

**ANIMAL BIO-MEDICAL WASTE DISPOSAL TECHNOLOGY CENTRE
RAJASTHAN UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES,
BIKANER**

The Animal Bio-Medical Waste Disposal Technology Centre at Rajasthan University of Veterinary and Animal Sciences (RAJUVAS), Bikaner is entrusted to develop and disseminate economic and effective technologies and strategies of animal biomedical waste disposal to improve the status of animal and human health and to prevent environmental hazards.

Objectives:

- ❖ To develop the centre as knowledge centre in biomedical waste disposal technology
- ❖ To impart trainings on biomedical waste disposal target groups
- ❖ To augment and strengthen facilities for the state in respect with animal bio medical waste disposal.
- ❖ To test and develop different methods of animal bio medical waste disposal to improve status of health and to prevent hazards.

Importance:

Hospital waste contains significantly high concentrations of pathogenic organisms. Generally, 10% of hospital generated waste is infectious, which can be hazardous to the public and livestock. This hazardous effect is further increases, if there is inadequate handling of these wastes. Infectious waste may contain pathogens, which can infect people through a number of routes, such as punctures, abrasions or lacerations of the skin, via the mucous membranes, and by inhalation or ingestion. The government of India (Notification of BMW Rules, 2016) specified that hospital Waste Management is a part of hygiene and it involve the management of a range of activities, which are mainly collection, segregation, transportation, operation/treatment and disposal of biomedical waste. It is the need of the day that, hazardous waste must be packaged, transferred and disposed of properly to protect animal, human, earth, and the environment to achieve “**One Health Approach**”.

Major Activities:

- ❖ The Animal Bio Medical Waste Disposal Technology Centre (ABMWDTC), RAJUVAS, Bikaner is regularly organizing trainings for the personnels such as medical doctors, veterinarians, post graduate students of veterinary colleges, nursing staffs, livestock assistant, technical assistant, lab assistant, class-IV employees, who directly or indirectly involved in the collection, segregation, disposal and treatment of bio-medical waste to safeguard the life of whole society and the environment.

- ❖ Beside this, Centre is also distributing leaflets, posters to PHC, CHC, Veterinary Hospitals, Sub Centres, Labs and PVKs etc. to create need-based knowledge and practical skills among target groups for safe waste disposal across clinical and farm levels.
- ❖ Research work is also in progress to improve health status and prevent hazards to target groups. Centre has studied bacteriological profile of biomedical waste generated by clinics, laboratories, private and government hospitals and other health care units of Bikaner.
- ❖ The Centre also assessed the efficacy of autoclave, Incinerator, microwave and other for safe disposal of biomedical waste and antimicrobial resistance.

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Capacity Development Programme:

The Animal Bio Medical Waste Disposal Technology Centre (ABMWDTTC), RAJUVAS, Bikaner is regularly organizing trainings for the personnels such as medical doctors, veterinarians, post graduate students of veterinary colleges, nursing staffs, livestock assistant, technical assistant, lab assistant, class-IV employees, who directly or indirectly involved in the collection, segregation, disposal and treatment of bio-medical waste to safeguard the life of whole society and the environment.

S. No	Year	No of Trainings	Total Beneficiaries
1.	2017-18	1	85
2.	2018-19	2	76
3.	2019-20	3	122
4.	2020-21	3	171
5.	2021-22	3	109
6.	2022-23	4	122
7.	2023-24	4	123
8.	2024-25	4	120
	2025-26	4	121
	Total	28	1019





पशुधनं नित्यं सर्वलोकोपकारकम्

ANIMAL BIOMEDICAL WASTE DISPOSAL ADVISORY

For Veterinary Hospitals, Clinics, Animal Houses & Public

Segregate Today, Protect Tomorrow



Animal Biomedical Waste is infectious and hazardous.

Proper segregation, handling and disposal protects animals, humans and the environment.

YELLOW

ANATOMICAL & SOILED WASTE



- Animal carcass/body parts/tissues
- Blood-soaked cotton, dressings & contaminated material



Use Yellow non-chlorinated bag/container.

Hand over to authorised biomedical-waste treatment facility. Animal anatomical waste may be incinerated/ plasma-pyrolised. Deep burial only in authorised rural/remote situations as per rules.

RED

CONTAMINATED RECYCLABLE WASTE



- Used gloves
- Tubing, IV sets, catheters
- Other contaminated recyclable plastics



Use Red bag/container.

Send for authorised treatment and recycling.

WHITE

SHARPS



- Needles
- Blades
- Scalpels
- Other sharps



Use puncture-proof, leak-proof, tamper-proof white container.

NEVER recap, bend or throw sharps in general waste.

BLUE

GLASS & IMPLANTS



- Broken/used contaminated glassware
- Vials, ampoules
- Implants



Use Blue marked container.

Send through authorised biomedical-waste channel.

DO NOT

- Throw animal carcasses or biomedical waste in open areas.
- Mix biomedical waste with household/municipal waste.
- Burn biomedical waste in the open.
- Touch needles, blood-soiled material or carcasses with bare hands.
- Give biomedical waste to informal waste collectors.

REMEMBER



SEGREGATE



LABEL



STORE SAFELY



HAND OVER TO AUTHORISED FACILITY



Protect Animals



Protect People



Protect the Environment



Dr Deepika Goklaney
Principal investigator
Dr Devender Choudhary
Co PI

ANIMAL BIOMEDICAL WASTE DISPOSAL TECHNOLOGY CENTRE
RAJUVAS BIKANER



Managed as per Biomedical Waste Management Rules, 2016 and amendments.

For a cleaner, safer and healthier tomorrow.



Be Responsible.



Segregate Waste.



Keep Animals Healthy.



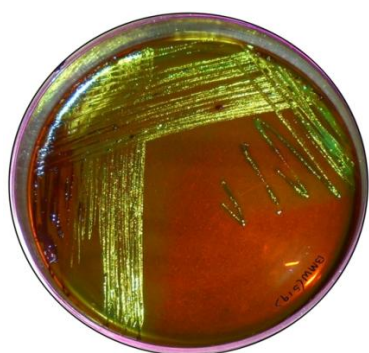
Keep Environment Clean.

Your small step in proper waste disposal can make a big difference.

Together for Animal Health, Public Health & Planet Health.

Major Research Finding:

Bacteriological Profile of Bio-Medical Waste and Assessment of the Efficacy of Autoclave and Incinerator- (2016) Sixty biomedical waste samples were taken Clinics of CVAS, Bikaner that showed a mean total viable count of (2.64×10^5) cfu/gm. Aerobic bacteria isolated were *Staphylococcus aureus* (40%), *E. coli* (33.33%), *Klebsiella* (21.66%), and *Pseudomonas aeruginosa* (13.33%). Steam autoclaving at 121 °C for 30 or 45 min effectively sterilized the waste, but 15 min was ineffective. Incineration at 500–600 °C completely destroyed all microorganisms. Both methods treated the waste successfully; however, autoclaving is preferred because it has no harmful environmental impact and is simpler to operate and maintain.



Isolation of *Escherichia coli* on EMB agar from Biomedical Waste Sample



Isolation of *Staphylococcus spp.* on Mannitol salt agar from Biomedical Waste Sample

Bacteriological Profile of Bio-Medical Waste and Assessment of the Efficacy of Autoclave and Microwave (2021) - Ninety biomedical waste samples from Bikaner showed a mean total viable count of (2.51×10^5) cfu/gm. Isolates included *S. aureus* (40%), *E. coli* (33.33%), *Klebsiella* (26.67%), and *P. aeruginosa* (16.67%). Bacteria were sensitive to gentamicin, levofloxacin, vancomycin, ciprofloxacin, chloramphenicol, tetracycline and co-trimoxazole, but resistant to erythromycin, clindamycin, oxacillin, ampicillin, streptomycin and linezolid. Steam autoclaving at 121 °C for 30 or 45 min was effective, while 15 min was not. Microwave treatment (70–100 °C, 2450 MHz, 30 min–1 h) completely destroyed all microorganisms. Both methods sterilized the waste successfully; however, microwave offers clear advantages over autoclave in terms of energy costs and environmental impact.



Results of biochemical tests for using HiStaph Staphylococcus aureus TM Identification Kit



Isolation of on MacConkey agar from biomedical waste sample

Studies on Bacteriological Profile of Bio-Medical Waste and Assessment of Efficacy of Autoclave, Microwave and Incinerator (2023) - Ninety biomedical waste samples from Bikaner had a mean total viable count of (2.86×10^5) cfu/gm. Isolates included *E. coli* (51.11%), *S. aureus* (35.55%), *Klebsiella spp.* (32.22%), *P. aeruginosa* (22.22%), *B. cereus* (15.55%), and *Streptococcus spp.* (13.33%). Bacteria were sensitive to gentamicin, levofloxacin, ciprofloxacin, vancomycin, cotrimoxazole, streptomycin and chloramphenicol, but resistant to ampicillin, amoxycylav, erythromycin, linezolid, oxacillin, penicillin-G and tetracycline. Autoclaving was effective at 121 °C for 30 or 45 min (ineffective at 15 min); microwave (97 °C, 2450 MHz, 30 min) and incineration (550 °C, 30 min) fully eliminated all microorganisms. All three methods effectively treated the waste; microwave is preferred due to shorter time, lower cost and no environmental harm.

Isolation of *Escherichia coli* on Eosin Methylene Blue Agar



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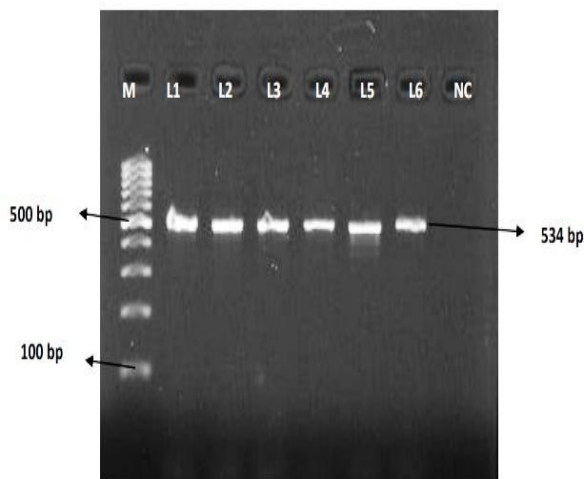
Results of biochemical tests for *Bacillus cereus* obtained from HiBacillus TM Identification Kits.

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Molecular Characterization of Methicillin Resistant Staphylococcus aureus isolated from Biomedical Waste (2024) - Out of 150 biomedical waste samples from Clinics of Bikaner, bacteria isolated were *E. coli* (38.66%), *S. aureus* (30.66%), *P. aeruginosa* (24.66%), *Streptococcus spp.* (17.33%), and *B. cereus* (7.33%). Non-*S. aureus*

isolates were highly sensitive to methicillin (100%), azithromycin, gentamicin and chloramphenicol, but showed high resistance to clindamycin, ampicillin, penicillin-G, erythromycin and oxytetracycline. *S. aureus* isolates were most sensitive to gentamicin (73.91%) and oxytetracycline, with highest resistance to penicillin-G (73.91%), ampicillin and co-trimoxazole; 17 of 46 isolates (36.95%) were MRSA. All 17 MRSA isolates carried the *mecA*, *coa* and 23S rRNA genes; *spaX* and *hla* were present in 94.11% and 88.23% respectively, while *mecC* was absent. Biomedical waste is a major reservoir of MRSA and other multidrug-resistant bacteria; proper management and treatment of infectious waste before disposal is essential to protect public and environmental health.

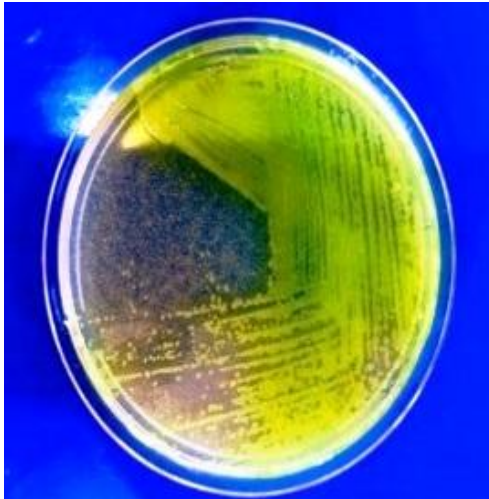


Agarose gel showing PCR amplified product for *hla* gene (534bp) in test isolates. Positive samples (L1=M1, L2=M2, L3=M3, L4=M4, L5=M5, L6=M6, NC= negative control) M=1000bp DNA ladder

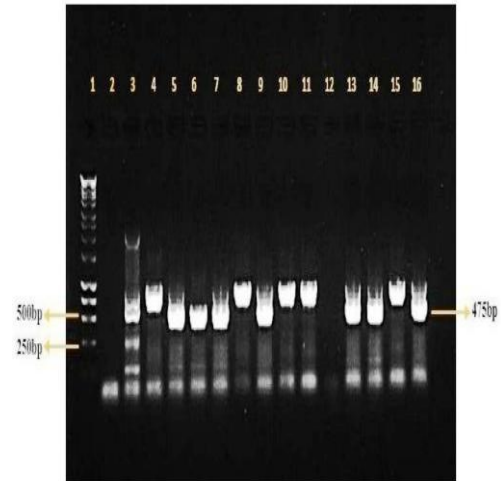


Biochemical tests for *Streptococcus* spp.

Isolation and Molecular detection of *Pseudomonas aeruginosa* from Bio-Medical Waste (2025) - Out of 200 biomedical waste samples, *Pseudomonas aeruginosa* was isolated from 43 (21.5%). Isolates showed high resistance to tetracycline (86.04%), ceftazidime (69.76%), ceftriaxone (65.11%), cefixime (62.79%), aztreonam (58.13%), and amikacin (53.48%), but remained largely susceptible to meropenem (81.39%), ciprofloxacin (79.06%), tobramycin (76.74%), imipenem (67.44%), and gentamicin (58.13%). All isolates were confirmed by 16S rRNA gene. Virulence genes *toxA* (93.02%) and *OprL* (90.69%) were highly prevalent. Resistance genes *blaTEM* (34.88%) and *blaNDM-1* (27.90%) were detected; *blaCTX-M* was absent. Conclusion: Stringent biomedical waste management is urgently required to prevent environmental spread of multidrug-resistant *P. aeruginosa*. Proper segregation, treatment, disposal, and continuous resistance monitoring are essential to protect public health and the environment.



Isolation of *Pseudomonas aeruginosa* on ceftrimide agar

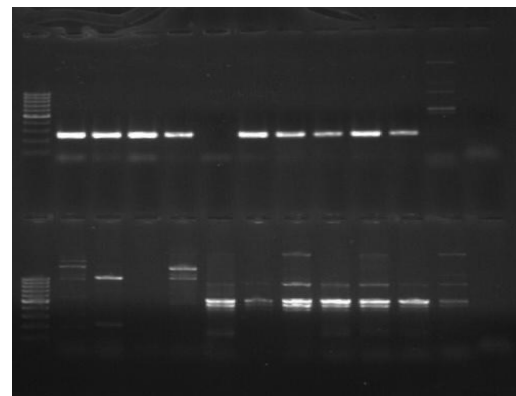


Agarose gel showing PCR amplified product for blaNDM-1 gene (475bp) in tested *Pseudomonas aeruginosa* isolates. M= 1kb

Antimicrobial sensitivity and esbl gene detection in *Acinetobacter Baumannii* Isolated From Biomedical Waste (2026)- Out of 300 biomedical waste samples, *Acinetobacter baumannii* was isolated from 15% (45/300), with higher prevalence in medical hospital waste (18%) than veterinary waste (12%). All isolates showed complete resistance to cefotaxime, ceftriaxone, aztreonam, tetracycline and amikacin, and 100% were ESBL producers. The blaOXA-51 and 16S rRNA genes were present in all isolates; blaNDM-1 (24.4%) and blaCTX-M (28.8%) were also detected, while blaTEM and blaSHV were absent. Isolates showed genetic relatedness to global strains and varying biofilm-forming ability, higher in medical waste isolates. Conclusion: Biomedical waste is an important reservoir of multidrug-resistant and ESBL-producing *A. baumannii*. Stringent waste management and an integrated One Health approach are essential to control the spread of antimicrobial resistance.



Phenotypic screening test of ESBL producing *Acinetobacter baumannii* isolates- I



Agarose gel showing PCR amplified product for blaCTX-M gene (550bp) in tested *Acinetobacter baumannii* isolates. Well 1= 100 kb DNA ladder; Well 2-12= Samples and Well 13=Negative control