Immunization Focus

A quarterly publication of the Global Alliance for Vaccines and Immunization www.VaccineAlliance.org

GAVI

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Immunization Focus is issued quarterly on the GAVI website at www.VaccineAlliance.org
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NEWS

Board accepts 'reward' approach to funding must be postponed

THE ALLIANCE is to revise its plan to award performance-based grants to countries for increasing the number of children they immunize. The changes, agreed this month by the GAVI Board, are intended to make the grants system more practical and realistic and will give countries more time to strengthen their reporting of immunization data, without abandoning the principle of "rewarding" improvement.

The immediate consequence is that, instead of being assessed for their first "reward" payment in their third year, countries will have an extra year of investment support, regardless of performance. The reward payment will kick in in the fourth year. For the first group of 16 countries approved for support for their immunization services in 2000, the first reward payments will be made in 2003 rather than 2002.

Although some may see the decision as a setback for the Alliance's way of working, others are simply pragmatic. "The revised approach is the most practical and equitable option," says Michel Zaffran of WHO, a member of the GAVI Working Group. "We are keeping the original principles – giving countries an opportunity to define weaknesses and encouraging their efforts to improve immunization coverage and reporting systems. But we had to take account of reality."

Back in 2000, GAVI agreed that countries should be rewarded with "shares" for increasing the number of children immunized each year with three doses of DTP (DTP3) chosen as a measure of coverage. For example, if a country increased the number of children receiving DTP3 from 100,000 to 120,000 it would be awarded 20,000 "shares". To discourage over-reporting, a data quality audit (DQA) was developed (see *Immunization Focus*, June and October 2001). External auditors were to check that the number of reported immunizations tallied with the numbers actually recorded.

Keep my clinic records safe, too: reporting systems need more investment before funding can be based on performance

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But field tests of the DQA last year in eight countries found "significant weaknesses" in the data reporting systems of seven. A report for the Board by the GAVI Task Force on Country Coordination concluded that it was too soon to introduce performance based funding. "Most countries... will initially be unable to demonstrate valid reported DTP3 data," the report said.

While the original idea was that the ◗

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amount awarded to each country would be adjusted to match the verified percentage of children receiving DTP3, the report concludes that this would be unworkable. No practical audit method would be able to check figures with the precision required to adjust funding in this way, the report says. Another serious problem with the audit is its cost – at $60,000 per country, it is not much less than the awards to some countries.

The task force recommended changes in the way performance is assessed. This year, the DQA should be used in all countries, but only to gauge whether the reporting system is broadly "reliable" or "unreliable". Reliable systems will be defined as those in which 80% or more of reported immunizations can be verified by the auditors. All countries, whether their systems are "reliable" or "unreliable", will receive the extra investment payment this year.

Next year, those countries whose systems are judged reliable will receive awards if their reported coverage increases, with figures endorsed by the country's interagency coordinating committee (ICC). Those with unreliable systems will in principle have their rewards deferred until they have improved their reporting systems. They could also choose to demonstrate, through a coverage survey, that they have achieved their target. But, says Zaffran, the use of coverage surveys will be limited and will follow strict criteria. In the longer term, GAVI partners are to investigate using other indicators besides DTP3 to assess the overall "health" of the immunization system.

Since GAVI first proposed it, the idea of basing grants on performance has attracted the interest of other players in international development, most recently the Global Fund to Fight AIDS, Tuberculosis and Malaria. But for the model to work, countries need to have clear and robust indicators for measuring performance, as well as the capacity to collect the data.

"One of the lessons we have learnt is that it is more complicated than one might think to set up a very simple model where you link disbursements to results," says Anders Nordstrom, interim executive director for the Global Fund, who is seconded from his post as head of the health division at the Swedish development ministry, SIDA. Nordstrom is confident that performance-based grants will remain central to future funding methods. But countries need long-term support to develop their own capacity for keeping clear health records to make this possible. Another lesson, he says, is for the donor community. "We have to change our own behaviour, too," he says. For example, donors should agree a small set of simple indicators rather than require countries to provide multiple sets of data. ■

Phyllida Brown

The Task Force report will be posted with all Board documents at www.vaccinealliance.org

SPECIAL FEATURE

This time, a vaccine for everyone?

With hopes running high for a new vaccine against the major killer pneumococcus, the Alliance partners are tackling the tough challenge of making sure it will be promptly available – and affordable – in developing countries. Phyllida Brown reports

FEW other microbes are as deadly. Pneumococcus kills at least 1 million people a year, according to WHO estimates – mainly young children in the world's poorest countries. Most die of pneumonia, while some develop fatal meningitis or septicaemia. And even those who survive meningitis often suffer long-lasting disabilities.

Given its huge toll on life and health – equal to or greater than either malaria or measles – pneumococcus has managed to keep a relatively low profile in the public consciousness. But it may not do so for much longer. In 2002, this microbe is finally beginning to attract the concerted global attention required to tackle a major killer, for two reasons.

First, a new tool to protect children from the disease is within sight. A pneumococcal conjugate vaccine (see Box 1) is now on trial in South Africa and the Gambia, with the results of the first trials in South Africa due later this spring. Most researchers are hopeful. If the vaccine proves as effective as its close cousin, licensed two years ago in the United States, it could potentially save hundreds of thousands of children's lives each year. "This could have a major impact on child survival, which is why GAVI has selected pneumococcal vaccines as a development priority," says Thomas Cherian, a paediatrician from the Christian Medical College, Vellore, India, who currently works at WHO's Geneva headquarters coordinating global research activities on pneumococcal vaccines.

But a vaccine can only save lives if it is accessible – and this is the second reason why ◗

Breathe in: a sick Iraqi girl with pneumonia is examined with a stethoscope

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pneumococcus is coming under the spotlight now. 2002 sees the birth of an ambitious plan, probably the first of its kind in international health, to make sure that the vaccine will actually reach those who need it most within five years of its licensure.

Well aware that the field trials are not even finished, the key players – which include the Vaccine Fund and the manufacturers, governments and other key GAVI partners – are pressing ahead with the plan because if the vaccine works, there is no time to lose.

Breaking a vicious circle

Too often in the past, new vaccines developed against major diseases such as hepatitis B have waited 10 or even 20 years after their initial licensure to reach those in low-income countries where disease burden tends to be highest. "We have always got caught in a vicious circle," says Orin Levine, a researcher at the National Institutes of Health in Bethesda, Maryland. Together with Jay Wenger and Thomas Cherian at WHO, Levine is charged by GAVI with the task of developing an agenda to rapidly evaluate and introduce pneumococcoal vaccines for developing countries. "Typically with new vaccines, the price is high," says Levine, "so there is no demand from the low-income countries, and the industry has no incentive to invest in increased capacity and supply. We are trying to break that vicious circle, and we have to break it at multiple points."

"The price is clearly prohibitive"

No one pretends that breaking that vicious circle will be easy. The price for pneumococcal conjugates is indeed high – at least relative to most children's vaccines. The product licensed in the US, made by Wyeth Vaccines, is sold there at around $50 a dose, and with three doses required, it costs $150 to protect each child. The candidate vaccine now on trial in Africa is designed to protect against a wider range of serotypes, or strains, of pneumococcus than those found in the US; its price might be expected to be at least as high. But, while the era of vaccines costing just a few cents a dose is clearly over, few believe that a vaccine costing fully $150 per child will be attractive to developing countries, given that many of these countries' governments spend under $20 on health per person each year. "This is a global issue," says Keith Klugman, of Emory University, Atlanta, the principal investigator on the South Africa trial. "The price is clearly prohibitive."

Putting real numbers on future demand

Wyeth appears willing to discuss a different price for the poorest countries, although no one is ready to start quoting figures at this stage. "The price is going to have to reach what is do-able and affordable," says Peter Paradiso, vice-president for scientific affairs and research strategy at Wyeth's Rochester, New York, base. "It is incumbent upon all of us to figure out how to do that, and to come up with a financial solution that can be acceptable to everybody", he says.

But no manufacturer is going to invest in producing more vaccine unless it knows that it has a buyer. Vaccine companies need to know that there is a credible demand for their product, and gauge the size of that demand, before they will move ahead. "We need to have some hard numbers put into the system so that people can proceed," says Paradiso. "The last thing we want is to ◗

1: Pneumococcus: the disease

- The bacterium, properly known as *Streptococcus pneumoniae*, causes acute respiratory disease, ear infections, meningitis and septicaemia. Pneumonia is the biggest cause of death. Of those who develop meningitis, studies in the Gambia and elsewhere suggest half will die and most of the remainder suffer longterm disabilities(1).
- Conservative estimates suggest that pneumococcus is responsible for at least 1 million of the 4 million deaths that occur worldwide each year in under-fives from acute respiratory infections(2).
- Pneumococcal disease can be treated with antibiotics, but an increasing number of strains in circulation are antibiotic-resistant. Vaccines are the only effective way to control the disease and effective, globally available vaccines would be among the most useful tools in public health for decades.
- Although there are at least 90 known serotypes, or strains, of *S. pneumoniae*, 9-11 serotypes appear to account for up to 80% of disease cases, with the prevalence of different serotypes varying from region to region(3).

Vaccines licensed and in trial

- Since February 2000 a pneumococcal conjugate vaccine made by Wyeth Vaccines has been licensed in the US and is routinely administered to infants there(4). Seven pneumoccocal serotypes are conjugated to a protein carrier, a mutated nontoxic form of the diphtheria toxoid called CRM_{197}; the vaccine is known as 7-valent. The conjugation technology – first developed for vaccines against *Haemophilus influenzae* type B (Hib) – is a feat in itself. For the pneumococcal vaccine, the bacterial polysaccharide from each different serotype is separately joined to a protein carrier in a laborious process.
- Unlike an earlier polysaccharide vaccine, the conjugate vaccine protects infants, the most vulnerable group. In trials, the vaccine reduced the incidence of invasive pneumococcal disease by more than 90 per cent, and also reduced pneumonia and ear infections.
- The vaccine on trial in Africa, also made by Wyeth, is 9-valent: in addition to the 7 original serotypes it includes two prevalent outside the US. If trials go well, a licence could be granted by about 2006. Additonal vaccines are at earlier stages (Box 2).
- Early evidence suggests that children immunized against *S. pneumoniae* are not only protected themselves, but are also less likely to pass the infection on to others. So a vaccine may protect unvaccinated as well as vaccinated children in a population and may also reduce the spread of antibiotic-resistant strains(6).

build up capacity and have a vaccine that is unused."

Which is where the new plan comes in. Sponsored by the World Bank, the Vaccine Fund and the Gates Foundation, the plan is an Alliance initiative to be agreed between public agencies, foundations, and vaccine manufacturers with products in development (See Box 2). It will set out a detailed road map for achieving the introduction of an agreed supply of an effective pneumococcal vaccine at an acceptable price, starting between 2006 and 2008.

The plan, being drawn up with the help of management consultants McKinsey & Company, will set clear targets for each stage along the road, and identify key parties – such as the manufacturers, funding agencies and the technical teams that would implement the plan. All parties will be expected to make commitments at each stage. The idea sounds obvious, but such a plan is rare outside the private sector. "It's common sense, as most really good ideas are," says Amie Batson at the World Bank. "But it is a new departure for us."

She hopes that the public sector can learn from the methods routinely employed by industry to plan the introduction of their products, and redirect those methods towards the global objective of achieving a speedy and ◗

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Testing time: an enrolment session for the trial in The Gambia

2: A dwindling set of vaccine manufacturers

Wyeth's 9-valent vaccine is the most advanced of the candidate pneumococcal conjugate vaccines. While many had hoped that, if trials proved successful, it could be licensed and used exactly as it is, the company favours developing the 9-valent vaccine as a combination product with meningococcus C.

Some researchers have argued against this combination, saying it would be inappropriate for developing countries as meningococcus C is a relatively minor pathogen in many populations, and the extra antigen is likely to add to the cost and even the time for bringing the product to market. Paradiso at Wyeth disputes this view and adds that, since the price of the vaccine in the poorest countries will be negotiated on different terms from those in industrialised countries, it will be unaffected by one extra antigen.

Regulatory problems

Although the rest of the field is not empty – quite – the alternatives are few. Glaxo SmithKline has developed an 11-valent candidate vaccine, but is currently reformulating it and doing additional work to improve the vaccine's consistency, so its journey to market will be delayed.

Aventis Pasteur had developed an 11-valent pneumococcal candidate vaccine, currently undergoing field trials in the Philippines. However, the company has recently decided not to pursue commercialization of the vaccine.

Dr Juhani Eskola at Aventis Pasteur says the decision was taken because, although the vaccine produces a strong immune response when given at the same time as whole-cell DTP (DTwP) vaccine, it performs disappointingly when given at the same time as acellular DTP (DTaP). Since most industrialized countries use DTaP, this presents a serious problem for the company in gaining regulatory approval and marketing of the product.

"We asked ourselves whether we could develop the vaccine for the DTwP environment," says Dr Eskola. The final conclusion was no, since some further trials of the vaccine would also be required. "With these regulatory difficulties, the development time would be extended," he says. "Since we also have another pneumococcal candidate, a protein vaccine, in development that could be used with both DTaP and DTwP, we decided we would focus on that and try to get it to the market as quickly as possible." He says that the projected timelines for the extra work on the conjugate vaccine would be almost as long as for the new protein vaccine, so it was a logical choice to go for the newer approach. However, he says the new vaccine is at a relatively early stage, and it will be "several years" before development is complete, assuming of course that it proves protective in trials.

Too little competition

Some researchers are dismayed that Aventis Pasteur has abandoned a vaccine that could have been suitable for many developing countries in favour of a newer approach that is still some distance from market. "While there may be major practical advantages to the protein vaccine approach, it is unproven, whereas the conjugate is an established mechanism," says Kim Mulholland, a paediatrician specialising in international child health at the University of Melbourne.

Mulholland – and, privately, others – believe that Aventis Pasteur's withdrawal of its product will also make it more difficult for the public sector to negotiate an affordable price for any pneumococcal vaccine in developing countries because Wyeth now has little competition. Eskola insists, however, that Aventis Pasteur remains "strongly committed" to work in the pneumococcus field and that the potential of the new vaccine is better. "Our plan really is to provide a vaccine for the whole world."

equitable introduction of a pneumococcal vaccine. If the approach works, it might eventually be extended to other new vaccines in future.

The idea for a detailed plan evolved from an initial decision by the GAVI Board in November 2000 to make the development of pneumococcal vaccines a priority(5), since when GAVI's task forces for R&D and financing have been seeking advice and setting agendas for action. "We're saying, let's start with our end target – a given level of coverage with a pneumococcal vaccine – and work backwards to say what activities are needed, where, and when, to ensure that the target is met," says Batson.


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Commitments by all parties

So far, the plan is just a framework to set out the details. "But by the end of 2002 we should have a good sense of the number of doses that might be needed, what the price range would be, and by what year," she says. By late 2003 proposals on funding should be drawn up, together with price and volume agreements with manufacturers. By 2004 the manufacturers should have clear agreements to scale up production and by 2006-2008, the vaccine could be purchased and introduced into a first group of countries. Preliminary discussions with the industry have already begun.

"It is up to all of us to come up with a financial solution"

There are many intermediate steps to be taken before the ultimate goal can be reached. One example is to measure the burden of pneumococcal disease in different regions and countries. Governments are more likely to see the value of a vaccine if they know that it could prevent a significant number of deaths and cases of illness and disability in their population. So, to find out the true burden of the disease in each population, detailed epidemiological studies must be set up now, each of which must be financed from somebody's budget. The plan will include details of exactly when such studies will be done and who will pay.

Can it work? Only if all sides – in public and private sectors – are prepared to think differently from before. Wyeth, for its part, is sounding cautiously positive. "The environment has changed," says Paradiso. "The Alliance is taking more ownership of this process."

Time for the public sector to take a risk

And, in the public sector too, there are some signs of a shift. "We [in the public sector] have to be willing to share the risks with the industry," says Levine. While industry has traditionally borne risks such as investing in production only to find that demand for a product is tiny or delayed for years, the public sector has generally been able to play safe with its money where vaccines are concerned. Some in the immunization community now think that, given the small number of manufacturers and the difficulties of guaranteeing markets in developing countries, that public-sector habit of playing safe may need to be rethought.

GAVI may need to commit itself, for instance, to buying a set number of doses of vaccine upfront – even, says Levine, if that means risking buying too much. "We have got to be prepared that someone will say, 'You spent millions on expensive vaccines that you cannot even use'," says Levine. Without willingess to take such risks, he believes, there might be no increase in the rate of progress and children in developing countries could still be waiting for pneumococcal vaccines in 2015.

High stakes

Does this mean that, to get vaccines to children in developing countries, the public sector has effectively to submit to the demands of the vaccine manufacturers? No, says Batson. "This process is in the public good and has to be controlled by the public sector. But it is in our interests to involve the private sector. The only way to accelerate access is for industry also to accelerate its investment in development and production capacity, so industry has to be involved." The stakes are high – and the responsibility on all players greater than ever before. ■

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Putting injection waste out of harm's way

By 2003, in line with WHO and UNICEF injection safety policy, all countries' immunization programmes should have shifted to using auto-disable (AD) syringes – with some 400 million to be supplied worldwide by UNICEF during the year. Although immunizations account for only 5% of all injections given worldwide, the new policy has highlighted the need for safe disposal of all injection waste. Below, Mark Haltmeier and other members of a WHO mission to assess healthcare waste disposal in Côte d'Ivoire highlight the importance for success of having a clear policy, knowledge and sustainable means. Alongside their article, our 'reports from the sharp end' in Cambodia, India and West Africa describe three practical solutions in 2002.

Reports from the sharp end

1: Cambodia: safe, non-polluting incinerators

SINCE Cambodia's Ministry of Health adopted an injection safety policy in 2000, the immunization programme has moved fast. It has to: from 2003 the introduction of AD syringes into the routine immunization system will mean 3 million extra syringes each year for the system to dispose of, says Keith Feldon, technical officer for Cambodia's Expanded Programme on Immunization. This number does not include AD syringes already being introduced for supplemental immunizations, nor hospital injections.

The country has chosen to use small-scale "auto-combustion" incinerators, which usually use dry combustion materials such as leaves, paper or coconut husks, and are easy to operate and maintain. With land scarce, the incinerators are also preferable to burial sites, and safer for workers to manage. So far, 14 of 24 provinces have installed them and trained operators, and ◗

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A Sicim incinerator, the type widely used in Cambodia for syringe disposal

Healthcare waste management: there are solutions

Mark Haltmeier, Annette Pruess, Franck Bouvet and Djibril Doucouré

THE national immunization programme in Côte d'Ivoire expressed concern about poor practices in the management of wastes from healthcare activities. As a result, a field assessment was conducted in the country during July 2000. The aim was to identify essential needs and find potential sources of funding by attracting donor attention to a problem that is known to cause significant disease burden.

To illustrate the kinds of problems we found and the solutions envisaged, here are some examples.

Knowledge without means

In a large hospital in Abidjan we were shown their incinerator, which had broken down some time ago due to the lack of funds to maintain it and a lack of know-how on how to repair this facility. Staff had therefore resolved to dumping the waste in an area of the compound and burning it on an open fire from time to time.

The top management seemed both well trained and aware of the risks related to inadequate disposal of waste. Their main concern, however, was the lack of a sufficient operational budget at the hospital level; a situation which had obliged them to close down their radiology and diagnostic units, let alone deal with the healthcare waste properly.

Means without sustainability

Back in the late 1990s, a project financed by a bilateral agency had led to the construction of 14 well-designed and properly built small incinerators, of which only two were reported to be still operational. The main reason for this situation was the budgetary cuts made by the government in the health sector, which had led to significant reductions of personnel in hospitals. The first to be dismissed were the "least qualified", and once the only people who knew how to operate these incinerators were gone, the whole system stopped functioning properly.

Means without knowledge

In many remote areas, where the burial of waste in pits seems to be the most appropriate solution, we found that healthcare staff were quite well informed of the risks and managed the situation in an adequate manner. There were nevertheless some cases where the need for proper training was identified. In these cases, used syringes and other wastes were seen in the vicinity of the "disposal area" - that is, close to a heap of waste called the burial "pit", but also elsewhere on a compound.

When knowledge and means – even modest – operate together

A visit to a small primary health centre just outside Abidjan revealed a much better picture. This facility – which has just a few beds for day care only – had a simple but efficient way to safely dispose of its waste. A small incinerator within the compound was filled every evening by a trained worker with the waste of the day: two buckets on average. As all wastes were added to the sharps, the incinerator did not require any extra fuel to function properly. The centre is supported by an NGO which specifically addressed this issue with the manager, providing thus both the knowledge and the means necessary for adequate elimination of the wastes.

Prerequisites for lasting improvements

The assessment showed the importance of providing both knowledge (training ◗

Healthcare waste management: there are solutions... *continued*

and awareness) and means, financial and technical. These elements need to be part of a normative framework. Those interviewed who were responsible for healthcare admitted the lack of action plans, coherent health policy and regulations governing waste disposal.

In our own view, external support is one extremely important factor for improving a system. This external help, which can be given by a local, national or international institution, could take the form of ongoing training. We believe that keeping people motivated and in touch with the most recent techniques is probably the key element to success.

While concrete outside help is essential, we also urge realism. High-tech solutions alone will not succeed. We need to move at a human pace. During our field trips, we passed a number of dangerously overloaded trucks, hoping every time we passed one of these modern, swaying "elephants" that they would not tip over like the other trucks and trailers we saw lying in ditches. This reminded us of the monstrous problem of mismanaged healthcare wastes. Don't believe that technical solutions can overcome every pitfall. We need to be careful not to overestimate our capacities, especially if the road is uneven. By doing things at a human pace, the chances of reaching the goal will increase, all the more so if we have knowledge of the "road" – that is, the socioeconomic and political context. ■

The authors, on a WHO mission, surveyed a cross-section of the country's waste management at two levels: first, geographically (from southeast to northwest), and second, at institutional level (from Ministry of Health and university hospital to village primary healthcare centres). The detailed report of the mission summarized some important limits to current waste management.There was a lack of plans of action. Safe waste management was not considered a priority; there was no formal legal framework; and a lack of financial resources limited appropriate measures. The full report is available at www.healthcarewaste.org

instructions on use of the incinerators have been circulated. "This incinerator seems to be appropriate in terms of cost, training, land space and potential risk to health workers and the population," says Feldon.

Encouragingly, early findings from WHO tests of the incinerators show that when they are used properly, they do not emit harmful amounts of pollutants such as dioxins or furans. And, although the country has had to invest significant capital in buying the incinerators, studies suggest that they are cost-effective with sustained use. Feldon hopes that costs will fall as local manufacturers of components such as safety boxes and AD syringes gradually replace expensive imports. He also believes that equipment manufacturers should take some responsibility for the costs of disposing of their products.

"It must be remembered that there is no perfect disposal solution, and that whatever technology is selected is only an intermediate path until there are improvements in both vaccine delivery methods and disposal systems."

2: India: an environmentally sustainable solution in a crowded country

AIR MARSHAL LK Verma, director general of medical services for the Indian Air Force, has taken on many challenges in his career – and medical waste disposal is just one of them. In a WHO pilot project at the Command Hospital Air Force, Bangalore, Verma has developed a "multi-option" approach that he believes is safe, appropriate and environmentally sustainable. The pilot project, one of 11 in India, was completed in 2000 and the approach is now being extended to all Armed Forces hospitals around the country by mid-2002, supported by the Indian Ministry of Defence.

Immunizations account for only a fraction of the injections given in many health care facilities (see *Immunization Focus*, March 2001), but the overall healthcare waste management policy followed at this hospital is nevertheless of interest to immunization programme managers, since many immunization centres share disposal facilities at hospital or district level.

Medical waste includes a broad range of components in addition to injection equipment, such as chemicals, radioactive wastes, used dressings, and large quantities of plastic. Instead of relying on just one method of disposal for all these items – autoclave, microwave, incinerator or hydroclave – Verma, a medical doctor and administrator, believes that a hospital needs to have all four to ensure waste is disposed of in the appropriate way. The key is to ensure that waste is properly segregated: the benefits outweigh the costs, says Verma, and hospital-related illness is reduced.

Although incineration is widely regarded as the best method for disposing of injection equipment, Verma has shown that much plastic hospital waste can safely be disinfected with hypochlorite solution or microwave, then shredded and sold for recycling. He believes this is preferable to having poorly maintained and wrongly used incinerators, which are already common in urban India, and which may emit pollutants such as dioxins and furans. Burial of injection equipment, plastics and human or animal tissue are not options in urban areas, he says, given the sheer population density in India and the competition for scarce land.

So the hospital in Bangalore, and the other Armed Forces hospitals, use a relatively sophisticated system that is suitable for their needs. After an injection is completed the used syringe is placed in a destroyer. A mechanical cutter cuts off the syringe at the nozzle. The needle is simply melted by passing an electric current through it. The resulting waste is disinfected and placed into an old water tank at underground level: the tank will take 5-10 years to fill, Verma estimates. The remainder of the plastic syringe is disinfected, shredded and the plastic is recycled. Waste handlers wear protective gloves, masks and goggles. Staff are trained not to recap needles or handle used syringes at all after use.

For more information see www.medwasteind.org/verma.htm and www.expresshealthcaremgmt.com/20010930/editorial2.htm

3: West Africa: small, locally built incinerators

Adama Sawadogo is nicknamed *le pyromane* – the pyromaniac – because he has been charged with the task of overseeing the safe disposal of injection waste in a multicountry measles immunization campaign. The disposal project is one function of a WHO logistics team, headed by Souleymane Koné of WHO's Côte d'Ivoire office in Abidjan, and covering five countries in West Africa: Burkina Faso, Mali, Togo, Benin and Ghana. The project was put together rapidly, beginning in September 2001, in time for a major measles immunization campaign starting in the region in December.

"We had to find a solution before the campaign started," says Sawadogo, an engineer by training. The team anticipated that the campaign alone would generate about 300 tonnes of injection waste across the five countries. "We had to destroy it all."

Wide open: clinical waste heaped in a mound in a shallow open pit in an African district hospital

©Susan Mackay/WHO

Sawadogo and his colleagues identified a simple type of incinerator, known as the De Montfort, which was devised by a British researcher, James Picken of De Montfort University, with initial funding from the UK Department of International Development. It is made of bricks that are fired to be especially resistant to heat, able to withstand the temperatures of up to 1500ºC that are necessary for waste destruction, and which can be manufactured locally.

The De Montfort has two combustion chambers and two doors: an upper door through which the safety boxes are inserted, and a lower door through which the ash can be removed after burning. The fire can be started with paper, cardboard or wood with a small quantity of firelighter. Up to four 5-litre safety boxes fit into the incinerator at once, stacked two on two.

After receiving training in the building of this incinerator from its inventor in a workshop in Bamako, the multicountry team supervised the building of 277 incinerators across the five countries. To ensure all safety boxes were burnt, each district had to record each box sent to the incinerator and an operator logged the arrival of each. Overall 65% of the campaign waste was burnt in De Montfort incinerators, and in some of the countries the figure was as high as 100%. Other methods were permitted for clinics in isolated areas in the largest districts, says Dr Sawadogo, where the distance to the nearest incinerator was too great to assure safe and economical transport.

Dr Sawadogo judges the overall performance of the incinerators during the campaign a success. He says there are a few structural problems that are being addressed with the inventor. Some of the incinerators had to work overtime, burning safety boxes from 9 am to 11 pm at the height of the campaign – particularly in Burkina where 6 million children had to be immunized. In a few cases, cracks have appeared in the bricks, suggesting that some might not have been fired at sufficiently high temperatures, while a few incinerators showed faults resulting, he believes, from the speed at which they had to be built. Nevertheless, the overall performance was efficient, affordable and manageable. "We already have proposals for improving the incinerators," he says. "At the same time, we are keeping the door open for using other methods alongside the De Montfort." ■

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Country reports by Phyllida Brown

WHO advice and resources

Motivation, leadership, a well-understood national policy and training matter as much as equipment in a successful healthcare waste management programme, says Richard Carr, WHO's specialist on the issue. There is no advantage in having an incinerator if no one knows how to use or maintain it, says Carr. "There are plenty of technologies that can be used; it is just a matter of getting people motivated," he says.

WHO has produced an aide-memoire for health system managers to use in planning a system for waste disposal: it contains advice and a checklist. It can be viewed or downloaded at www.healthcarewaste.org or obtained by writing to Richard Carr at WHO: carrr@who.int

Immunization Focus

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Designed and produced by: Synergy New Media, London N17 9LN, UK. www.synergynewmedia.co.uk