Y. Hutin	WHO/ATT/TECHNET.99/Session 3/WP.1
Immunization safety priority project	M. Birmingham	WHO/ATT/TECHNET.99/Session 3/WP.2
Comparative costs of injection policies	G. Larsen	WHO/ATT/TECHNET.99/Session 3/WP.3
Life of sterilizable syringes in Zambia	R. Fielden	WHO/ATT/TECHNET.99/Session 3/WP.4
Sterilization under the microscope	W. Sopwith	WHO/ATT/TECHNET.99/Session 3/WP.8
Report: TN Subcommittee on sharps disposal	J. Lloyd	WHO/ATT/TECHNET.99/Session 3/WP.20

Title	Author	Document number
CSIR Incinerator Testing Progress	D. Rogers D. Phillips	WHO/ATT/TECHNET.99/Session3/WP.21
De Montfort incineration project	D.J. Picken	WHO/ATT/TECHNET.99/Session 3/WP.22
Thermo processing progress	M. Brookman	WHO/ATT/TECHNET.99/Session 3/WP.23
Session 4		
National Vaccine Supply Planning	G. Larsen	WHO/ATT/TECHNET.99/Session 4/WP.4
Multi Dose Vial Policy (MDVP)	M. Dicko J. Lloyd	WHO/ATT/TECHNET.99/Session 4/WP.6
Integrating vaccines and drugs in Tanzania	S. Muziki O. Hazemba	WHO/ATT/TECHNET.99/Session 4/WP.9
Session 5		
Hib/HepB: Gambia & South Africa	D. Phillips	WHO/ATT/TECHNET.99/Session 5/WP.5
The logistics of integrating Vitamin A	T. Goodman	WHO/ATT/TECHNET.99/Session 5/WP.6
Liberia	A. Gasasira	WHO/ATT/TECHNET.99/Session 5/WP.7