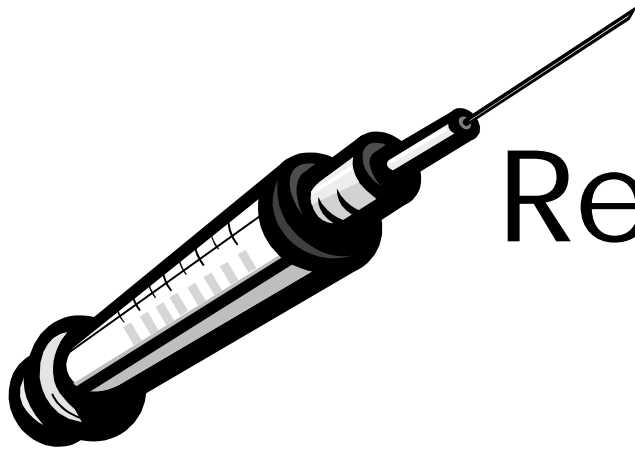


# Status



# Report

*Bio-Medical Waste Management Practices*

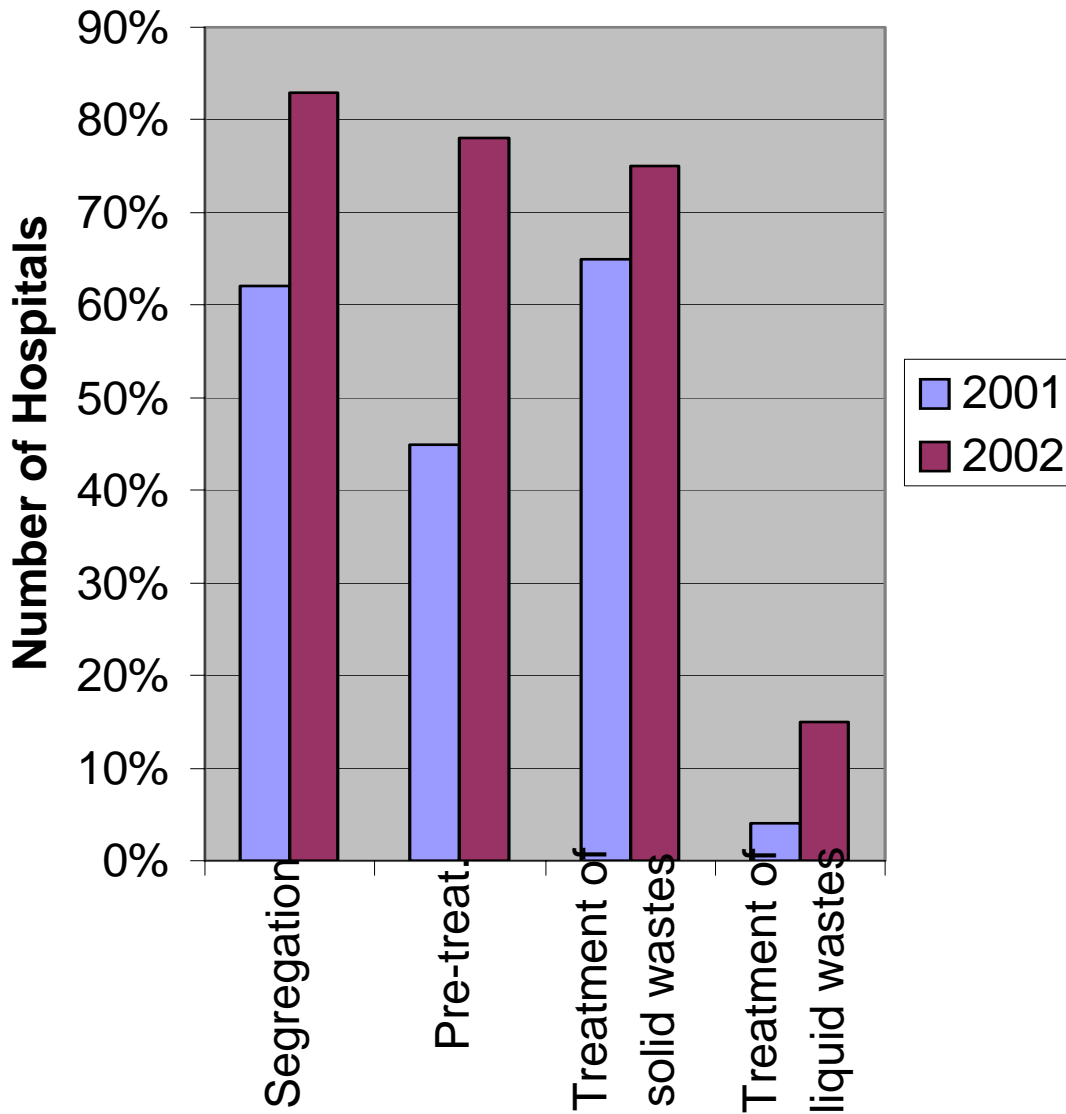
*In Chennai*



Citizen consumer and civic Action Group(CAG)

*September 2002*

## Status of Bio-medical waste management practices in Chennai



GRAPH 1

# CONTENTS

INTRODUCTION	4
OBJECTIVES	4
METHODOLOGY	4
SURVEY FINDINGS	5
Hospitals (including Nursing Homes and clinics)	
Laboratories	
Blood banks	
RECOMMENDATIONS	12
Centralised treatment facility	
Training and Awareness	
CASE STUDIES	15
Madras Medical Mission	
Sundaram Medical Foundation	
Sri Ramachandra Medical College and Hospital	
Unique case of Madras Veterinary College	
REPORT OF THE SEMINAR	18
ANNEXURES	20
<b>I – List of healthcare institutions surveyed</b>	
<b>II - Key stakeholders in Chennai’s bio-medical waste management</b>	
<b>III – Bio-Medical Waste (Management &amp; Handling) Rules 1998</b>	
<b>IV - A copy of the special protocol developed by Lister Laboratory</b>	

# INTRODUCTION

The bio-medical waste situation in Chennai has seen major improvements, though sporadic and with exceptions. The main attribute to the changing scenario is the decision to set up a centralised waste treatment facility (CWTF) for the city's hospitals. In fact, when the actual process of identifying the land and the CWTF provider took place in the latter half of 2001, the whole campaign towards better medical waste management and disposal made significant progress.

With the CWTF in sight, waste management is getting a face-lift. However, unfortunately, there are still some institutions that are unwilling to make any changes even today and claim that good practices can only be adopted after the facility has actually started operating. Nevertheless, the Indian Medical Association (IMA), the Tamil Nadu Pollution Control Board (TNPCB) and Citizen consumer and civic Action Group (CAG) have been urging the healthcare institutions to sign up for the centralised facility.

## OBJECTIVE

The report aims at presenting the status of bio-medical waste management as it exists currently in Chennai city. With the aid of this report, The 2002 survey aims to find out whether healthcare institutions have identified and solved the bio-medical waste management practices that they had been facing. The report of this survey takes up the issue of the priority given to the procedural systems followed by healthcare institutions to manage waste apart from the implementation of new systems. The report presents the bio-medical waste management scenario in Chennai as it exists today. With the aid of this report, CAG intends to create as well as increase awareness amongst healthcare personnel and also the public regarding effective bio-medical waste management practices and its benefits.

## METHODOLOGY

In order to gain knowledge about the status of bio-medical waste management in various healthcare institutions of Chennai, CAG conducted three surveys over a period of two years (from 2000 – 2002), with financial assistance from Health Care Without Harm (HCWH). There was a time gap of one year between each survey and the findings of the various surveys conducted were brought out in the form of reports. The following table gives a year-wise list of the survey results brought out by CAG

<b>S.No</b>	<b>Year</b>	<b>Name of the report</b>
<b>1</b>	2000	Healthcare 'LESS'
<b>2</b>	2001	Hands That Heal and Hands That Harm
<b>3</b>	2002	Hands That Heal and Hands That Harm – II

**Table 1**

CAG also conducted a one-day workshop titled "Managing Bio-medical Waste", for the benefit of various healthcare personnel and the details of which have been discussed subsequently in this report. CAG also offered (and still continues to offer) recommendations to hospitals, which approached the organisation, to help them solve various problems that they encountered regarding bio-medical waste management. Also for the benefit of the hospital staff and the general public, CAG brought out 4 informative posters on all important aspects of bio-medical waste management.

After these activities were completed, the 2002 survey was conducted which was intended to be a review survey. The survey aimed at studying the changes and improvements made by the healthcare institutions, after receiving help from CAG.

This final report has been drafted using all the above mentioned inputs and it presents the status of bio-medical waste management in various healthcare institutions of Chennai city. It must be mentioned here that CAG could not conduct the review survey in a few hospitals due to delay or denial of permission to survey. These hospitals were Devaki Nursing Home, MIOT, Apollo Speciality Hospital, Government General Hospital and Stanley Medical College and Hospital.

The following is the summary and analysis based on the findings of the Bio-medical waste management surveys done during 2001 and 2002.

## SURVEY FINDINGS

### HOSPITALS (includes Nursing Homes & Clinics)

Parameters that are mentioned in the Bio Medical Waste (Management and Handling) Rules (henceforth referred to as BMWR), were chosen to effectively gauge the levels of improvement with regard to the bio-medical waste management practices in the various healthcare institutions in Chennai. These parameters were: -

- Segregation
- Pre-treatment methods
- Treatment and disposal methods

### SEGREGATION

Under the BMWR, segregation of bio-medical waste is mandated as the key basic step to proper waste management. The specifications of the Rules, mentioned under Schedule II can be referred from Annexure III.

On the whole, there has been a noticeable positive change in the attitude of hospital staff towards segregation and hence many more institutions have implemented substantial, if not complete waste segregation.

The common basic system practiced is usually the 4-bin combination – with three plastic-lined, steel or plastic bins for infectious waste like blood-soaked dressings/bandages, plastic waste and general waste (medicines packaging, etc.) and a special fourth container for sharps. The sharps containers come in various forms ranging from normal small plastic buckets to used PET bottles. A unique practice was noticed in the **General Surgical Clinic**, where cardboard boxes are used for holding sharps.

Segregation practices have emerged in varying degrees and can now be broadly classified as: -

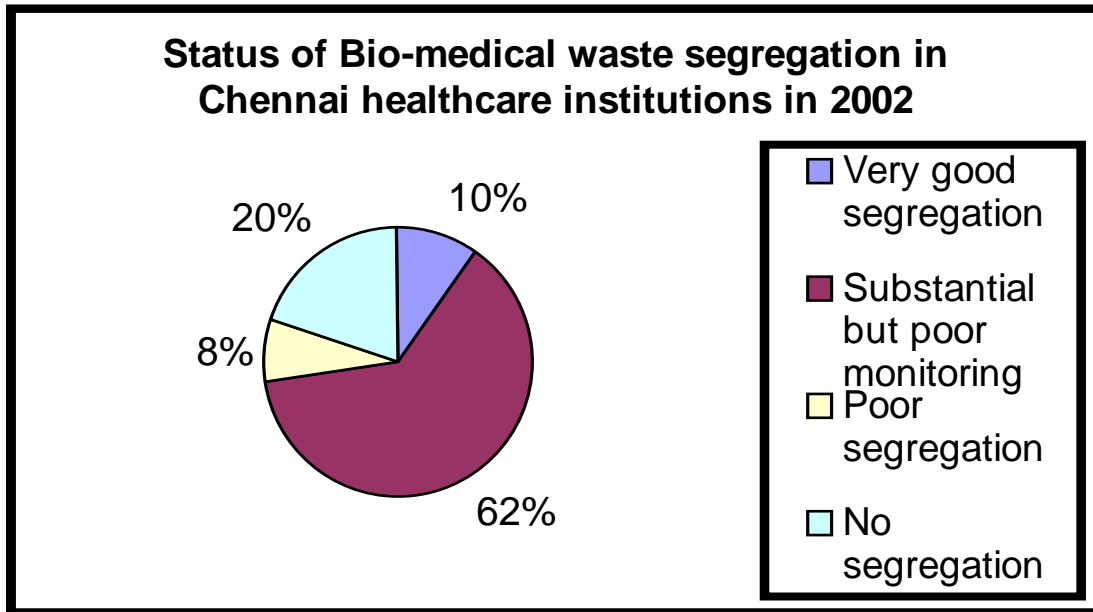
- Well segregated
- Substantial Segregation with poor monitoring
- Poor segregation
- No segregation

In the first category, hospitals like **Apollo Hospital, Sundaram Medical Foundation, Madras Medical Mission** and **Sri Ramachandra Medical College and Hospital** rank high.

However, most hospitals in Chennai fall under the second category.

Examples of hospitals in the third category include **Dr Hande hospital, The Institute of Child Health and Hospital for Children** and **Trinity Acute Care Hospital**.

Unfortunately, our study revealed that even today, no segregation is being practiced in hospitals such as **Chennai Kalliappa hospital, CSI Rainy Hospital, Durgabai Deshmukh Hospital, G.G Hospital, KKR ENT Hospital, Voluntary Health Services (VHS)** and in several Government hospitals.



GRAPH 2

## PRE-TREATMENT

Before treatment and disposal of bio-medical waste comes an often overlooked but essential step of pre-treatment or disinfection. Normally, pre-treatment involves the use of 1% Sodium Hypochlorite solution, where used plastics, sharps/syringes and laboratory utensils are soaked in this solution for up to 15 minutes (depending on degree of infection) before they are sent for further treatment and disposal.

Given that the final disposal of waste is done in large mixed waste dumpsites, this is a crucial step. Also, it is important from the point of view of prevention of nosocomial infections (hospital acquired).

Most institutions that follow segregation have implemented disinfection. It was noticed that pre-treatment was being practiced at varying levels and can be broadly classified based on the chemical used: -

### Hypochlorite (1.5%)

The survey results indicate that there has been an increase, not only in the levels of use of Hypochlorite, but also in the number of hospitals and clinics using it. Most hospitals, which are segregating their waste, also ensure that they disinfect it. This merely goes to show that segregation is a fundamental step, which facilitates the automatic implementation of subsequent steps of waste management. Glaring infringements was noticed yet again at hospitals that are simply refusing to adopt any measures whatsoever and are being indifferent to the whole issue.

Hospitals that are extremely particular about disinfection are **Sundaram Medical Foundation** and **Madras Medical Mission**.

## Bleach

Another form of disinfection observed is bleaching using a bleaching agent or Dettol. This is practiced particularly by institutions having a common liquid waste treatment system and by small or lower revenue generating private institutions (other than Government hospitals). **Dr Hande Hospital** for example, uses bleach and alternates disinfection with Hypochlorite.

## TREATMENT AND DISPOSAL

In order to streamline the processes of waste treatment, the BMWR specifies individual standards for treatment methods. Treatment of bio medical wastes includes the treatment of both the solid as well as the liquid wastes that are generated by the various healthcare institutions.

### *I – Treatment and disposal of solid wastes*

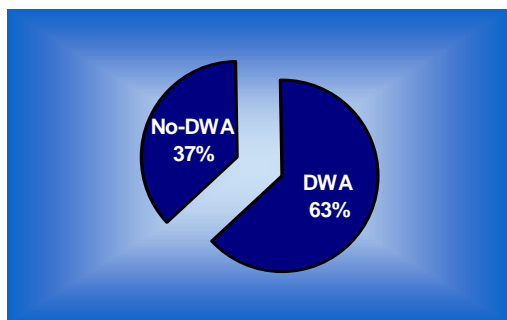
Hospitals have been found to practice any one or a combination of these methods for the treatment of their solid wastes.

#### 1. Autoclave

A standard accepted method that was practiced even before the BMWR was introduced is autoclaving. Using steam generated at high pressure and temperature, the autoclave disinfects, treats and mutilates the material. The Rules clearly specify that the autoclave should be dedicated for the purposes of disinfection and treatment of bio-medical waste.

In the current survey nearly 40% of the hospitals do not employ an autoclave solely for the purpose of waste disposal (refer Graph 3). This does not necessarily mean that these institutions do not possess an autoclave.

**GRAPH 3 – Number of institutions using a Dedicated Waste Autoclave (DWA)**



From this it can be interpreted that the existing autoclaves (for instance small capacity autoclaves for laboratory material disinfection) are inefficiently subject to disposing off waste and the institutions are not fully geared to handle larger volumes of waste

From the 21 healthcare institutions surveyed that did not possess a dedicated waste autoclave in 2001, two institutions (**Dr Hande Hospital** and **Dr. Mehta's Nursing Home**) have since succeeded in employing an autoclave exclusively

for the purpose of treating their bio-medical wastes

Though it appears as there has been an insignificant increase in the number of institutions following better waste treatment practices, in actuality, we now find that 62% of institutions possess autoclaves and this figure is likely to increase at quite a sharp rate, with the Tamil Nadu Pollution Control Board proposing to prohibit on-site incineration.

#### 2. Hydroclave and Microwave

When compared to the popularity of autoclaves, these treatment options are not yet very preferred. **Sri Ramachandra Medical College and Hospital** is the only institution that is successfully using a hydroclave for its waste. The CWTF that is proposed for Chennai is also expected to employ a hydroclave as a treatment option.

### 3. Deep Burial

Pathological infectious waste constitutes about 15% of the total bio-medical waste generated by any healthcare institution. However, this requires maximum attention. The preferred option has been and still continues to be incineration of this waste because traditionally, burning has been an accepted practice and a boon for volume reduction.

#### STANDARDS FOR DEEP BURIAL

A pit or trench should be dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.

It must be ensured that animals do not have any access to burial sites. Covers of galvanised iron/wire meshes may be used.

On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.

Burial must be performed under close and dedicated supervision.

The deep burial site should be relatively impermeable and no shallow well should be close to the site.

The pits should be distant from habitation, and sited so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.

Incinerating waste is now increasingly coming under criticism the world over because of its excessive emissions. As a technology option, many countries are rejecting incineration and switching over to alternative non-burn methods of disposal. The European Union in a recent directive has even classified other waste disposal technologies such as gasification, pyrolysis and plasma arc as equivalent to incineration.

In India, Andhra Pradesh is one of the many states that has stringently prohibited the on-site incineration of medical waste. CAG has been lobbying vigorously for a ban on incineration of all wastes, especially mixed wastes, within the State of Tamil Nadu. In this light, Tamil Nadu is likely to take steps similar to those adopted by Andhra Pradesh in this regard. This being the situation, a good way to dispose off pathological waste is deep burial.

**NO** healthcare institution in Chennai city follows deep burial as a disposal option.

In a city scenario, due to the crunch for land, hospital premises do not have the capacity to allot space for deep burial. Government hospitals on the contrary, which are presently in the lowest rung of compliance could potentially use the available large campus space and exercise this option effectively.

### 4. Incineration

In the earlier half of the 20<sup>th</sup> century, incineration as a waste disposal option was favoured the world over. However, as the century progressed, research on incineration revealed definite links to the release of hazardous emissions, both in the fly ash as well as in the bottom ash. It was later clearly proved by the United States Environmental Protection Agency (USEPA) that incineration of bio-medical and municipal solid waste, released dioxins, which are now proven carcinogens. As a result, the developed Occident countries, especially the USA and countries of the European Union had discarded it or had adopted extremely stringent regulations for incinerators.

## Medical Waste Incineration - Bad Option

Incineration is a complex technology that basically burns waste. However, one must understand that the problem of medical waste is one of killing pathogens and not of destroying the materials on which the pathogens are sitting. Incineration attempts to do both. When subject to incineration, materials such as plastic disposables or cellulose rich materials pose serious concern. The burning of plastics especially in unregulated incinerators, create a new set of chemical toxins, some of which according to current research, are extremely toxic, even in minute quantities.



It is now well known that the infectious part is a mere 15%, which is of utmost concern. 85% of waste composition being non-infectious, segregation becomes the key to proper medical waste management, not incineration. Even when combined with municipal waste (MSW)(which has been the practice), incineration does not become viable because most of the MSW is wet and biodegradable making it unsuited for burn-based technologies like incineration.

In the meanwhile however, India was encouraging incineration. Though not looked at very seriously for municipal waste, bio-medical waste had been traditionally put in an incinerator for disposal. In 1995, the Supreme Court of India, in response to a public interest petition seeking management of waste mandated all healthcare institutions to incinerate their waste. Taking advantage of the situation, countries in the process of discarding incineration technology transferred the technology to unsuspecting India.

However, with the BMWR the government identified a series of waste management and disposal options, and laid down minimum standards for the exercise of some of these options. Further, environmental groups in India too have been lobbying for stricter restrictions, if not a complete ban on incineration.

### Dioxins

Dioxins, emitted from incinerators and other industrial sources, enter the body through fatty foods such as meat and dairy products such as chicken, egg, meat, milk etc, as they are fat-soluble. Along with Furans and PCBs, it is classified under the list of Persistent Organic Pollutants – 12 toxic chemicals the world is trying to eliminate.

Acid gases effect serious respiratory and cardiovascular impacts while heavy metals can have negative neurological and metabolic impacts. It is proven that dioxin can be toxic in very low concentrations, as low as 0.006 picogram (one trillionth part of a gram) per kilogram body weight per day

India has NO testing facilities for dioxins and furans. The cost of testing can range from \$1000 to \$50,000, which developing countries like India can afford.

Even though standards now exist for medical waste incineration, it is our opinion that as a technology, medical waste incineration is a bad option when compared to other existing non-burn alternatives such as autoclaving. The reasons for this have been explained in the boxes above.

With regard to the status of medical waste incinerators in Chennai, the 2001 survey findings revealed that incinerators were being subject to irrational use in healthcare institutions. The survey found that hospitals that had installed incinerators were often indiscriminately burning all their waste including plastic-laden general waste from canteens,

plastic syringes and PVC blood-bags. The current survey showed that the management and staff

were much more aware of the hazards involved with such indiscriminate disposal of mixed waste. This has consequently led to a substantial decline in the use of incinerators and rendered them redundant. This could possibly be attributed to this decline in incineration practices after hospitals have realised that the danger of wastes getting reused is high and that open municipal dumpsites, which are the current destinations of bio-medical waste, can cause rampant infection and environmental damage.

Further, the Tamil Nadu Pollution Control Board has opposed the incineration of Bio-medical waste. In letters to city's healthcare institutions, the TNPCB has warned them not to use incinerators and has said that it would not grant permission for the setting up of new incinerators. Hence some hospitals are improving their existing autoclaves or purchasing new ones to treat and dispose their waste.

## ***II – Treatment and disposal of liquid wastes***

A form of waste that is by-and-large neglected for treatment by many institutions is the liquid effluent comprising of drugs, chemicals, excreta, laboratory solutions, body fluids like blood, etc. Most of this waste is drained into the municipal sewage system. The mixing with raw sewage of this component of any hospital's waste is potentially very dangerous.

Currently some large institutions have been able to afford the space and the resources to deal with their liquid waste. **Apollo Hospital** and **Sri Ramachandra Medical College and Hospital** have installed effluent treatment plants to which the liquid waste is diverted and then drained into the municipal sewerage system.

Some other institutions have a neutralisation tank in which hypochlorite or bleach is used for disinfection. **Billroth Hospital** and **Sundaram Medical Foundation** have adopted this system. Certain unique forms of disposal are also employed. **Dr. Mehta Nursing home** has a common drain in which bleach is added.

Unfortunately the survey found that no other institution has any treatment facilities in this regard. This is therefore an area of concern that needs priority attention. Hospitals need to incorporate treatment of liquid waste into their existing infrastructure to come up with effective solutions with regard to bio-medical waste management. A possible way forward in this regard, is a dialogue with the city municipal sewerage authority (Chennai Metropolitan Water Supply and Sewerage Board).



### **Apathy of Government institutions**

An unfortunate factor has been the relative failure of most Government hospitals to safely manage and dispose their waste. Though there is awareness on what needs to be done, these institutions blame the lack of adequate funds as being the primary reason for not being able to implement any safe waste management system.

**Stanley Medical College and Hospital, Government General Hospital, Kilpauk Medical College and Hospital and Royapettah Government Hospital**, all rank poorly in this regard.

(Photographs above and beside provide evidence of unscrupulous waste disposal practices by the Government hospitals)



What is worse is that a few private institutions like **Chennai Kalliappa Hospital** and **G.G Hospital**, have not yet found it necessary to streamline their waste management practices. This is extremely

unfortunate since these institutions are large and as such do not have any reason for this failure. These institutions are located close to amidst residential areas, and are therefore a serious threat to the neighbourhood.

### **THE UNIQUE CASE OF MADRAS VETERINARY COLLEGE**

The TamilNadu University of Veterinary and Animal Sciences (TANUVAS) runs a veterinary college and hospital that deals with the healthcare of a variety of animals. Horses, cattle, pet dogs, cats and birds are regularly treated and operated upon. This institution is facing a huge problem of disposal of animal carcasses. The single-chambered incinerator is run down and burns mixed waste. A large volume of plastics was observed being put into the incinerator. Carcasses of small animals are incinerated in the campus, while unfortunately large carcasses (horses weighing upto 2 tonnes) are transported to the Kodungaiyur landfill site for disposal. Though the van acquired for this purpose is state-of-the-art the means of disposal is not. These decaying carcasses are the source of large-scale epidemics. It is even reported that leather manufacturers use this hide in leather industry.

TANUVAS' animal carcasses can neither be subjected to disposal in crematoria on ethical grounds nor can they be deeply buried because residents on the campus have opposed such a proposal. The institution has very recently implemented a basic segregation process after the officers in charge of medical waste attended training programmes on the issue. The Resident Veterinary Officer is keen to bring about positive changes. However, it is ironical that, though the hospital generates a lot of infectious, animal waste and by default comes under the purview of the BMWR, it has never been invited to be a part of the deliberations on the CWTF. It becomes imperative that the concerned authorities look into this matter immediately and evolve a specific solution to this unique and hazardous problem.

## **LABORATORIES**

As mentioned earlier, the survey also throws light on the bio-medical waste management practices followed by the diagnostic laboratories and blood banks in Chennai city. The details are elaborated below.

The 2 laboratories surveyed in Chennai were **Ehrlich Laboratory** and **Lister Laboratory and Research Centre**.

### **SEGREGATION**

Both laboratories have implemented a system of segregation. Ehrlich has 4 colour-coded plastic lined open bins provided at each testing station. Charts are provided above the bins for easier understanding. Lister manages its waste by disposing all laboratory waste including disposable gloves, sharps and infected cotton in a bin lined with a thick orange plastic bag. The bin is clearly marked with a biohazard symbol. All general waste is disposed of in a separate bin.

While Lister has been successful in segregation, Ehrlich is finding monitoring and implementation difficult. This was evident from the fact that waste had been mixed in some bins. Lister also has a system of accounting its waste stream.

### **TREATMENT AND DISPOSAL**

Needle destruction and basic disinfection of sharps is being followed. Infected plastics are treated with hypochlorite before final disposal in the community bin. Incineration is not being practiced by any of the institutions, however both treat their liquid waste before draining it into the sewer lines.

Autoclaving is practiced by Lister but not by Ehrlich. At Ehrlich, it was revealed that no waste was autoclaved and that all waste was collected by Onyx in secure plastic bags. The previous survey indicated that a lot of the laboratory waste was autoclaved before disposal. Ehrlich Laboratory treats its liquid in a small room in the rear of its campus.

Management of Ehrlich labs is aware of the issues surrounding bio medical waste management and provide training to the staff. However, the directions are not strictly being followed.

At Lister, all employees are given a copy of the Standard Operating Procedures<sup>2</sup> for bio medical waste management. Employees were knowledgeable about the laboratory's waste management practices and are effectively putting them into practice.

## BLOOD BANKS

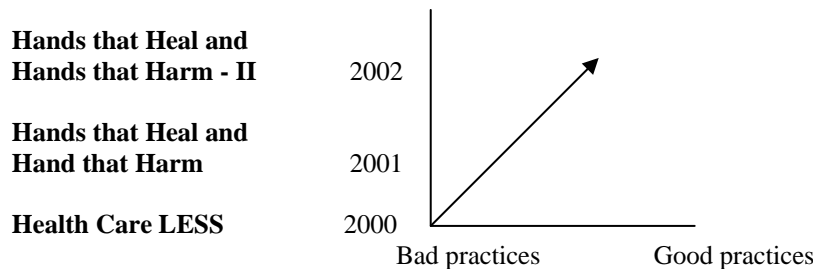
The survey studied the waste management at two blood banks - **Jeevan Blood bank and Research Centre** and **Lions Blood Bank**.

Jeevan Blood Bank is part of the Lister group and hence bio-medical waste management practices are similar to that mentioned under Lister laboratory. On the contrary, CAG's survey found that the Lions Blood Bank does not do much segregation. Needles are cut using a needle-cutter and a little bit of treatment with hypochlorite solution is done. Discarded blood bags are incinerated. Date expired blood bags are given to the MGR Medical University for research purposes by Lions Blood Bank.

This above situation is true for other blood banks as well, excepting the ones attached to hospitals that have implemented a reasonable system for waste management. Yet again the lack of a central facility is pointed out as the reason for not having taken any initiative.

## RECOMMENDATIONS<sup>1</sup>

In a general context, in relation to bio-medical waste management in Chennai city, the three surveys conducted by CAG show that there has been a marked improvement in the situation. (Refer Graph 2 and Graph 3). However, the overall picture does not mean, Chennai is significantly ahead on this front. Finer introspection into individual cases shows that many areas require much more attention.



**GRAPH 3 - Bio-medical waste management practices**

On segregation, the basic step a lot has been achieved. As a concept it has caught on and many institutions are earnestly attempting to take measures to implement it. This would set the ball rolling for the CWTF to function smoothly once it is set-up. Some small institutions are yet to take steps. For these establishments, we recommend the following simple cost-effective system: -



<sup>1</sup> Healthcare institutions can approach us for specific recommendations for their respective institutions

<sup>2</sup> Dr. Srinivasan has formulated the SOP (a policy document) specifically for laboratories using the BMWR as the basic document.

- 4 basic segregating devices are required. They could be as simple as three buckets of colours red, yellow and black and one smaller bucket of a different colour (for sharps). This is to essentially to follow the basic directions provided for in the BMWR. Based on the number of wards, floors or nursing stations in the institution, this system can be replicated to achieve comprehensive segregation.
- Even before segregating, that is putting the respective waste in the respective bin, a certain amount of pre-treatment maybe required. For instance, in the case of sharps, it would mean destruction of the needle and disinfection of the syringe body and plunger using hypochlorite. This being a crucial step it is recommended that simple needle destroyers and basic amounts of hypochlorite solution be kept at nursing stations/testing rooms or at places where blood is drawn.

With respect to treatment, the following general recommendations can apply to a variety of institutions: -

- Autoclave: A dedicated waste autoclave is a must. Steam disinfection is the one of the best-known forms of disinfection and can effectively and substantially reduce the risks associated with disposal of bio-medical waste.
- Incineration: It is a dangerous practice, primarily because the waste going into the incinerators is absolutely indiscriminate and unmonitored. Also, for the reasons sighted earlier, it is absolutely essential to avoid incineration.

For specific technology requirements it is advisable for institutions to approach the appropriate technology providers and the Indian Medical Association (IMA) or the TNPCB. In the end, the institutions should ensure that they compulsorily sign up for the CWTF, through the IMA, to ensure that the last stage of waste disposal is taken care of suitably.

## **CENTRALISED FACILITY FOR BIO-MEDICAL WASTE MANAGEMENT**

After having discussed the trend in practices of disposal of bio-medical waste we find that centralisation of disposal services is the new approach that would reduce mismanagement and would better improve disposal. A few regions in the country have started setting up Centralised Waste Management Facilities (CWTFs) run by private waste companies.

The CWTFs get set-up after the State Chapter of the Indian Medical Association (IMA), through a tender bid conducted by the State Pollution Control Board, identifies a private operator. A mutually acceptable cost of disposal is worked out between the healthcare institutions through the IMA and the operator which is normally based on a per bed calculation. It is also occasionally done based on weight (per Kg).

**The healthcare institutions must note that even though a central facility will take care of final disposal, segregation and treatment as per the Rules is mandatory before collection and transportation to the facility.**

### **Advantages of CWTF**

1. As many small clinics and nursing homes are unable to afford expensive infrastructure for effective waste disposal, a CWTF will be beneficial to them in disposing their waste, provided they strictly adhere to the norms of segregation and basic treatment methods.
2. Monitoring of final disposal becomes much more effective if it is centrally done and would greatly reduce malpractices such as reuse of needles, syringes, bloodbags, etc.

## **Training and Awareness**

The surveys re-emphasised one other very important aspect to bio-medical waste management, that of imparting training to hospital staff. It was clearly demonstrated that those institutions that did show improvement had either started new training programmes or intensified their existing ones. Protocols for spills, vaccination for occupational exposure and needle stick injuries, guidelines for waste handling and transportation within premises, have now come into force in the institutions that have scored high.

Hence, we strongly recommend that all healthcare institutions implement training programmes for all staff involved in bio-medical waste management in order to improve their existing practices. For this purpose the Environment Training Institute (ETI) organises periodically training programmes. Alternatively CAG, with its tie-ups to national and international organisations, would be able to assist in organising (not conducting) training programmes. However, the onus of responsibility in taking the initiative lies wholly with the healthcare institutions.

In a nutshell, the problem of bio-medical waste needs a systematic approach. With appropriate investments and dedicated efforts in the areas of **segregation, waste minimisation, safe technologies, training and centralised facilities**, it is ensured that hands that heal only heal, and don't harm.

# CASE STUDIES

The following three hospitals have been illustrated as model hospitals as they are currently following good practices with regard to bio-medical waste management.

## MADRAS MEDICAL MISSION

### A. Segregation:

The hospital practices segregation at all levels. Each floor has the color-coded bins located at the patient screening and testing room (each floor has one). The waste sharps go into a can without recapping. (This has been done to reduce occupational needle-stick injuries). There are 2 bins; one for plastics and the other is for the cotton dressings, etc. Each of the diagnostic labs has a similar in-house system for the wastes they generate.

### B. Treatment

- Sharps: get collected in plastic cans with a narrow mouth and they are transported to the shredder for shredding. Before shredding they are immersed in a tub of hypochlorite changed 2 times a day.
- Infected Plastic Waste: is collected from each floor, labs and blood bank and transported to the autoclave. Disinfection is done before autoclaving.
- Infected Solid Waste: A tie-up with a crematorium helps to discard their infectious solid waste.
- Liquid Waste: The hospital has got a dedicated sewer line into which it drains the liquid waste after subjecting to neutralization.

The hospital has its own Vermifarm to take care of much of its general waste, the rest of which goes to the Corporation.

### C. Spill protocol

Presently cleaning is done with phenyl and Dettol. The need was brought to light after the survey and the administration is suggesting that a spill protocol be adopted.

### D. Transport of Waste

The waste is collected 2 times a day and is transported by large tubs to the common bin and treatment site at the rear end of the campus. Handlers wear a basic plastic apron, mask and gloves.

### E. On Site Treatment

There is a common disinfection centre at the hospital where a tub of hypochlorite is used to disinfect plastics, syringes and needles. The plastics are autoclaved and the needles and syringes are shredded. Incinerator is not used.

### F. Training and Awareness

The staff is thoroughly trained on the waste management practices. New staff goes through a training session before induction.

### G. Changes/Improvements since 2001

- A comprehensive immunization programme has been designed for the entire staff directly and indirectly related to waste management within the hospital.
- A new protocol for needle-stick injuries is being reviewed.
- Systematic documentation of waste generation is now practiced.
- Vermi-farming of general waste is a new concept and is being practiced for disposing general waste
- Doctors too, go through a systematic training programme on waste management.
- After collection each bag is stamped with the seal of the place from where the waste was generated. This provides for effective monitoring if segregation is not done.

# **SUNDARAM MEDICAL FOUNDATION**

## **A. Segregation**

6 different bins are present at each nurse's station and the colour of each bin is in accordance with the BMWR. 2 bins for sharps, yellow bins for infected cotton, dressing, etc., a red bin for infected plastic. Non-infected plastic is stored in a separate bin and sent for recycling. A separate bin hosts infected glass. Sharps, infected plastics and glass are autoclaved. Black bins located in the halls and in patient rooms are used for general waste. A special set of yellow bins is placed in the bathrooms with instructions for the disposal of sanitary pads etc.

## **B. Treatment**

- Sharps: Needles are autoclaved and shredded and the steel from the shredded needles is sent to a steel foundry.
- Infected Plastic Waste: is disinfected, autoclaved and given to a contractor for recycling purposes.
- Infected Solid Waste: is sent to a crematorium for disposal.
- Liquid Waste: Treated with 1% hypochlorite solution and then disposed down the drain. The hospital has its own effluent treatment plant.

After treatment both bio-medical waste and general waste are contracted out to a private agency for disposal.

Lab waste such as slides and petri dishes get sterilised in a dedicated autoclave before reuse. A larger autoclave permits for sterilization of non-lab infectious waste.

Manual transportation of waste to the main bin at the rear of the campus helps authorised waste dealers and collectors to pick it up. There is very minimal on-site incineration only to tackle increased volumes.

## **C. Transport of wastes**

The wastes are collected twice a day. They are transported by means of trolleys and the trolleys, which are provided with colour-coded plastic bags and bins. The personnel handling and transporting the wastes are being provided with protective gear. The main bin is located behind the main hospital wing near the incinerator and shredder.

## **D. On-site treatment**

Treatment of liquid wastes is being done in the neutralisation tank using bleach. There is a single chambered incinerator, where the infectious solid wastes like dressings, cotton, body parts etc are treated. The staffs handling the incinerator are provided with protective gear. An autoclave is also present, which is used for the treatment of syringes, needles, infectious plastic wastes etc

## **E. Training and awareness.**

The hospital is committed to providing proper training regarding effective bio-medical waste management practices to each and everyone of it's staff member. Classes are conducted for small groups of the staff members, which talk about the importance of effective waste management practices and their significance. Also, the different effective methods of bio-medical waste management and their importance is being taught to all the staff members.

## **F. Changes/Improvements since 2001**

- The different waste segregation bins are labelled and charts with instructions on waste management are taped on the walls of every nurse station.
- Liquid wastes are collected in the neutralisation tank where 1 litre of bleach is added daily for disinfection.
- Regular training of the staff is now being done, regarding waste management practices.

# **SRI RAMACHANDRA MEDICAL COLLEGE AND HOSPITAL**

## **A. Segregation**

Waste is segregated in 3 colour coded clearly marked plastic lined bins. The bins are used for general waste, infectious waste and plastics. 2 extra buckets are provided in the special ward and the dressing room of the general ward to segregate syringes and needles.

## **B. Treatment**

- Sharps: Needles are recapped and pyrolyzed. Syringes are disinfected and hydroclaved
- Infected Plastic Waste: disinfected, hydroclaved and given to a contractor for recycling purposes.
- Infected Solid Waste: Incinerated in a single-chambered pyrolyzer.
- Liquid Waste: Treated with 1% hypochlorite solution and then disposed down the drain. The hospital has its own effluent treatment plant.

After treatment both bio-medical waste and general waste are contracted out to a private agency.

Lab waste such as slides and petri dishes get sterilized in a dedicated autoclave before reuse.

A larger autoclave permits for sterilization of non-lab infectious waste.

## **C. Transport of Waste**

Waste is collected 3 times a day and placed at a designated corner of each floor and via a forklift it is taken to the ground floor. It is transported then to the hydroclave or the pyrolyzer by carts and wheelbarrows.

## **D. On Site Treatment:**

The hospital has an incinerator, which is presently not in operating condition. But upgradation is planned for bettering the operation. This is intended to be a stopgap measure till the centralised facility is ready to function.

## **E. Training and Awareness:**

- The administration and hospital employees are very knowledgeable about waste management. Regular training programmes are conducted in the hospital.
- All waste is weighed and house keeping department keeps meticulous records of all waste generated in the hospital.
- Directly/indirectly exposed staff is vaccinated for Hepatitis B and is given regular tetanus shots.

## **F. Changes/Improvements since 2001**

- The hospital has inducted a comprehensive vaccination programme for all staff connected to bio-medical waste management to occupational exposure to Hepatitis B.
- The hospital is well acknowledged for its training programmes not only in medical waste but also in the area of environmental and occupational health

## **G. Avenue for further improvement**

- The recapping of needles allows for emissions when pyrolyzed and increases risk of needle stick injuries.
- The in-house monitoring system has to be strengthened.

# REPORT OF THE SEMINAR: 'MANAGING BIO-MEDICAL WASTE'

## **Focus**

With the survey findings of the year 2001, this seminar was organized primarily, to disseminate the findings to healthcare institutions that participated, to discuss and debate on the areas of concern highlighted in the findings and to find mutually agreeable means to bring about overall improvement in the situation. The seminar was also aimed to showcase current trends and good practices from all over India (especially south. India) for the benefit of healthcare institutions so that they would start adopting and implementing such practices.

## **Venue and date**

Tamil Nadu Pollution Control Board Auditorium, Chennai.  
October 12, 2001

## **Resource persons and presentations**

### *CAG and health*

Mr. Sriram Panchu, Advisor, CAG

### *CAG and the issue of Bio Medical Waste*

Dr. Arjun Rajagopalan, Trustee, CAG

### *Bio Medical Waste – the Indian scenario*

Mr. Ravi Agarwal, Chief Co-ordinator, Srishti, New Delhi

### *Role of government authorities*

Ms. Sheila Rani Chunkath, Chairperson, Tamil Nadu Pollution Control Board

### *Best practices for infectious waste, sharps and laboratory instruments*

Dr. Rema Menon, Lions Blood Bank, Chennai

### *Best practices for segregation, protective gear and emergency situations*

Dr. T. Vaidehi, Sundaram Medical Foundation, Chennai

### *Best practices for intra-hospital transportation of waste, plastic waste and training*

Dr. Philomena Mariados, Madras Medical Mission, Chennai

### *Best practices for monitoring - experience in Bangalore*

Dr. Girish Rao, M.S. Ramaiah Medical College, Bangalore

### *Advantages of composting waste*

Group Captain Dr. H. S. Arora, Command Hospital, Bangalore

### *Advantages of a centralised facility - experience in Hyderabad*

Ms. Jyotsna Chauhan, Co-ordinator, JC Associates, Hyderabad

### *Role of communities in bio medical waste management*

Mr. Ravi Agarwal, Chief Co-ordinator, Srishti, New Delhi

## **Issues of discussion and Outcomes**

After a brief introduction, Mr. Sriram Panchu and Dr. Arjun Rajagopal placed in perspective CAG's role in healthcare and bio-medical waste management issues. Dr. Arjun Rajagopal emphasised on the importance of effective waste management in healthcare and dismissed debate on its importance.

Mr. Ravi Agarwal talked about how America had realised the importance of bio-medical waste management after the incident when a large mass of bio-medical waste consisting of needles, syringes, infected cotton and dressings etc, washed up in a beach in California. He also did an overview of the present scenario in the country regarding bio-medical waste management. He lauded the efforts of the Tamil Nadu government for initiating work for the establishment of a centralised waste treatment facility and urged the healthcare institutions of Chennai to adopt and effectively implement safer and better waste management practices.

Ms. Sheela Rani Chunkath, the Chairperson of the TNPCB underscored that the Board would take very stringent action like issuing shut-down orders to those healthcare institutions violating the Bio-Medical Waste (Management and Handling) Rules. She applauded the efforts of CAG and Srishti and urged the healthcare institutions to seek the help of such organisations to solve their waste management problems.

The best practices for all categories of waste were showcased, extensively discussed and debated during all the technical sessions. Finally the panel addressed the following important issues:

- Efficiency of present incinerators and the feasibility of non-incineration alternatives to disposal.
- Space constraints with respect to pathological waste and feasibility of sending them to crematoria
- Disposal of placenta
- Safe disposal and phase out of PVC plastic
- Community testing kits to monitor hazardous releases from hospitals
- Current practices with disposal of mercury and its phase out (replacing with alternatives)
- The Autoclave technology
- Setting up and functioning of centralised facilities

In conclusion, there was general agreement that the above priority areas needed to be explored in depth. So a committee has been formulated with CAG as a member. Many healthcare institutions have also invited CAG to do an audit of their respective management practices and advise them on areas of improvement. By connecting the Chennai group of hospitals to the national network CAG hopes to succeed in evolving regional solutions with a national perspective.

# ANNEXURE I

## LIST OF INSTITUTIONS SURVEYED AND THEIR CONTACT ADDRESSES

### **Apollo Hospital**

Infection Control Committee Officer: Dr. Ram Subramaniam  
Assistant Manager Housekeeping: Shabita Dinesh  
21, Greams Lane, off Greams Road, Chennai 600006

### **Apollo Speciality Hospital**

320, Anna Salai, Chennai 600 035

### **Best Hospital**

10, Vellala Street, Kodambakkam, Chennai 600024

### **Billroth Hospital**

Administrative Officer: N.S. Thoppukkalai / Assistant Administration Officer: Mrs. Shirley  
43, Lakshmi Talkies Road, Chennai 600030

### **Chennai Kaliappa Hospital**

Manager - Administration: R. Sarojini  
52, 2nd Main Road, R.A. Puram, Chennai 600028

### **Communicable Diseases Hospital**

Director: Dr. P. Kugananthan  
17th St, Poombuhar Nagar, Chennai 600099

### **CSI Rainy Hospital**

Director: Dr. K.M. Shyamprasad  
45, G.A Road, Chennai, 600021

### **Devaki Hospital**

148, Luz Church Road, Chennai 600004

### **Dr. H.T. Vira Reddy Hospital**

Joint Director: V. Venkata Krishnan  
New Avadi Road, Chennai 600030

### **Dr Hande Hospital**

Administrative Officer: Mr. Srinivasan  
44 Lakshmi Talkies Road, Chennai 600030

### **Dr. Mehta's Nursing Home**

Executive Director: Mr. Dilip Mehta  
Nursing Superintendent: S. Natarajan  
21, McNeals Road, Chennai 600010

### **Durghabhai Deshmukh General Hospital and Research Centre**

Superintendent: Dr. Vasudevan  
12, Durgabhai Deshmukh Road, Chennai 600028

### **Ehrlich Laboratory**

Manager-Operations: A. Abdul Ghani  
46 Masilamani Road, Royapettah, Chennai 600014

### **G. G. Hospital**

Administrative officer: Ms. Meena Bama  
6- E, Nungambakkam High Road, Chennai 600034

**General Surgical Clinic**

Manager: Mr. P. Padhmanabhan  
121 G.N. Chetty Road, T Nagar, Chennai 600017

**Government General Hospital**

Dean: Dr. C. Ravindranath  
Poonamalee High Road, Chennai 600003

**Government Peripheral Hospital**

Senior Civic Surgeon: Dr. R. Thirunarayanan  
Anna Nagar, Chennai 600102

**Halstead Surgical Clinic**

Administrative Officer: Dr. C.M.K Reddy  
815 Poonamallee High Road, Chennai 600010

**Indian Red Cross Society Blood Bank**

50, Montieth Road, Egmore, Chennai 600 008

**Institute of Thoracic Medicine**

Director: Dr. K. Jagannath  
Spur Tank Road, Chetpet, Chennai 600031

**Institute of Child Health and Hospital for Children**

Director: Dr. C. S. Rex Sargunam  
Halls Road, Egmore 800008

**Jeevan Blood Bank**

1, Jagannathan Street, Nungambakkam, Chennai 600034

**KJ Hospital**

Chief Administrations Officer: Mr. Venkatramen  
925, Poonamallee High Road, Chennai 600084

**KKR ENT Hospital and Research Institute**

Administration Officer: Dr. K.K. Ramalingam  
Poonamallee High Road, Chennai 600084

**Kanchi Kamakoti Child's Trust Hospital**

Doctor of BMW Management Committee: Dr. Shiv Balen  
12- A Nageswara Road, Nungambakkam, Chennai 600034

**Kensington Hospital**

Administration Officer: Dr. A Venagopal  
856, Poonamallee High Road, Kilpauk, Chennai 600010

**Kilpauk Medical College and Hospital**

Harrington Road, Chennai 600030

**Lions Blood Bank**

20, Marshall's Road, Chennai 600008

**Lister Laboratories**

3, Jaganathan Road, Chennai 600034

**MIOT Hospital**

4/112, Mount Poonamallee Road, Chennai 600089

**Madras Medical Mission**

Contact: Dr. Philomena Mariadoss  
Assistant Director – Administration  
4/A, Dr J.J Nagar, Chennai 600050

**Madras Veterinary College**

622, Vepery Road, Chennai 600007

**Malar Hospital**

Executive Administrator / Public Relations Officer: -: Ms. Tanzeer Reen  
52, 1<sup>ST</sup> Main Road, Gandhi Nagar, Chennai 600020

**Mediscan Clinical Laboratory**

203, Avvai Shanmugam Salai, Chennai 600014

**Public Health Centre**

114, Lake View Road, Chennai 600083

**Royapettah Government Hospital**

Royapettah, Chennai 600014

**Shankar Netralaya**

18, College Road, Chennai 600006

**Sri Ramachandra Medical College and Hospital**

Officer in charge: Dr. Kalpana Balakrishnan  
Housekeeping: Mr. Thangaraj  
1, Ramachandra Nagar, Porur, Chennai 600116

**St. Isabelle Hospital**

18, Oliver Road, Mylapore, Chennai 600004

**Stanley Medical College and Hospital**

Dean: Dr. J. K. Vijayalakshmi  
Royapuram, Chennai 600 001

**Sundaram Medical Foundation**

Dr Meena Ganesh  
Anna Nagar, Chennai 600040

**Trinity Acute Care Hospital**

Administrator in charge of BMW: Mr. Chandru  
33, Desikachari Road, Chennai 600 004.

**The Guest Hospital**

782, Purusawakkam High Road. Chennai 600010

**Vijaya Hospital**

180, NSK Road, Chennai 600026

**Voluntary Health Services**

Secretary: Dr. N.S. Murali  
Taramani, Chennai 600013

## ANNEXURE II

### STAKEHOLDERS IN CHENNAI'S BIO-MEDICAL WASTE MANAGEMENT

Agencies	Trainers	Others
<p>Mr. R. Ramachandran Senior Executive Engineer Tamil Nadu Pollution Control Board Ph: 2353134-40</p> <p>Mr. J. Balasubramaniam Deputy Director of Medical Education - Hospitals and Dispensaries Ph: 8254681</p> <p>Dr. R. Ayyadurai Director Public Health and Preventive Medicine Ph: 4320802</p> <p>Dr. M. Ramasubbu Director of Medical Services Ph: 4343271</p> <p>Mr. Jacob Director Tamil Nadu Medical Services Corporation Ph: 8241890/91</p> <p>Mrs. Girija Vaidyanathan Secretary - Department of Health Govt. of Tamil Nadu Ph: 5361875</p> <p>Mr. CMK Reddy Chairman Federation of Medical and Dental Associations of TamilNadu Ph: 6413344</p> <p>Mr. Arul Pitchai Narayanan Chairman Indian Medical Association – Tamil Nadu Chapter Ph: 6443055</p>	<p>Dr. R. K. Jayaseelan Director Environmental Training Institute (ETI) Tamil Nadu Pollution Control Board (TNPCB) Ph: 2353153</p> <p>Dr. V.N Rayudu Deputy Director Environmental Training Institute (ETI) Tamil Nadu Pollution Control Board (TNPCB) Ph: 2353153</p> <p>Dr. Kalpana Balakrishnan Environmental health Unit Sri Ramachandra Medical College Ph: 4768403</p>	<p>Ms. Vinni Reddy Director GJ Multiclave India Pvt. Ltd. Hyderabad Ph: 040 – 3375134 (Operator of CWTF)</p> <p>Citizen consumer and civic Action Group (CAG) Adyar, Chennai 600 020 Ph: 4914358 / 4460387</p>

# **ANNEXURE III**

## **BIO-MEDICAL WASTE (MANAGEMENT & HANDLING) RULES 1998**

### **MINISTRY OF ENVIRONMENT & FORESTS NOTIFICATION**

New Delhi, 20th July 1998

**S.O. 630 (E).**-Whereas a notification in exercise of the powers conferred by Sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986) was published in the Gazette vide S.O. 746 (E) dated 16 October, 1997 inviting objections from the public within 60 days from the date of the publication of the said notification on the Bio-Medical Waste (Management and Handling) Rules, 1998 and whereas all objections received were duly considered..

Now, therefore, in exercise of the powers conferred by section 6, 8 and 25 of the Environment (Protection) Act, 1986 the Central Government hereby notifies the rules for the management and handling of bio-medical waste.

#### **1. SHORT TITLE AND COMMENCEMENT:**

- (1) These rules may be called the Bio-Medical Waste (Management and Handling) Rules, 1998.
- (2) They shall come into force on the date of their publication in the official Gazette.

#### **2. APPLICATION:**

These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form.

#### **3. DEFINITIONS:** In these rules unless the context otherwise requires

- (1) "**Act**" means the Environment (Protection) Act, 1986 (29 of 1986);
- (2) "**Animal House**" means a place where animals are reared/kept for experiments or testing purposes;
- (3) "**Authorization**" means permission granted by the prescribed authority for the generation, collection, reception, storage, transportation, treatment, disposal and/or any other form of handling of bio-medical waste in accordance with these rules and any guidelines issued by the Central Government.
- (4) "**Authorized person**" means an occupier or operator authorized by the prescribed authority to generate, collect, receive, store, transport, treat, dispose and/or handle bio-medical waste in accordance with these rules and any guidelines issued by the Central Government;
- (5) "**Bio-medical waste**" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, and including categories mentioned in Schedule I;
- (6) "**Biologicals**" means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunization or the treatment of human beings or animals or in research activities pertaining thereto;
- (7) "**Bio-medical waste treatment facility**" means any facility wherein treatment, disposal of bio-medical waste or processes incidental to such treatment or disposal is carried out;
- (8) "**Occupier**" in relation to any institution generating bio-medical waste, which includes a hospital, nursing home, clinic dispensary, veterinary institution, animal house, pathological

laboratory, blood bank by whatever name called, means a person who has control over that institution and/or its premises;

(9) "**Operator of a bio-medical waste facility**" means a person who owns or controls or operates a facility for the collection, reception, storage, transport, treatment, disposal or any other form of handling of bio-medical waste;

(10) "**Schedule**" means schedule appended to these rules;

#### **4. DUTY OF OCCUPIER:**

It shall be the duty of every occupier of an institution generating bio-medical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.

#### **5. TREATMENT AND DISPOSAL**

(1) Bio-medical waste shall be treated and disposed of in accordance with Schedule I, and in compliance with the standards prescribed in Schedule V.

(2) Every occupier, where required, shall set up in accordance with the time-schedule in Schedule VI, requisite bio-medical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or, ensure requisite treatment of waste at a common waste treatment facility or any other waste treatment facility.

#### **6. SEGREGATION, PACKAGING, TRANSPORTATION AND STORAGE**

(1) Bio-medical waste shall not be mixed with other wastes.

(2) Bio-medical waste shall be segregated into containers/bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. The containers shall be labeled according to Schedule III.

(3) If a container is transported from the premises where bio-medical waste is generated to any waste treatment facility outside the premises, the container shall, apart from the label prescribed in Schedule III, also carry information prescribed in Schedule IV.

(4) Notwithstanding anything contained in the Motor Vehicles Act, 1988, or rules hereunder, untreated biomedical waste shall be transported only in such vehicle as may be authorized for the purpose by the competent authority as specified by the government.

(5) No untreated bio-medical waste shall be kept stored beyond a period of 48 hours

Provided that if for any reason it becomes necessary to store the waste beyond such period, the authorized person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment.

#### **7. PRESCRIBED AUTHORITY**

(1) The Government of every State and Union Territory shall establish a prescribed authority with such members as may be specified for granting authorization and implementing these rules. If the prescribed authority comprises of more than one member, a chairperson for the authority shall be designated.

(2) The prescribed authority for the State or Union Territory shall be appointed within one month of the coming into force of these rules.

(3) The prescribed authority shall function under the supervision and control of the respective Government of the State or Union Territory.

(4) The prescribed authority shall on receipt of Form 1 make such enquiry as it deems fit and if it is satisfied that the applicant possesses the necessary capacity to handle bio-medical waste in accordance with these rules, grant or renew an authorization as the case may be.

(5) An authorization shall be granted for a period of three years, including an initial trial period of one year from the date of issue. Thereafter, an application shall be made by the occupier/operator for renewal. All such subsequent authorization shall be for a period of three years. A provisional authorization will be granted for the trial period, to enable the occupier/operator to demonstrate the capacity of the facility.

(6) The prescribed authority may after giving reasonable opportunity of being heard to the applicant and for reasons thereof to be recorded in writing, refuse to grant or renew authorization.

(7) Every application for authorization shall be disposed of by the prescribed authority within ninety days from the date of receipt of the application.

(8) The prescribed authority may cancel or suspend an authorization, if for reasons, to be recorded in writing, the occupier/operator has failed to comply with any provision of the Act or these rules.

Provided that no authorization shall be cancelled or suspended without giving a reasonable opportunity to the occupier/operator of being heard.

## **8. AUTHORIZATION**

(1) Every occupier of an institution generating, collecting, receiving, storing, transporting, treating, disposing and/or handling bio-medical waste in any other manner, except such occupier of clinics, dispensaries, pathological laboratories, blood banks providing treatment/service to less than 1000 (one thousand) patients per month, shall make an application in Form 1 to the prescribed authority for grant of authorization.

(2) Every operator of a bio-medical waste facility shall make an application in Form 1 to the prescribed authority for grant of authorization.

(3) Every application in Form 1 for grant of authorization shall be accompanied by a fee as may be prescribed by the Government of the State or Union Territory.

## **9. ADVISORY COMMITTEE**

The Government of every State/Union Territory shall constitute an advisory committee. The committee will include experts in the field of medical and health, animal husbandry and veterinary sciences, environmental management, municipal administration, and any other related department or organization including non-governmental organizations. The State Pollution Control Board/Pollution Control Committee shall be represented. As and when required, the committee shall advise the Government of the State/Union Territory and the prescribed authority about matters related to the implementation of these rules.

## **10. ANNUAL REPORT**

Every occupier/operator shall submit an annual report to the prescribed authority in Form 11 by 31 January every year, to include information about the categories and quantities of bio-medical wastes handled during the preceding year. The prescribed authority shall send this information in a compiled form to the Central Pollution Control Board by 31 March every year.

## 11. MAINTENANCE OF RECORDS

(1) Every authorized person shall maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal and/or any form of handling of bio-medical waste in accordance with these rules and any guidelines issued.

(2) All records shall be subject to inspection and verification by the prescribed authority at any time.

## 12. ACCIDENT REPORTING

When any accident occurs at any institution or facility or any other site where bio-medical waste is handled or during transportation of such waste, the authorized person shall report the accident in Form III to the prescribed authority forthwith.

## 13. APPEAL

Any person aggrieved by an order made by the prescribed authority under these rules may, within thirty days from the date on which the order is communicated to him, prefer an appeal to such authority as the Government of State/Union Territory may think fit to constitute.

Provided that the authority may entertain the appeal after the expiry of the said period of thirty days if it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

*SCHEDULE I*  
(See Rule 5)  
*CATEGORIES OF BIO-MEDICAL WASTE*

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Option	Category	Treatment and Disposal
1	<u>Human Anatomical Waste</u> Human tissues, organs, body parts	Incineration/Deep Burial
2	<u>Animal Waste</u> : Animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospitals and animal houses.	Incineration/Deep Burial.
3	<u>Microbiology &amp; Biotechnology Waste</u> : Waste from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures.	Incineration/ Autoclaving/ Microwaving
4	<u>Waste Sharps</u> : Needles, syringes, scalpels, blades, glass etc that may cause punctures and cuts. This includes both used and unused sharps.	Disinfection (chemical disinfection/ Autoclaving/Microwaving and mutilation/shredding
5	<u>Discarded medicines and cytotoxic drugs</u> : Waste comprising of outdated, contaminated and discarded medicines.	Incineration/ Disinfection and drugs disposal in secured landfills
6	<u>Solid waste</u> : Items contaminated with blood and body fluids including cotton, dressing, soiled plaster casts, lines, bedding, other material contaminated with blood.	Incineration/ Autoclaving/ Microwaving
7	<u>Solid waste</u> : items generated from disposable items other than	Disinfection by chemical

	sharps such as tubings, catheters, intravenous sets etc.	treatment/ Autoclaving/ Microwaving and Mutilation/ Shredding
8	<u>Liquid waste</u> : waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities.	Disinfection by chemical treatment and discharge into drains.
9	<u>Incineration Ash</u> : Ash from incineration of any Bio-medical waste.	Disposal in Municipal Landfill.
10	<u>Chemical Waste</u> : Chemicals used in the production of biologicals, chemicals used in disinfection, chemicals used as insecticides etc	Chemical treatment and discharge into drains for liquids and secured landfill for solids.

**SCHEDULE II**  
(see Rule 6)

**COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIO-MEDICAL WASTES**

<b>Color Coding</b>	<b>Type of Container -I Waste Category</b>	<b>Treatment options as per Schedule I</b>
Yellow	Plastic bag Cat. 1, Cat. 2, and Cat. 3, Cat. 6.	Incineration/Deep Burial
Red	Disinfected container/plastic bag Cat. 3, Cat. 6, Cat.7.	Autoclaving/Microwaving/ Chemical Treatment
Blue/White Translucent	Plastic bag/puncture proof Cat. 4, Cat. 7. Container	Autoclaving/Microwaving/ Chemical Treatment and estruction/shredding
Black	Plastic bag Cat. 5 and Cat. 9 and Cat. 10. (Solid)	Disposal in secured landfill

**Notes:**

1. Color coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
3. Categories 8 and 10 (liquid) do not require containers/bags.
4. Category 3 if disinfected locally need not be put in containers/bags.

*SCHEDULE III*  
(see Rule 6)  
*LABEL FOR BIO-MEDICAL WASTE CONTAINERS/BAGS*

**BIOHAZARD  
HANDLE WITH CARE**

Note: Label shall be non-washable and prominently visible.

*SCHEDULE IV*  
(see Rule 6)

*LABEL FOR TRANSPORT OF BIO-MEDICAL WASTE CONTAINERS/BAGS*

Day ..... Month .....  
Year .....  
Date of generation .....

Waste category No .....  
Waste class  
Waste description

**Sender's Name & Address**

Phone No .....

Telex No ....

Fax No .....

**Contact Person .....**

**In case of emergency please contact**

Name & Address:

Phone No.

**Receiver's Name & Address**

Phone No .....

Telex No .....

Fax No .....

**Contact Person .....**

**Note :**

Label shall be non-washable and prominently visible.

*SCHEDULE V*  
(see Rule 5 and Schedule 1)  
*STANDARDS FOR TREATMENT AND DISPOSAL OF BIO-MEDICAL WASTES*

**STANDARDS FOR INCINERATORS:**

All incinerators shall meet the following operating and emission standards

**A. Operating Standards**

1. Combustion efficiency (CE) shall be at least 99.00%.
2. The Combustion efficiency is computed as follows:

$$\text{C.E.} = \frac{\% \text{CO}_2}{\% \text{CO}_2 + \% \text{CO}} \times 100$$

3. The temperature of the primary chamber shall be 800 ± 50 deg. C°.

4. The secondary chamber gas residence time shall be at least I (one) second at 1050 ± 50 C°, with minimum 3% Oxygen in the stack gas.

**B. Emission Standards**

Parameters correction)	Concentration mg/Nm <sup>3</sup> at (12% CO <sub>2</sub> )
(1) Particulate matter	150
(2) Nitrogen Oxides	450
(3) HCl	50
(4) Minimum stack height shall be 30 metres above ground	
(5) Volatile organic compounds in ash shall not be more than 0.01%	

**Note:**

- Suitably designed pollution control devices should be installed/retrofitted with the incinerator to achieve the above emission limits, if necessary.
- Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants.
- Chlorinated plastics shall not be incinerated.
- Toxic metals in incineration ash shall be limited within the regulatory quantities as defined under the Hazardous Waste (Management and Handling Rules,) 1989.
- Only low sulphur fuel like L.D.0dLS.H.S.1Diesel shall be used as fuel in the incinerator.

**STANDARDS FOR WASTE AUTOCLAVING:**

The autoclave should be dedicated for the purposes of disinfecting and treating bio-medical waste,

(I) When operating a gravity flow autoclave, medical waste shall be subjected to:

- (i) A temperature of not less than 121 C° and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or
- (ii) a temperature of not less than 135 C° and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or
- (iii) a temperature of not less than 149 C° and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.

(II) When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:

- (i) a temperature of not less than 121 C° and pressure of 15 psi per an autoclave residence time of not less than 45 minutes; or
- (ii) a temperature of not less than 135 C° and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes;

(III) Medical waste shall not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.

**(IV) Recording of operational parameters**

Each autoclave shall have graphic or computer recording devices that will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.

**(V) Validation test**

Spore testing:

The autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be *Bacillus stearothermophilus* spores using vials or spore Strips; with at least  $1 \times 10^4$  spores per millilitre. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121 C° or a pressure less than 15 psi.

**(VI) Routine Test**

A chemical indicator strip/tape that changes color when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different locations to ensure that the inner content of the package has been adequately autoclaved.

**STANDARD FOR LIQUID WASTE:**

The effluent generated from the hospital should conform to the following limits

<b>PARAMETERS</b>	<b>PERMISSIBLE LIMITS</b>
PH	6.3-9.0
Suspended solids	100 mg/l
Oil and grease	10 mg/l
BOD	30 mg/l
COD	250 mg/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent.

These limits are applicable to those hospitals, which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

**STANDARDS FOR MICROWAVING**

1. Microwave treatment shall not be used for cytotoxic, hazardous or radioactive wastes, contaminated animal carcasses, body parts and large metal items.
2. The microwave system shall comply with the efficacy test/routine tests and a performance guarantee may be provided by the supplier before operation of the limit.
3. The microwave should completely and consistently kill the bacteria and other pathogenic organisms that is ensured by approved biological indicator at the maximum design capacity of each microwave unit. Biological indicators for microwave shall be *Bacillus Subtilis* spores using vials or spore strips with at least  $1 \times 10^1$  spores per milliliter.

## STANDARDS FOR DEEP BURIAL

1. A pit or trench should be dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.
2. It must be ensured that animals do not have any access to burial sites. Covers of galvanized iron/wire meshes may be used.
3. On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.
4. Burial must be performed under close and dedicated supervision.
5. The deep burial site should be relatively impermeable and no shallow well should be close to the site.
6. The pits should be distant from habitation, and sited so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.
7. The location of the deep burial site will be authorized by the prescribed authority.
8. The institution shall maintain a record of all pits for deep burial.

*FORM I*  
(see rule 8)  
*APPLICATION FOR AUTHORISATION*  
(To be submitted in duplicate.)

To

The Prescribed Authority  
(Name of the State Govt/UT Administration)  
Address.

1. Particulars of Applicant

- (i) Name of the Applicant  
(In block letters & in full)
- (ii) Name of the Institution:  
Address:  
Tele No., Fax No. Telex No.

2. Activity for which authorisation is sought:

- (i) Generation
- (ii) Collection
- (iii) Reception
- (iv) Storage
- (v) Transportation
- (vi) Treatment
- (vii) Disposal
- (viii) Any other form of handling

3. Please state whether applying for fresh authorisation or for renewal:  
(In case of renewal previous authorisation-number and date)

4.

- (i) Address of the institution handling bio-medical wastes:

- (ii) Address of the place of the treatment facility:
- (iii) Address of the place of disposal of the waste:

5.

- (i) Mode of transportation (in any) of bio-medical waste:
- (ii) Mode(s) of treatment:

6. Brief description of method of treatment and disposal (attach details):

7.

- (i) Category (see Schedule 1) of waste to be handled
- (ii) Quantity of waste (category-wise) to be handled per month

8. Declaration

I do hereby declare that the statements made and information given above are true to the best of my knowledge and belief and that I have not concealed any information.

I do also hereby undertake to provide any further information sought by the prescribed authority in relation to these rules and to fulfill any conditions stipulated by the prescribed authority.

Date:

Signature of the Applicant

Place:

Designation of the Applicant

*FORM II*  
*(see rule 10)*  
*ANNUAL REPORT*

(To be submitted to the prescribed authority by 31 January every year).

1. Particulars of the applicant:

(i) Name of the authorized person (occupier/operator):

(ii) Name of the institution:

Address

Tel. No

Telex No.

Fax No.

2. Categories of waste generated and quantity on a monthly average basis:

3. Brief details of the treatment facility:

In case of off-site facility:

(i) Name of the operator

(ii) Name and address of the facility:

Tel. No., Telex No., Fax No.

4. Category-wise quantity of waste treated:

5. Mode of treatment with details:

6. Any other information:

7. Certified that the above report is for the period from

Date .....

Signature .....

Place.....

Designation.....

*FORM III*  
(see Rule 12)

*ACCIDENT REPORTING*

1. Date and time of accident:

2. Sequence of events leading to accident

3. The waste involved in accident:

4. Assessment of the effects of the accidents on human health and the environment.

5. Emergency measures taken

6. Steps taken to alleviate the effects of accidents

7. Steps taken to prevent the recurrence of such an accident

Date .....

Signature .....

Place.....

Designation.....

[F.No.23-2/96-HSMD]  
VIJAY SHARMA, Jt.Secy

# ANNEXURE IV

## THE SPECIAL PROTOCOL DEVELOPED BY LISTER LABORATORY

### WASTE DISPOSAL

- General waste
- Waste contaminated with Blood and Body Fluids
- Microbiological waste
- Sharps

### SEGREGATION AT THE POINT OF COLLECTION

- **General waste** includes non-infectious solid wastes that are collected in BLACK coloured plastic bags or sacks.
- **Waste contaminated with Blood and Body fluids** are collected in YELLOW / ORANGE plastic bags or containers with Biohazard labels.
- **Microbiological waste** includes all infectious material that are collected in YELLOW / ORANGE plastic bags or containers with Biohazard labels.
- **Sharps** include any material that can cut or puncture like needles, syringes, scalpels, microslides, coverglass etc., that are collected in puncture proof containers.

### DECONTAMINATION

Wastes contaminated with Blood and Body fluids, Microbiological wastes and Sharps are decontaminated in 4% Sodium hypochlorite for a minimum period of 30 minutes and then autoclaved at 15 lbs for 30 minutes and then sent for final disposal.

### FINAL DISPOSAL

All the materials that have been autoclaved are packed in thick plastic YELLOW / ORANGE bags with Biohazard labels and then handed over to Corporation conservatory workers for final disposal.

CITIZEN CONSUMER AND CIVIC ACTION GROUP (CAG) IS A PUBLIC INTEREST GROUP IN CHENNAI DEALING WITH ISSUES OF PUBLIC HEALTH, SAFETY, PERFORMANCE OF PUBLIC UTILITIES, CONSUMER AND ENVIRONMENTAL PROTECTION.



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