



*Capacity Building: Education and Training
Programs Initiated by BioSafety Association
of Pakistan To Meet Bio-threats*

(www.bsapk.org)

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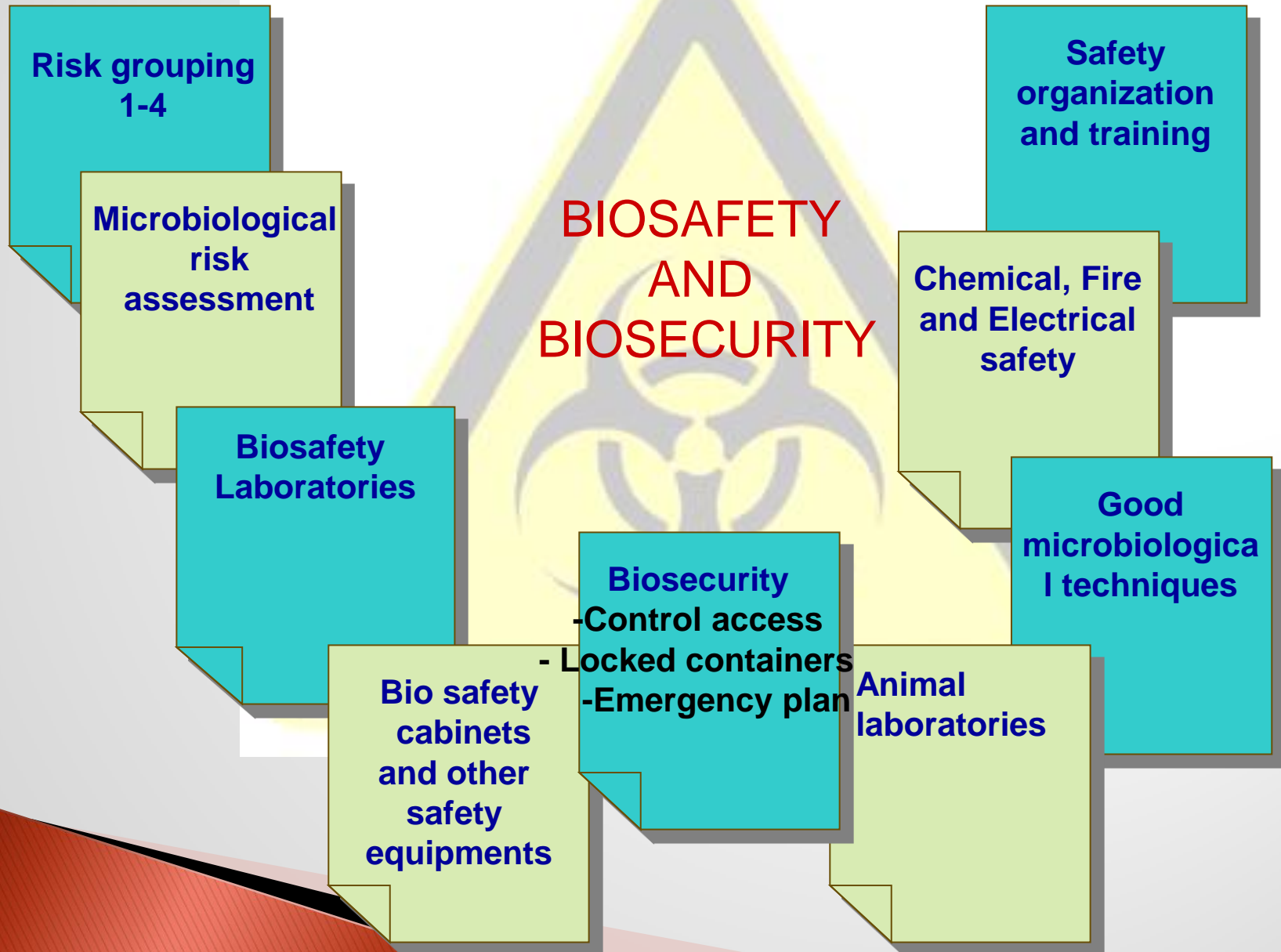
Survey of Bio-Safety Practices and Biosafety Breaches in Public and Private Sector Diagnostic Laboratories of Karachi, Pakistan .

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- ▶ *(Applied Biosafety Vol. 15, No. 4, 2010)*

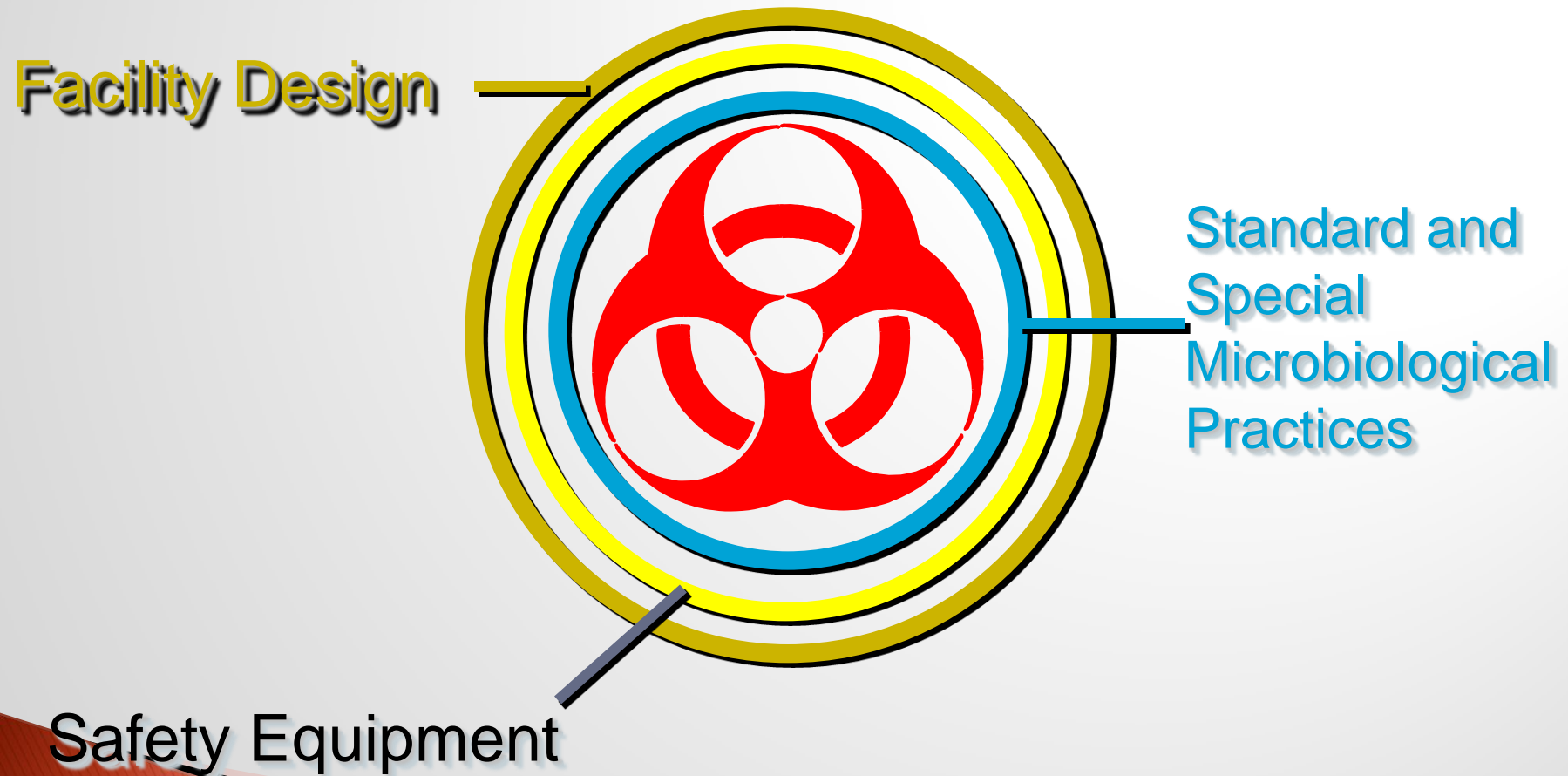
Biosafety and Biosecurity:

- ▶ Containment to reduce or eliminate exposure of laboratory workers and outside environment to potentially hazardous /infectious materials /agents/toxins
- ▶ Strict adherence to standard Microbiological Lab. Practices and techniques , know-how and training, safety equipments and facility design for worker protection , barrier to outside persons , animals and environment

CONCEPTS



Interrelationship of Biosafety and Containment



WHY PAKISTAN IS IMPORTANT?



BIOSAFETY AND BIOSECURITY

**Biosafety
and
Biosecurity-Very hot
issue after 9/11**

**Political instability
in the region**

**war against
terrorism**

**Vital geo strategic
location**

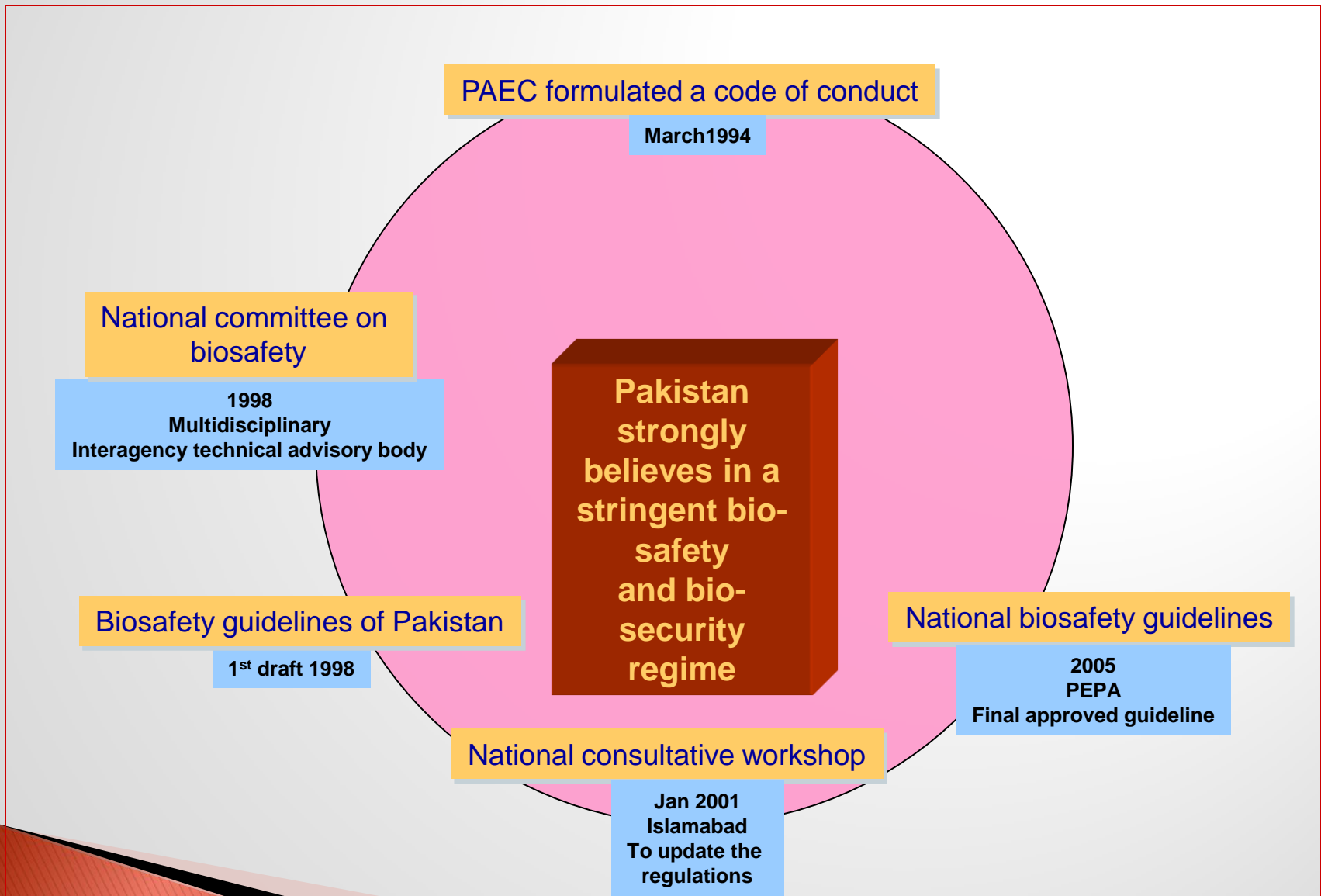
**Emerging
extremism**

**Lack of
implementation of
regulations**

**Limited government
resources**

**Lack of public
awareness**

PROGRESS AND DEVELOPMENT



NATIONAL BIOSAFETY GUIDELINES

**Government of Pakistan
Pakistan Environmental Protection Agency
(Ministry of Environment)**

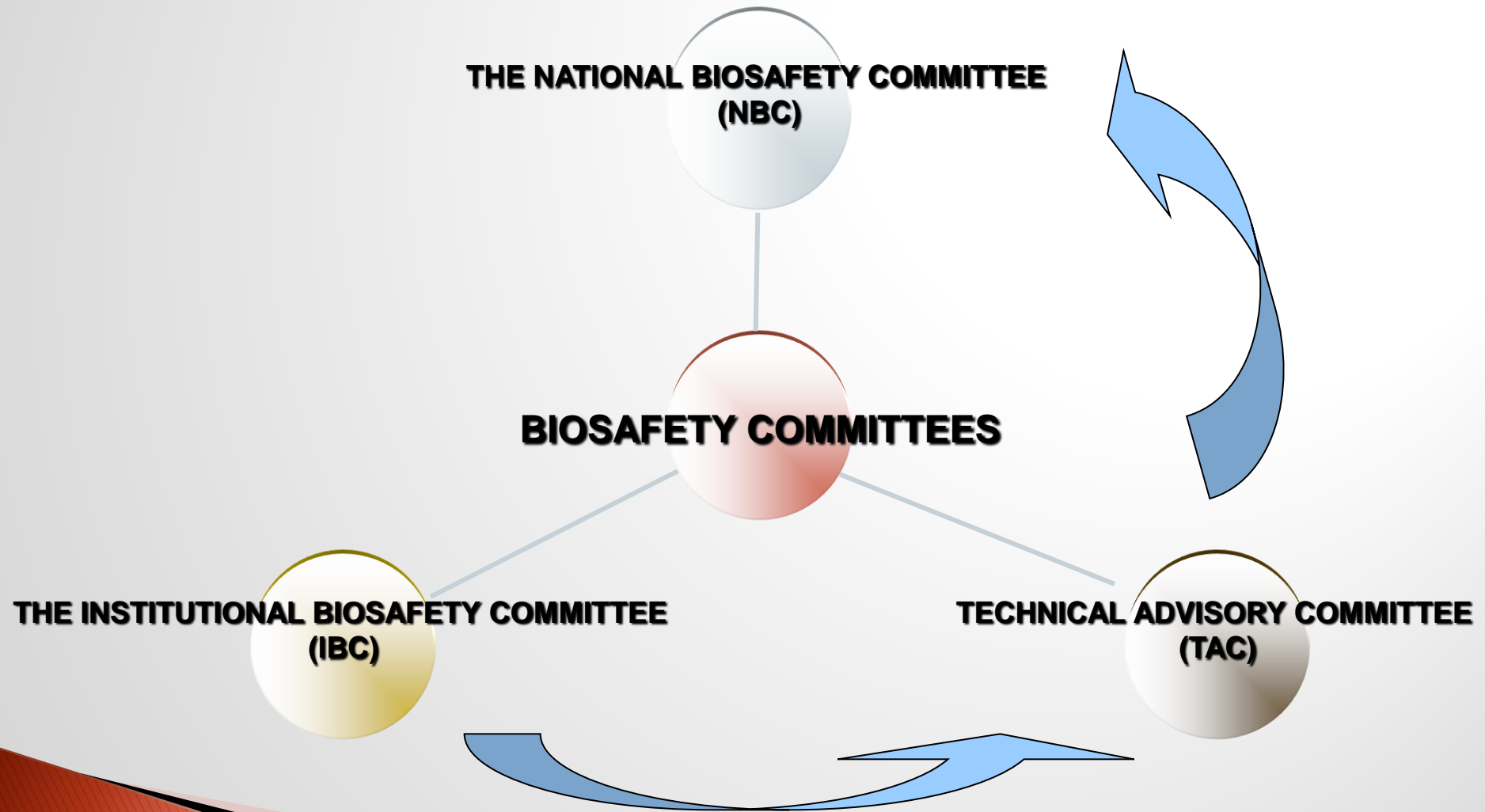
(May 2005)

**Related Reference: Pakistan Biosafety Rules, 2005
S.R.O 336(I)/2005**

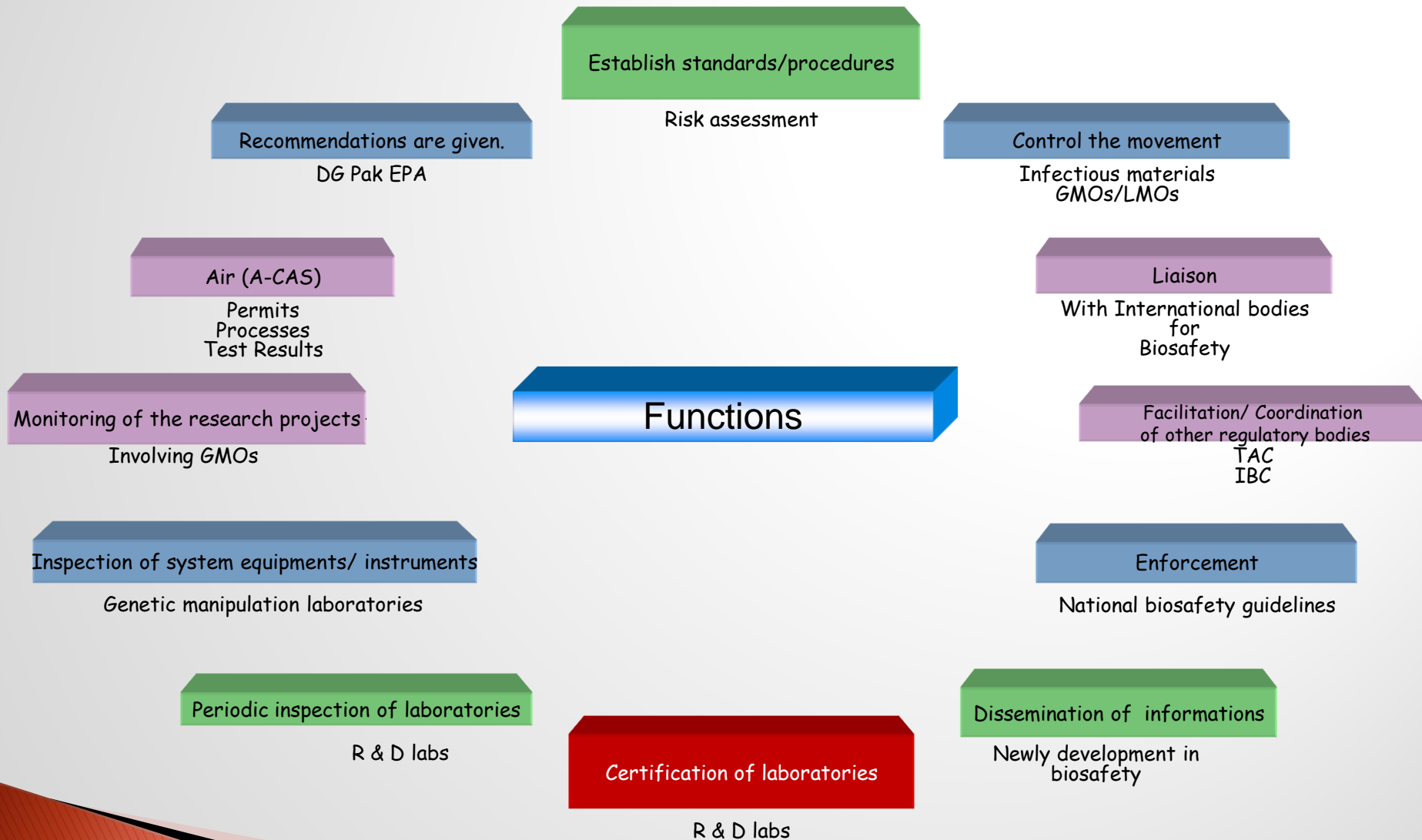
GUIDELINES

- These guidelines have been prepared keeping in view the guidelines prepared by UNIDO, FAO, WHO, UNEP, and all the developed and developing countries with modification to suit our unique and specific socio-economic and geographic environment.
- The objective of these guidelines.
- Is to prevent unintentional negligence leading to misuse and irresponsibility by laboratory workers/researchers as well as the end-users.

BIOSAFETY COMMITTEES IN PAKISTAN



NBC





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Biosafety Breaches : Cause of IDS

- ▶ IDS not only cause enormous suffering , they strain the capabilities of our already poor health-care system and deplete financial resources.
- ▶ Due to poor Biosafety /Biosecurity practices in hospitals and by basic containment laboratories which provide bulk of diagnostic services.
- ▶ The labs. in private sector and in most of the life sciences research centers , livestock farms , slaughter houses lack basic biosafety measures to safeguard their worker's health.
Professionals responsibility ??

▶ MDR ,XDR

Requirements for Capacity Building

- ▶ Determining the status of Biosafety practices , Surveys
- ▶ Awareness about biosafety , biosecurity and biorisk
- ▶ Presence of National Guidelines for Labs. and healthcare , food , pharma , diagnostic and livestock industry and their implementation

Health Care Personnel

- ▶ Involved in handling and disposing infected clinical material are not aware of the potential threats to their health and the health of the community.
- ▶ Improper disposal of hospital , public health laboratory waste in open areas or in big bodies of water is a source of disease epidemics and loss of life.
- ▶ Proper handling and containment of all microbes as well as infected samples is essential to limiting the spread of infection in humans, food crops and animals and their products.

Sharing what we saw : Survey

- ▶ **Biosafety Breaches
Very Common**

Health Care /Condition of Labs.



HIV Transmission

- ▶ Promiscuous sexual activities
- ▶ Intravenous drug use
- ▶ **Use of contaminated syringes, needles, etc**
- ▶ Unscreened and unsafe blood, blood products
- ▶ HIV positive Repatriates, Deportees
- ▶ Vertical transmission from mother to child



A—Blood collection without PPE.



Pipettes without any mechanical device and also some recapped used syringes.



C—Improper discarding of used syringes may be reused.



AFGHAN REFUGEE CHILDREN COLLECTING GARBAGE OUTSIDE A PUBLIC SECTOR HOSPITAL



Here used clinical waste is dumped without any decontamination

Afghan refugees getting shaved with street barber- Sharing of razor blades











- Blood collection with bare hands
- Improper labeling
- **Report mixing very common**
- Direct pouring of blood samples from syringes to tubes and centrifuge



Untrained Personnel

Unaware of Biosafety

Unaware of biohazard



- Recapping of Syringes
- Improper discarding
- Rare use of pipetting devices
- usually mouth pipetting
- Media pouring without specified area
- Decontamination of surfaces ??



- Improper ventilation
- Open samples (Even Sputum)
- Improper diagnosis
- Direct discarding without autoclave



BIOSAFETY VIOLATIONS IN CLINICAL DIAGNOSTICS OF KARACHI



Primary barriers and PPE





SAFETY VIOLATIONS IN CLINICAL DIAGNOSTICS OF KARACHI





SAFETY VIOLATIONS IN CLINICAL DIAGNOSTICS OF KARACHI





SAFETY VIOLATIONS IN CLINICAL DIAGNOSTICS OF KARACHI





BIOSAFETY VIOLATIONS IN CLINICAL DIAGNOSTICS OF KARACHI





SAFETY VIOLATIONS IN CLINICAL DIAGNOSTICS OF KARACHI



Microbiological Biosafety :

Teaching and Training in Pakistan

- ▶ Realizing importance of microbiological sciences , University of Karachi established a Department of Microbiology in 1957 which has trained more than 15000 scholars from all over Pakistan in last 50 yrs in Microbiological Biosafety / aseptic procedures / safe handling of infected samples / risk assessment, protecting themselves and the community.
- ▶ Also hosted Microbiology Laboratory sessions for nurses of AKU – a private University . Associated as faculty member since 1974.

Biosafety / Biosecurity: PSM/BSAP

- ▶ Pakistan Society for Microbiology est. in 1974 has regularly organized biennial conferences , workshops , designed courses / workshops to train life scientists in microbiological safety issues in food , pharma , healthcare , diagnostics , environment and food agriculture and livestock product industry.

- ▶ The events of 9/11 ,misuse of EDPs highlighted the importance of enhancing awareness about Biosafety and Biosecurity issues to protect the HC professionals , ,Biomedical Researchers , Agri. and Livestock Farmers .
- ▶ After a detailed discussion with Dr.Hawley , President ABSA (2006) and other members of ABSA Affiliate Committee we decided to organise and initiate **BioSafety Association of Pakistan** as an affiliate of PSM and ABSA.

BSAP in view of our Survey Reports

- ▶ **Poor infrastructure in Healthcare Institutions**
- ▶ **Inadequate institutional arrangements**
- ▶ **Inappropriate functioning of existing laboratories, no Biosafety training, no SOPs**
- ▶ **Policy, legislative arrangements**
- ▶ **Inefficient information system**
- ▶ **Lack of job specification & description**
- ▶ **Lack of monitoring & supervisory arrangements**

Biosafety Association of Pakistan

- ▶ officially launched in March 2007 at the end of the Sixth International Biennial Conference of Pakistan Society for Microbiology in Islamabad in collaboration with HEC, COMSTEC and PARC
- ▶ Dr. Robert Hawley – President – ABSA , Scientists from Sandia Laboratories, USDA and BEP provided help and guidance for the establishment of BSAP(www.bsapk.org)



- ▶ BioSafety Association of Pakistan – (BSAP) is a non– profit organization that is an affiliate of PSM, the leader in the profession of Microbiology and Biological safety since 1974
- ▶ Dedicated to expanding biological safety awareness and best microbiological and chemical practices to prevent occupational illness due to infectious or biologically derived materials / biohazards

BSAP- Functions

- ▶ Organize seminar meetings addressing current topics of interest to membership, attendance outside of the membership is encouraged
- ▶ Arrange tours to provide them an opportunity to visit local facilities featuring state of the art technology applicable to maintain biosafety ,chemical safety and biocontainment
- ▶ Arrange for participation of members in conferences / training courses organized by BSAP/ ABSA and other international and national biosafety organizations

BSAP Affiliations:

- ▶ **Biosafety Association of Pakistan became affiliated with American Biosafety Association of Pakistan (ABSA) in 2008**
- ▶ **Biosafety Association of Pakistan (BSAP) became a member of Pakistan Consortium of Scientific Societies (PCSS) in 2008.**
- ▶ **Biosafety Association of Pakistan (BSAP) became a member of IBWG International Federation of Biosafety Associations (IFBA) in 2008/9.**

BSAP Members in Different Institutions of Pakistan:

- ▶ **Universities and academic institutions of Pakistan.**
- ▶ **Pakistan Agriculture Research Council (PARC)**
- ▶ **Environmental Protection Agency (EPA)**
- ▶ **Pakistan Medical Research Council (PMRC)**
- ▶ **Dow University of Health Sciences (DUHS)**
- ▶ **Jinnah Medical and Dental College (JMDC)**
- ▶ **Jinnah University for Women (JUW)**
- ▶ **National Institute of Child Health (NICH)**
- ▶ **Sindh Poultry Vaccine Center (SPVC)**
- ▶ **Agha Khan University Hospital (AKUH)**
- ▶ **Fatima Jinnah Dental College(FJDC) and others.**
- ▶ **Bahuddin Zakariya University Multan.**
- ▶ **National Institute of Biotechnology(NIBGE)**
- ▶ **University of Balocistan, Quetta**
- ▶ **King Edward University, Lahore**
- ▶ **Shah Abdul Latif Bhattai University Khairpur and many others....**

. CHAPTERS IN INSTITUTIONS



International Federation of Biosafety Associations
IBWG > IFBA 2009 meeting

Biosafety :Trained Manpower Requirement/ Master Trainers

1. Qualified microbiologists , well trained technicians in microbiology, in Clinical Labs. , for virology, mycology , Immunology etc.
2. A public health specialist/epidemiologist would be required along with a pathologist
3. Biosafety Training Experts , Biocontainment engineering specialists , Laboratory Management Specialists , Biomedical scientists , Medical Waste Disposal Experts would also be required for PHLS labs

Training Curriculum for Biosafety and Biosecurity at University / College level

- ▶ The curriculum proposed below is intended to be integrated into an existing program Such as public health or industrial hygiene, resulting in a concentration in “biosafety”.

two semester class on laboratory biosafety and biosecurity (semester one would cover basics and semester two would cover advanced topics).

- ▶ The course would include a hands–on laboratory component. Masters students seeking a biosafety concentration would be expected to do a masters project on a relevant topic.
- ▶ Universities adopting this program could develop a third semester option based on their areas of expertise.
- ▶ The first semester of this course can also be introduced as a stand alone unit for any student in a life science program either at the undergraduate or graduate level.

Biosafety Curriculum Developed



International Master Biosafety Training programs BSAP Members

- ▶ Trained Biosafety Personnel core group developed by arranging local and international trainings for BSAP scientists in different academic and R&D and healthcare Institutions of Pakistan i.e
- ▶ **BSL-2 and BSL-3 Training in Emory and CDC, 2006 , 2007 , 2008.**
- ▶ **Master's Training Program in Biosafety and Biosecurity in Bangkok, Thailand, June 2008.**
- ▶ **Biosafety Training Albuquerque, USA ,2009**
- ▶ **Many Training Courses attended at ABSA Meetings (2006,2007,2008 and 2009,2010) , at John Hopkins , U.MD , UT-MEM - USA**

Current BSAP Master Trainers

- ▶ Prof.Dr. Aqeel Ahmad ,Dr. Tasneem Adamali (KU – Micro) , Ahsan Sattar (Multan)
- ▶ Dr.Shazia Hakim and Ms. Ghufrana (JWU)
- ▶ Dr. Farhan Essa , Dr. Rafiq Khanani (DUHS)
- ▶ Sikander Sherwani (FUAST) , Dr. Adnan Khan (KU) ,
- ▶ Dr. Rafiq Khanani (DUHS – Diagnostics)
- ▶ Dr. Ghulam Fatima (Civil Hospital – Karachi)
- ▶ Dr. Zaheer Ahmad (NARC – Islamabad)
- ▶ Dr. Shakeel Babar (Quetta – Balochistan)
- ▶ Dr. Nazia Bibi (Lahore) , Nain Tara (IIDRL)
- ▶ Dr. Tayyaba Aejaz (Lahore), Dr. Saeed Khan (AKU)
- ▶ Dr. Taseer Ahmad (KU) , Yasir Raza (IIDRL)
- ▶ Dr. Nadia Farhan (Essa Laboratory)
- ▶ Dr. Nazeer Ahmad (Gilgit) , Asma (SZABIST)

Dr. Nazia Bibi During BSL-3 Training at John's Hopkins University





Master Trainers with Mentors



Master Trainers with ABSA mentors



BSAP Training/Workshops

- ▶ In an effort to build our capacity and improving biosafety and biosecurity practices in Pakistan , **Biosafety Association of Pakistan** initiated a series of hands-on training workshops in 2006, in collaboration with ministry of health , environment , planning and agriculture and experts from ABSA and ASM , PSM

Trainings /Workshops (2007–2011)

First Biosafety and Biosecurity workshop held during the Sixth International Biennial Conference of Pakistan Society for Microbiology (PSM), in march 2007., which was attended by more than 300 scientists representing Universities , R&D , Healthcare , Agriculture institutions from all over Pakistan and abroad

Hands On Training at NARC Isd.





Second National Biosafety Workshop

- ▶ 2nd BSAP Workshop organized in collaboration with PARC and Planning Commission of Govt. of Pakistan
- ▶ Biosafety experts from ABSA , Sandia Laboratories -USA , Pakistan Society for Microbiology and Biosecurity Engagement Program - BEP- USA participated.
- ▶ Attended by > 400 scientist from various universities, R&D institutions , Hospitals etc



Training at NARC – Islamabad



The Purpose of Trainings

- ▶ **Develop an appreciation of biosafety and biosecurity issues , increase BSL 2–3 level knowledge and skills using hands on experience to handle real time situations and to enhance local institution’s biosafety capacity within the limited available resources to effectively contribute to national fight against emerging infectious diseases in humans , animals and crops.**



Workshops in Major Cities

- ▶ In last 5 yrs , BSAP developed special courses and organized Training Workshops at 18 different Universities , Hospitals , Pathological laboratories in major cities including Islamabad , Multan, Karachi , Lahore , Hyderabad , Khairpur , Peshawer and Quetta with participation from public and private sector scientists , medical professionals , paramedical staff , technicians and senior students .

Training Component :

In each session we train participants

- ▶ Infections and their sources , isolation , identification of causative agents , disposal of infected specimens
- ▶ Development of laboratory safety and security measures , selection and use of appropriate PPE , operation of biological safety cabinets
- ▶ Assessment of possible risks , animal handling procedures , Emergency/ spill management etc.

BSAP Resource Persons

- ▶ **Biosafety in Handling Liquids Workshop** for Participants of US–Japan 14th EID Conference in Penang – Malaysia – Sept. 2010
- ▶ COMSTECH International Workshop on Biosafety and Biosecurity : Need and Necessicity in Islamabad Sept. 26–28 , 2011
- ▶ Comstech International Workshop for Managers on Biosafety , Biosecurity and Bioethics in October 2011





...HILAH
...ZZAMAN



Training Workshops and Seminars

- ▶ Biosafety in Health Care and Biomedical Research **Khairpur University – Sindh**
- ▶ Biosafety Issues in Emergencies and Disaster Management **Sindh University – Hyderabad**
- ▶ Biosafe handling of MDR–TB infected specimens for the isolation *M. tuberculosis* ***Ojha Institute of Chest Diseases***
- ▶ Handling of Biological spills in the laboratory
- ▶ Biosafety Issues in Investigating an Epidemic of Viral Infections **Dow University**
- ▶ Biosafety in Patient Care **Civil Hospital**

Future Workshops /Seminars/ Projects

- ▶ **7th International Biennial Conference of Pakistan Society for Microbiology in Karachi -in December 2011**
- ▶ **BSAP Task Force will soon finalize Institutional Biosafety /Biosecurity guidelines and send recommendation to Ministry of Environment / Health as well as to Pakistan National Accreditation Council ,**
- ▶ **Conducted Training Workshop on Microarray and Biosafety at CEMB - FCU -Lahore in March 7-11,2011, Training Workshops on Biosafety and Recently completed Proper Disposal of Medical Waste - BEP Funded Project**

First Pair of Gloves : Training





PPE for Biosafety



Initial Impact Assessment

Results are encouraging, need to continue our efforts for national biosafety capacity building in other institutions because we feel that hands on learning experience of the participants improved their know how about biosafety issues to identify biological risks and to mitigate them by cost effective solutions. help them in formulating institutional biosafety policies and programs to reduce the incidence of serious infections like TB, Hepatitis, Bird Flu etc as well heavy economic losses due to Zoonosis, Livestock and Crop diseases and possible threat of bioterrorism by misuse of select agents.

Biosafety Status Survey

Biosafety during lab work and transfer of lab material from one place to other is a critical tool in the global fight against infectious diseases and laboratory personnel, particularly those working in microbiological laboratories as they are exposed to biohazards which may result in laboratory Acquired Infections.

Background

- ▶ Laboratories are considered as a critical tool in the global fight against infectious diseases and Laboratory personnel, particularly those working in microbiological laboratories are exposed to biohazards which may result into laboratory Acquired Infections / Nosocomial infection

Objective of Current Survey

- ▶ **Level of awareness about Biosafety measures taken by hospital based laboratory technicians during their routine work in clinical laboratories of Metropolitan City Karachi.**



Nosocomial infections

- ▶ Nosocomial infections include almost all clinically evident infections that are not present at the time of hospitalization.
- ▶ Within hours after admission, a patient's flora begins to acquire characteristics of the surrounding bacterial pool (CDC, 2000).
- ▶ Most infections that become clinically evident after 48 hours of hospitalization are considered nosocomial.

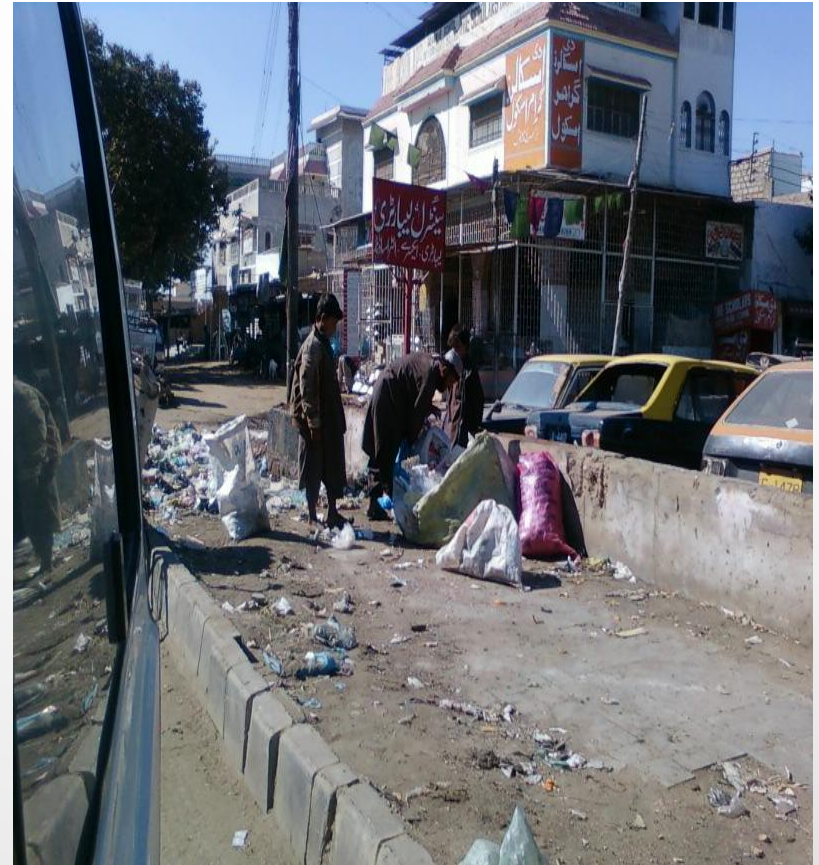
Who is responsible for spreading nosocomial infection?

- ▶ **Health care workers**
- ▶ **Doctors**
- ▶ **Laboratory Technicians**



Greatest Health Concerns to Lab personnel.

- ▶ Lack of awareness
- ▶ Scared of training programs
- ▶ Limited resources
- ▶ Unsafe handling & discarding procedures.

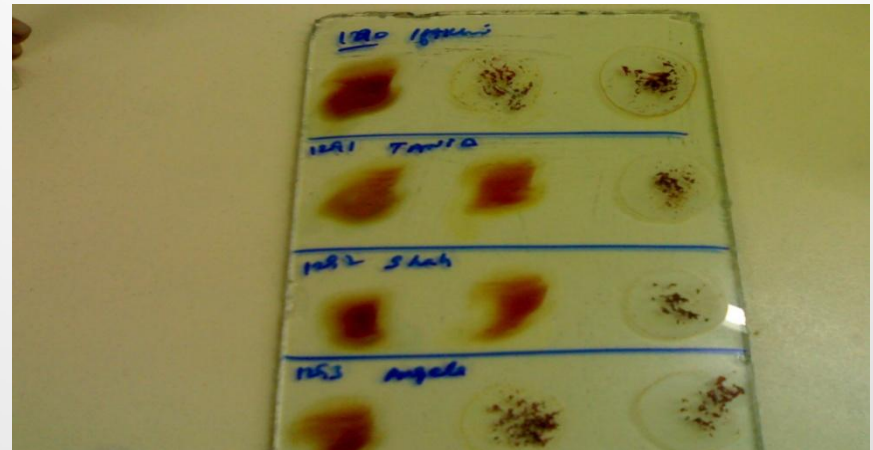


Greatest health concerns to Lab personnel.

- ▶ Continuous threat of nosocomial infection.
- ▶ Constantly exposed to opportunistic pathogens or potentially pathogenic organisms.



Unsafe laboratory practices frequently observed during Sample processing



Bio-Hazard

Microbiological lab having sewage over flow



Methodology Used

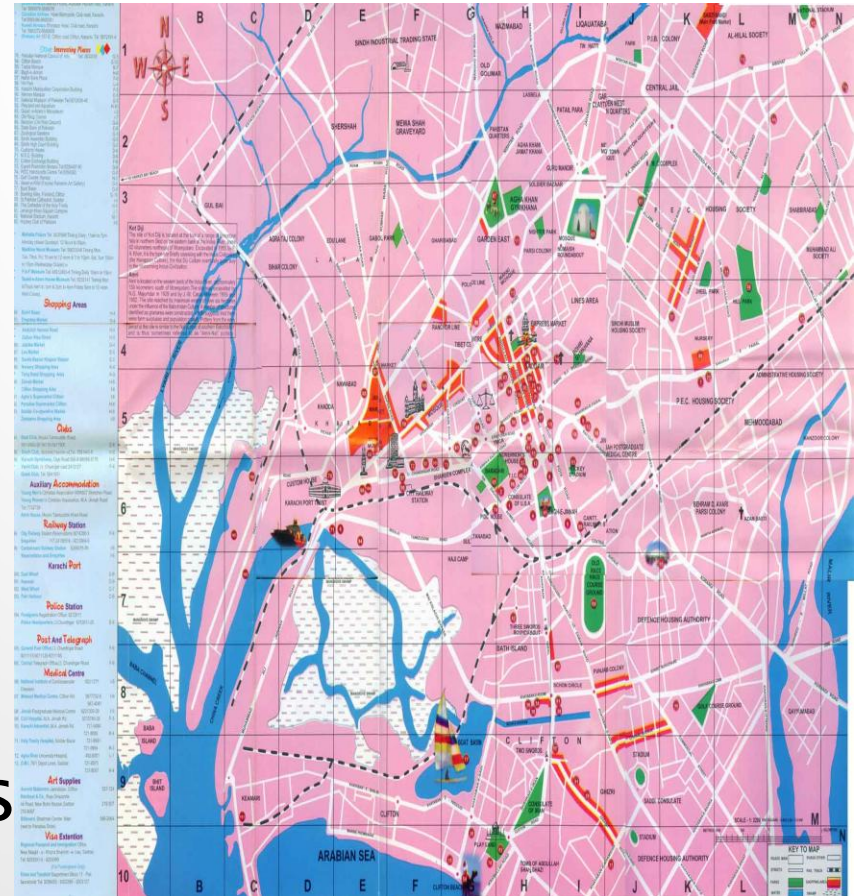
- ▶ An anonymous, questionnaire was filled by the clinical laboratory workers after taking consent.
- ▶ **Sampling plan:-**
Simple random sampling
- ▶ **Study design:-**
Quantitative, Cross sectional survey

Basic questions asked in Survey forms

- routine lab.practices such as unsafe work practices e.g. eating or drinking in Labs.
- mouth pipetting of biological samples,
- use of personal protective equipments,
- proper disinfection, handling, collection and processing.
- questions regarding disposal of used syringes, sharps objects and chemicals and also about the hepatitis B mmunization
- status of the workers.

Sample Size

- ▶ From all 18 towns of Karachi 253 Laboratory Technicians from both private and public hospital based laboratories are recruited.
- ▶ Almost 14 technicians from each town



General Findings

- ▶ In Our Study 200 were males and 53 were females Tech.
- ▶ In private hospitals, 32 % laboratory workers had 1–5 year experience while in government hospitals only 17% had similar experience
- ▶ About 61.7% technicians had a working experience of more than 5 years.

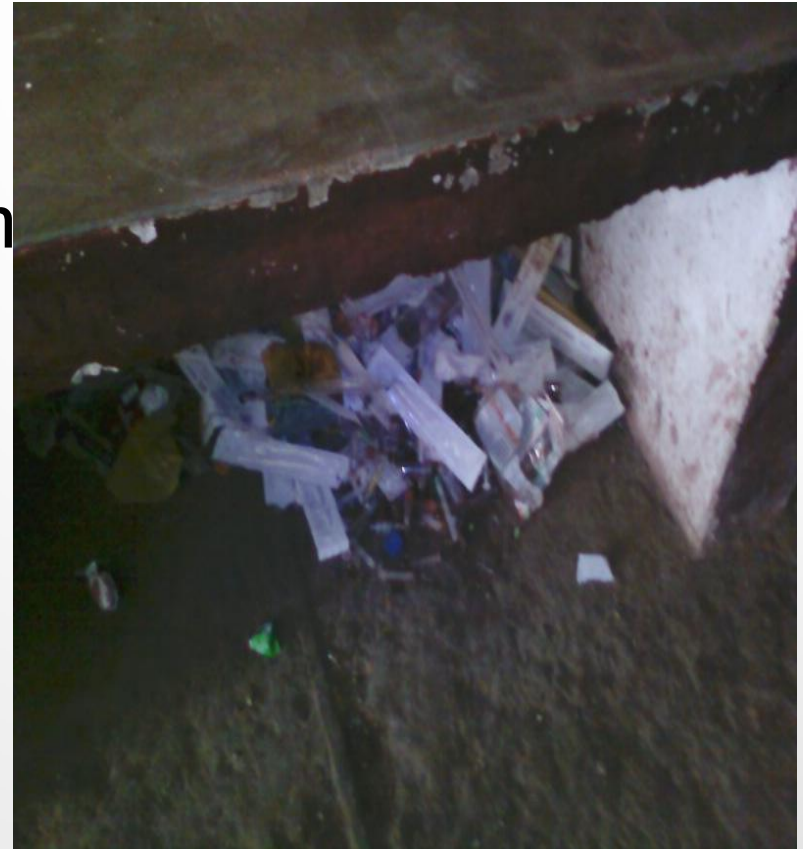
Personal Protective Equipments

- ▶ All the labs surveyed were BSL 2 level in which Personal Protective Equipments (PPE) rank as the prime requirement for an individual.

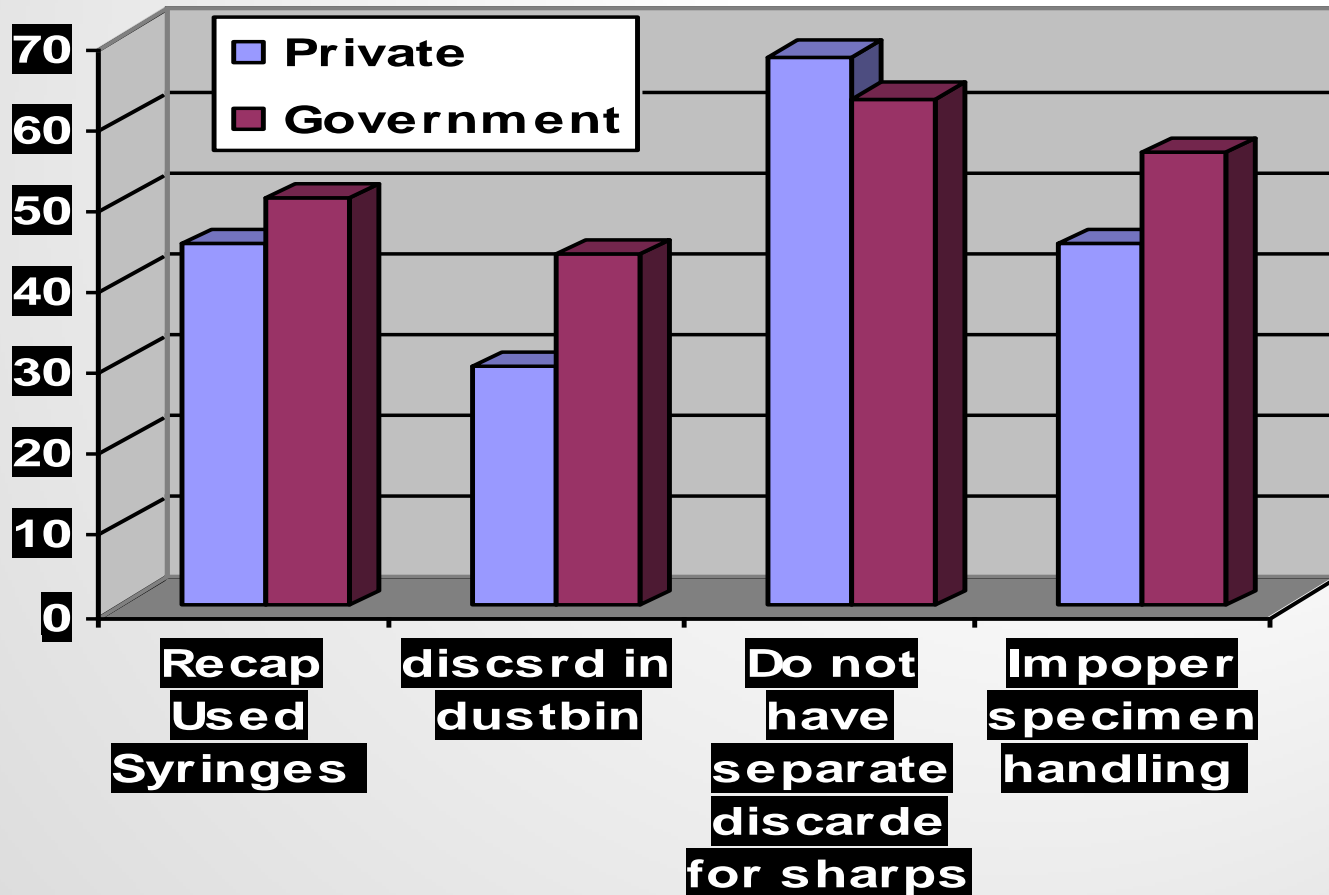


Used Syringes and Sharps

- ▶ Special category of medical waste that can punch / pierce through the body parts during collection, Transportation and disposal.
- ▶ Recapping of used Syringes is strictly prohibited (BMBL in BSL 2 labs)
- ▶ To avoid reuse of syringes, they must be discarded properly,



Used Syringes and Sharps

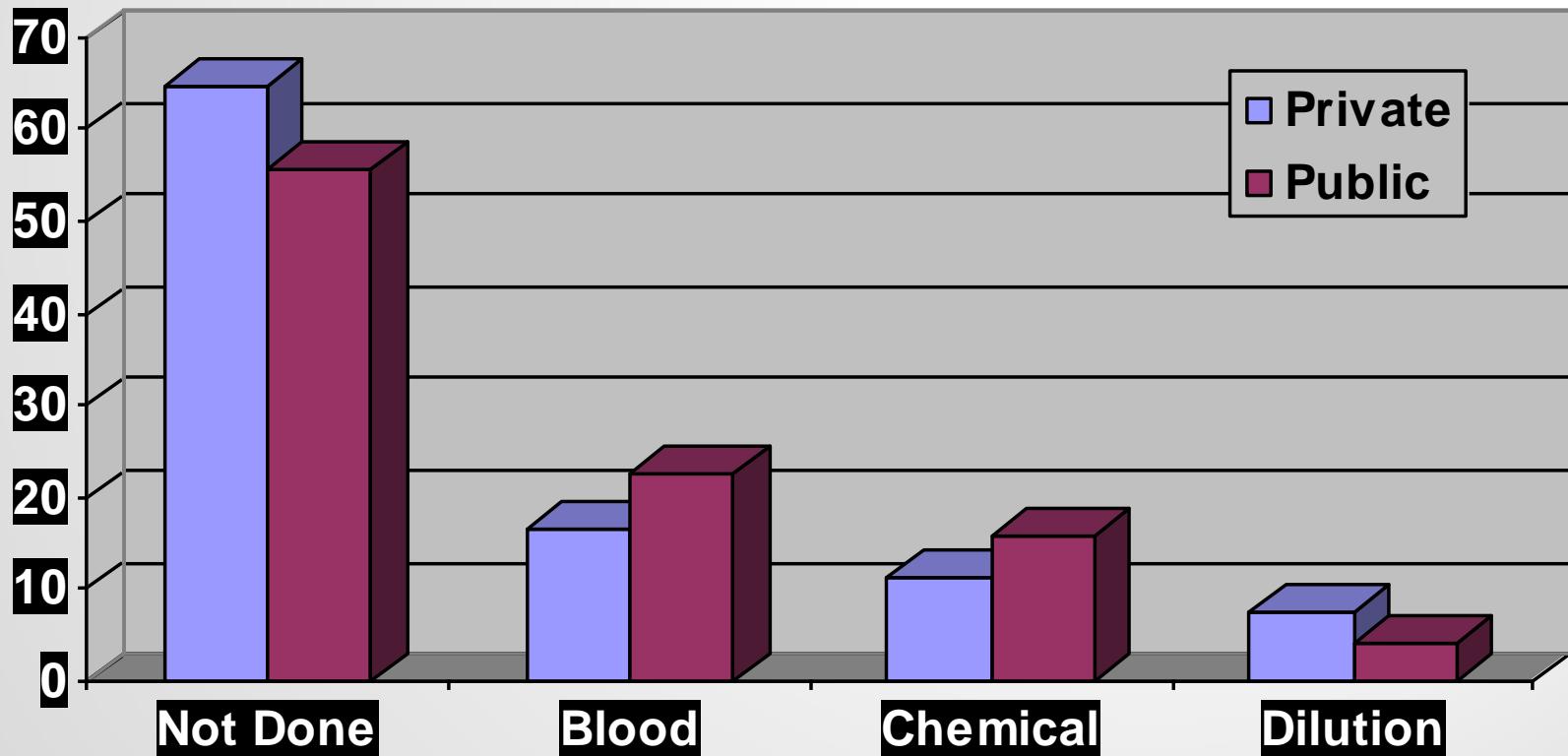


Mouth pipetting

- ▶ Mouth pipetting is obsolete and is strictly prohibited in clinical laboratories world wide.



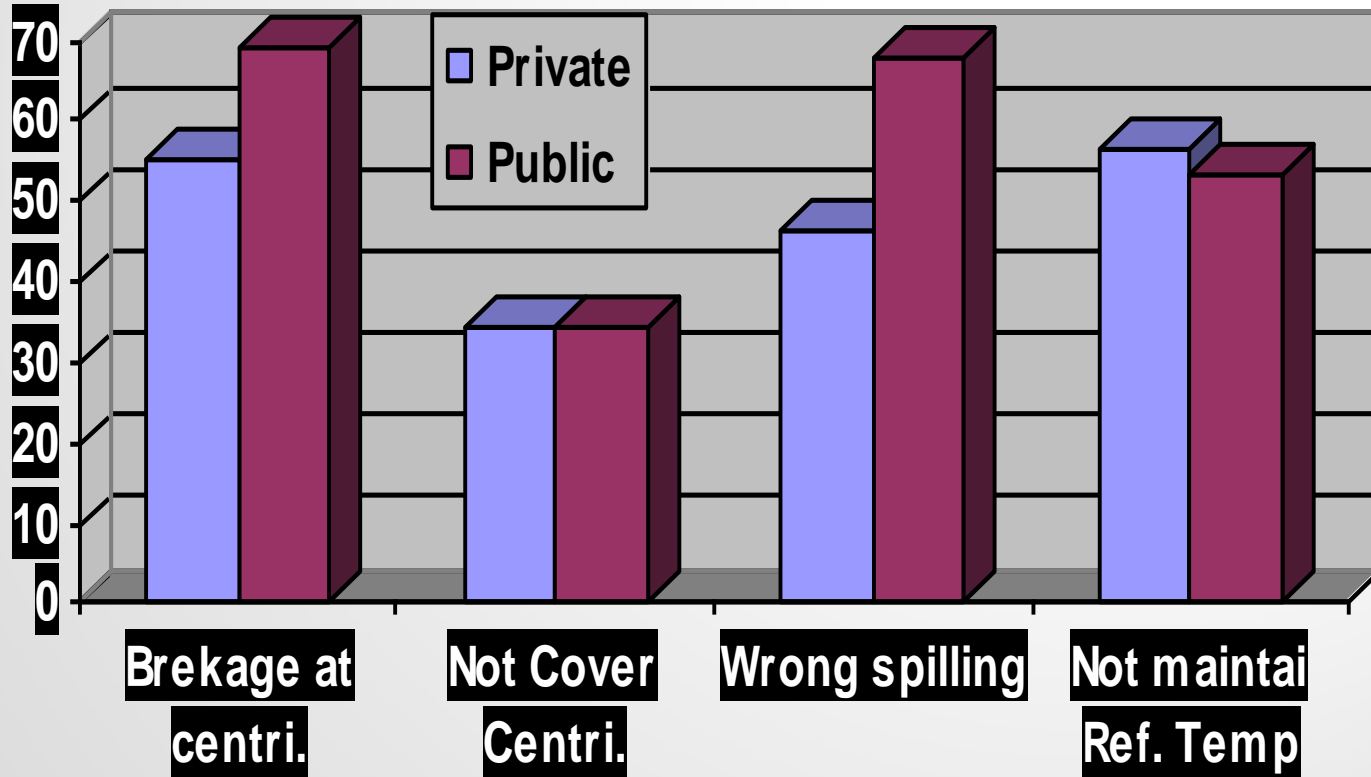
Mouth pipetting



Centrifuge machines

- ▶ Main vectors of dispersing aerosol in laboratory environment
- ▶ Source of Nosocomial infection.
- ▶ It is advisable that tubes and Centrifuge machine should be covered by a suitable caps.

Centrifuge Machines



Laboratory Design

- ▶ Biosafety cabinet, fire extinguisher, separate place for eating and drinking and Emergency exit is the primarily requirement for BSL 2 labs

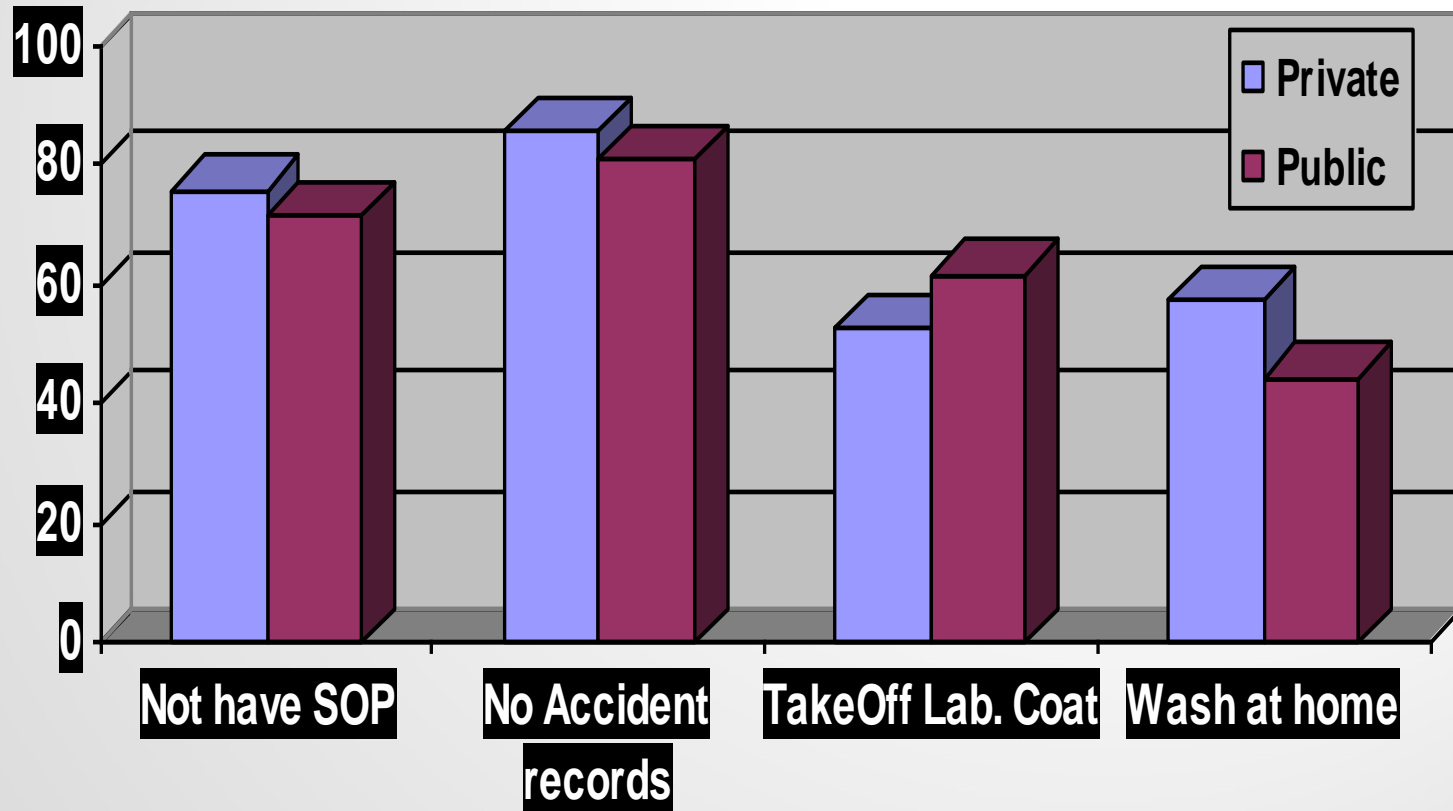


Biosafety Procedures

- ▶ Maintaining Sops Standard Operating procedures and Accident record is an important requirement of BSL 2 labs



Biosafety Procedures



Conclusions

- ▶ **Results of this survey confirm that there is a lack of awareness regarding good lab practices (GLP) among the lab technicians.**

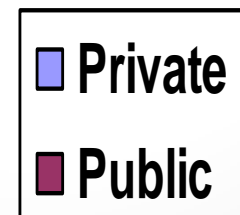
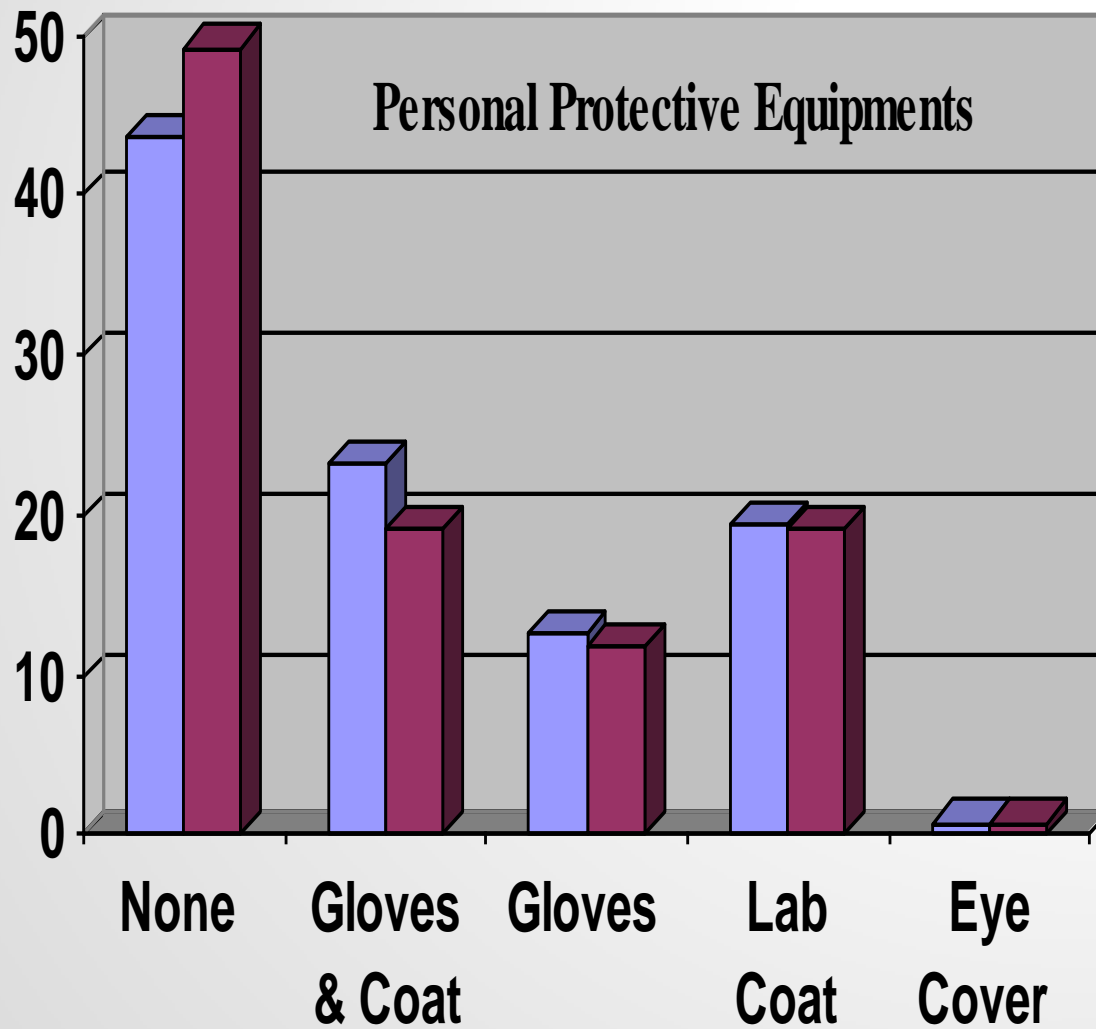


Conclusions

- ▶ **There must be institutional bio-safety committees to control, maintain and record, nosocomial infection and accidents.**
- ▶ **There must be a biological safety officer whose job should be to monitor the proposed work activities, procedures performed in compliance to SOPS,**

Conclusions

- ▶ **There is a great need for organizing basic training programs in order to increase awareness among the laboratory technicians about biosafety and biosecurity guidelines to protect themselves , their families and the community at large, this was also suggested by 34% of respondents of this survey.**



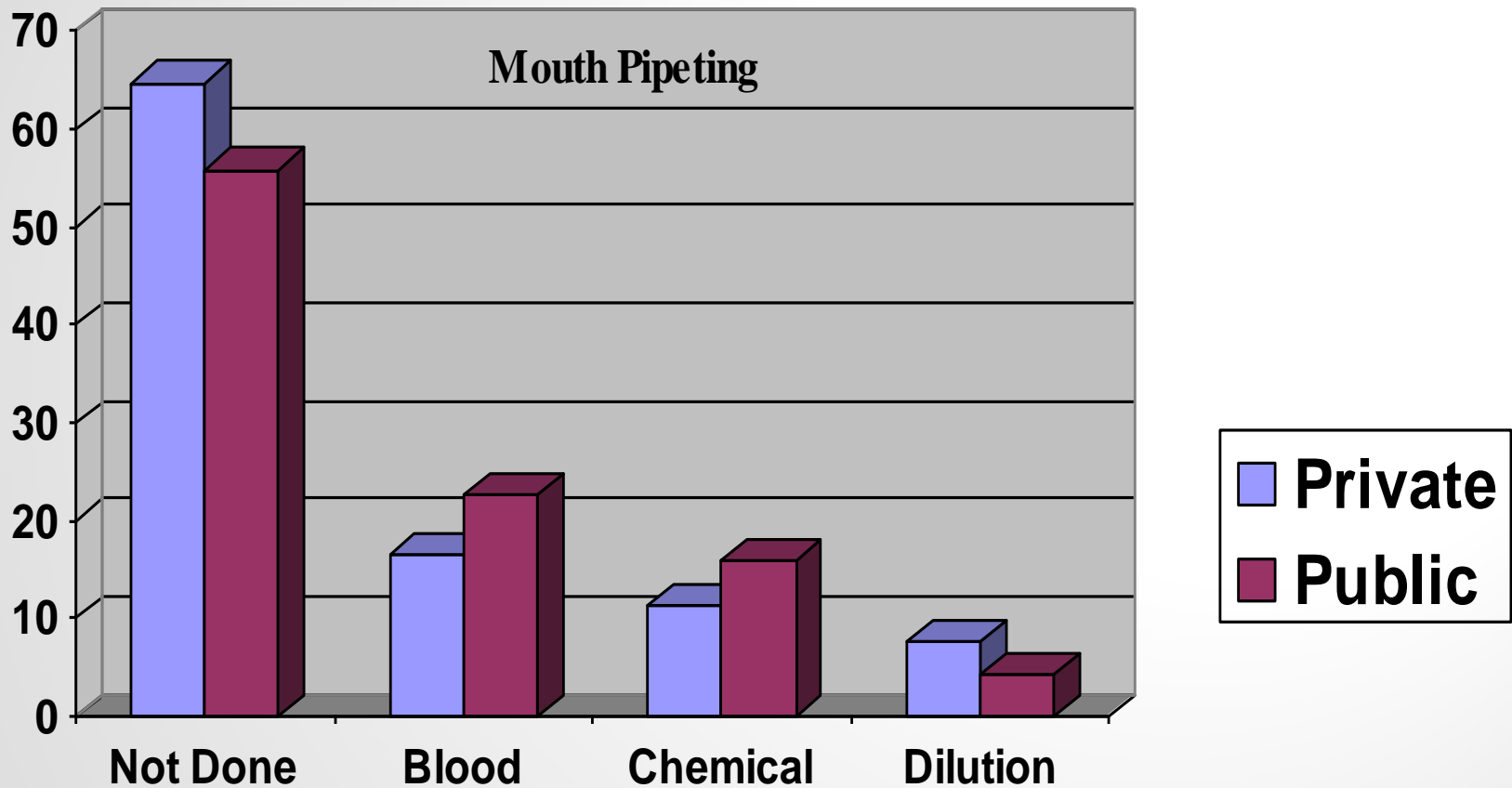
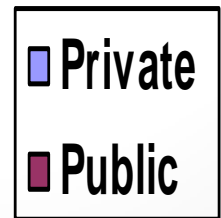
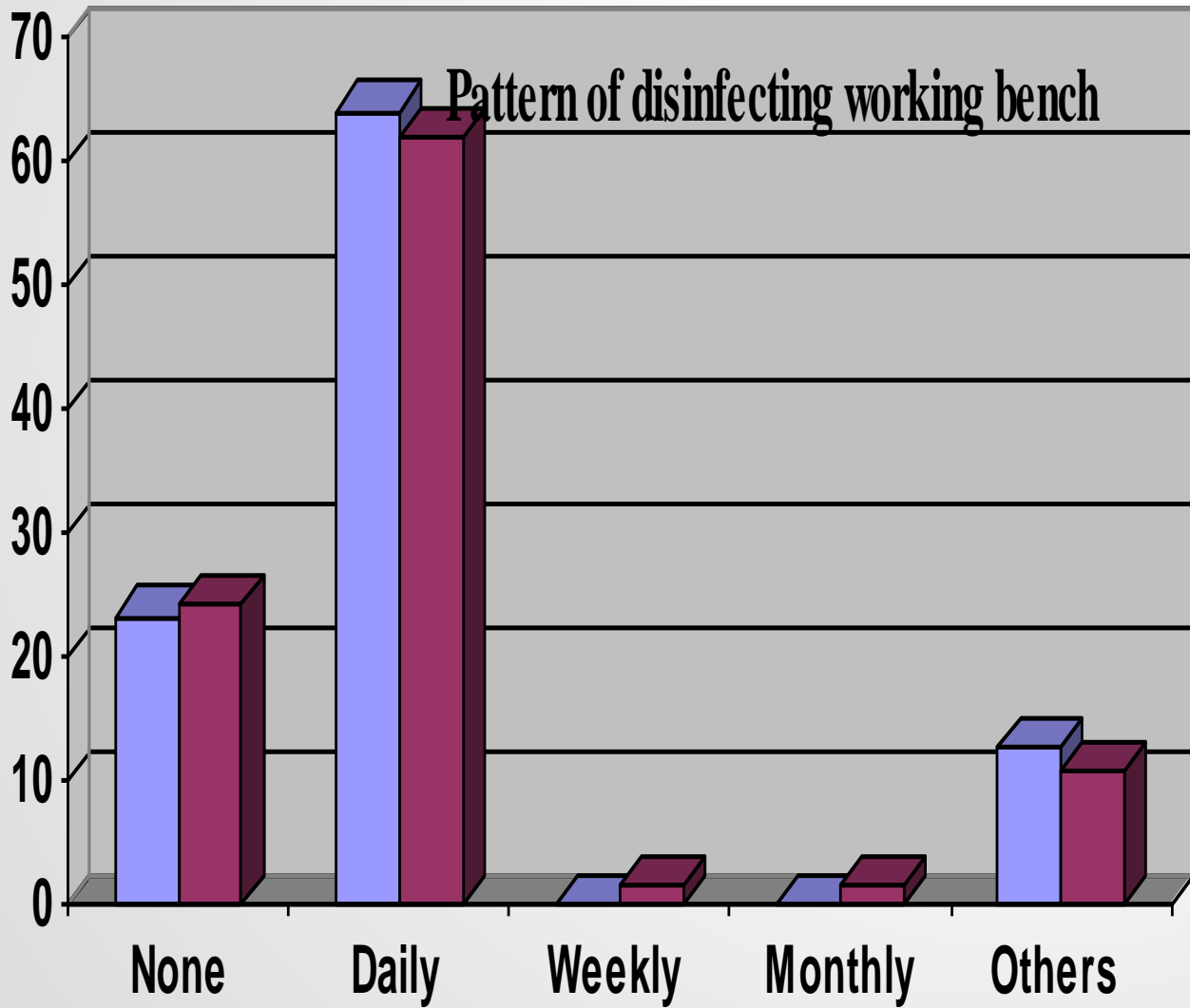


Figure 02: Bar represents percentage of laboratory workers performing mouth pippeting for various purposes



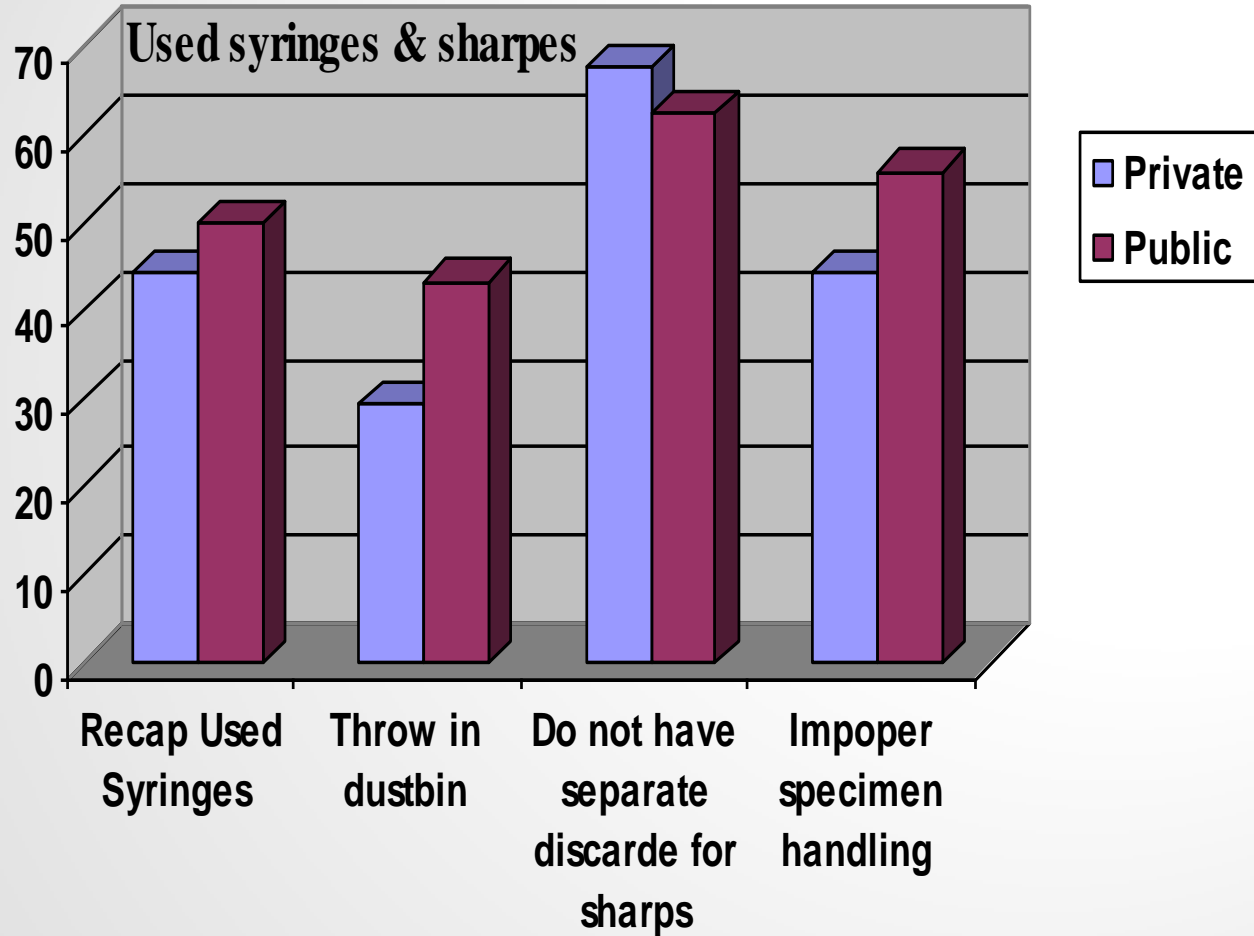


Figure 04: Handling and discarding procedures (percentages) of used syringes and sharpes.

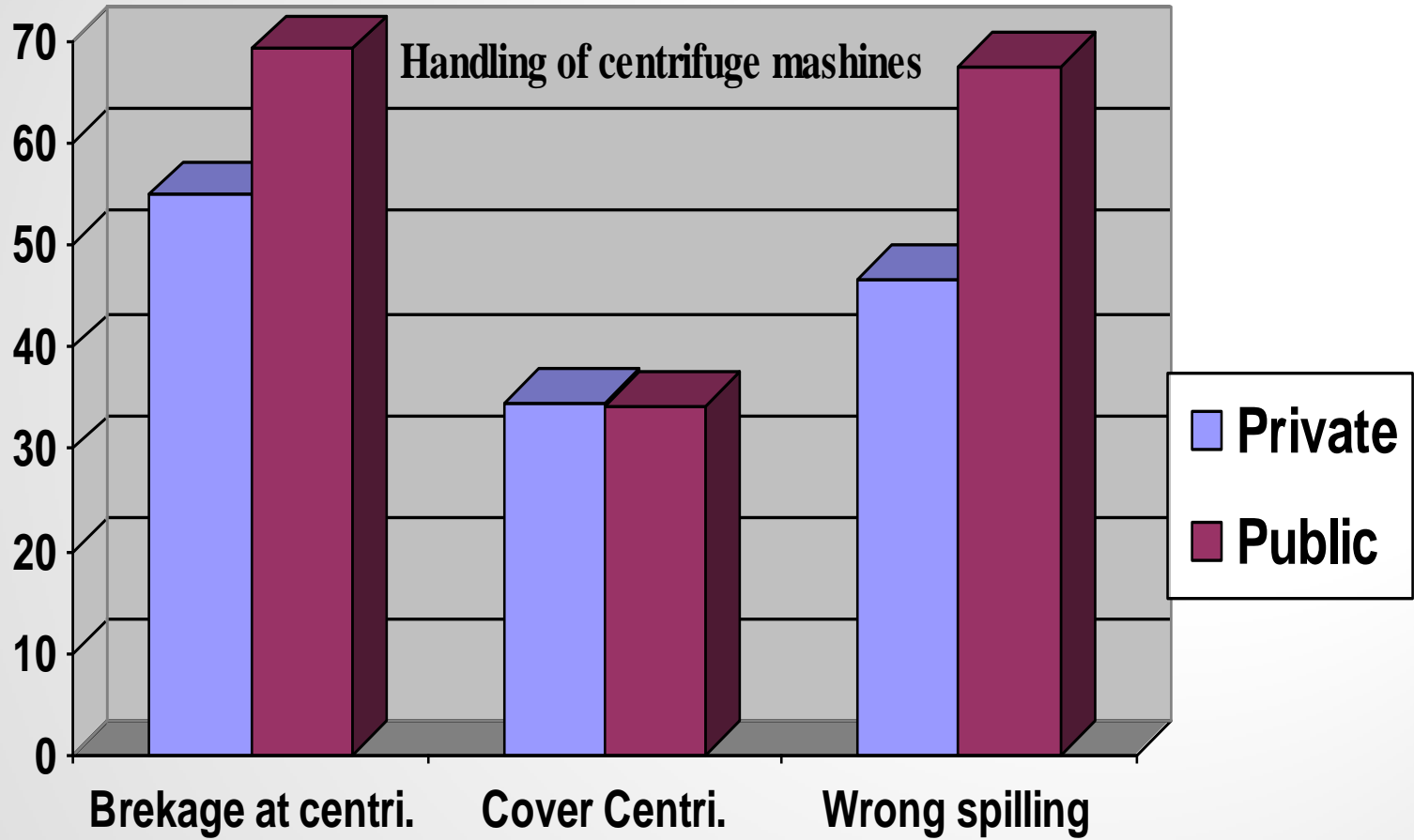


Figure 05: Bar represent improper centrifugating procedures followed during centrifugation.

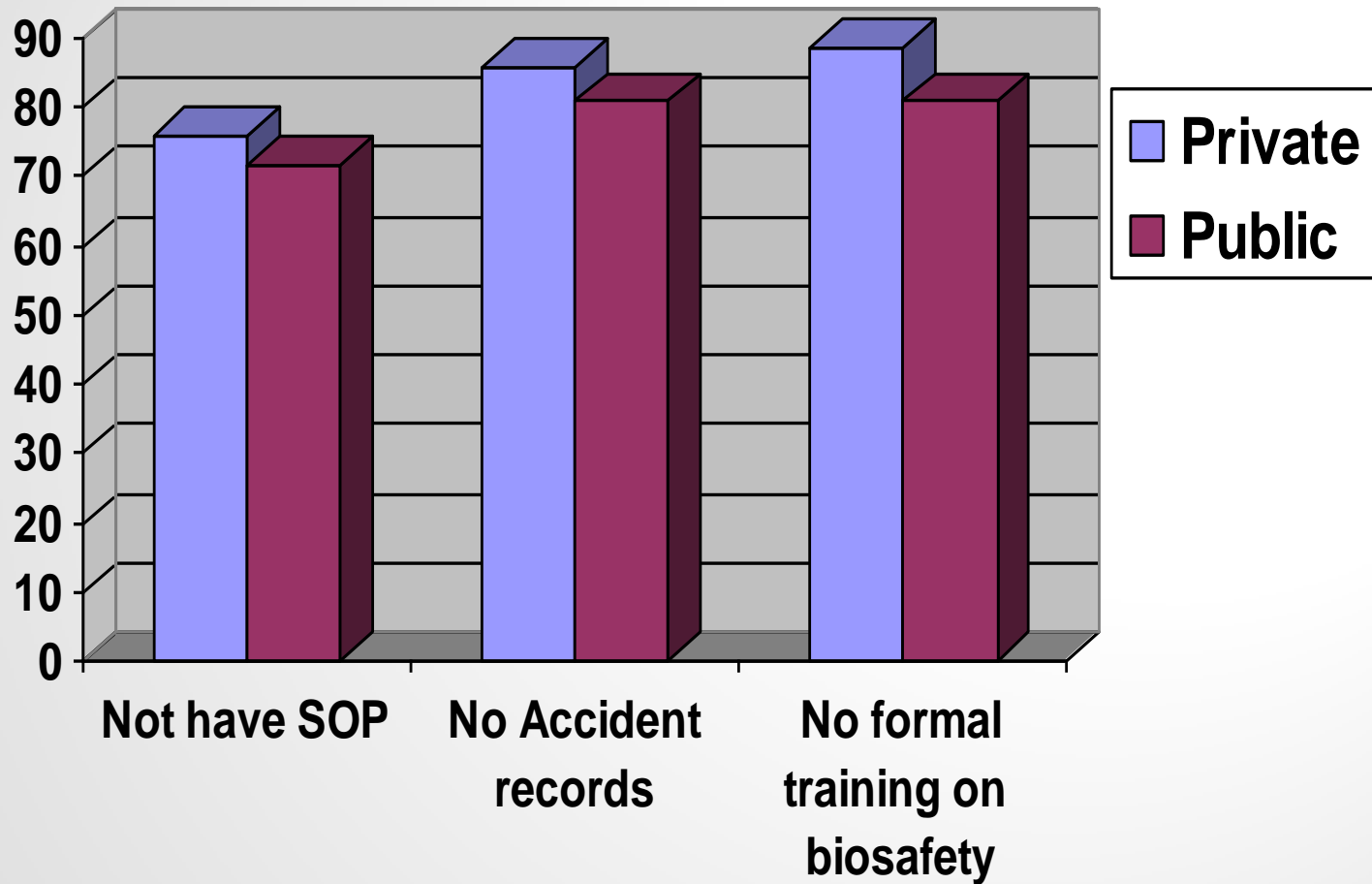


Figure 06 : Shows percentages regarding use of standard operating proceduers. accident records and training on biosafetv

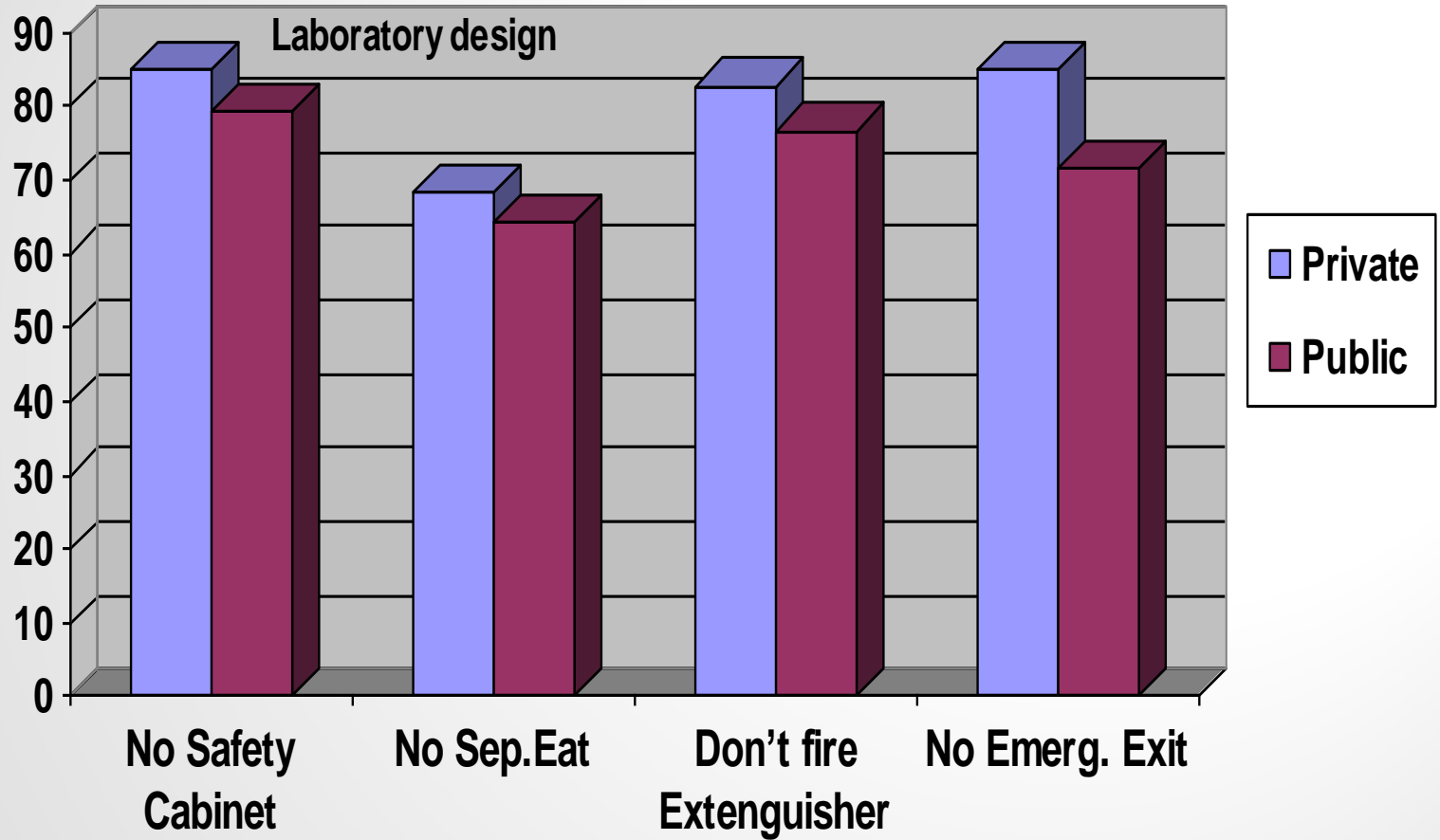


Figure 07 :Laboraory Design

Implementation of Biosafety

- ▶ All procedures with live agents and toxins performed inside the biosafety cabinet
- ▶ No work with open vessels on open bench to minimize aerosol generation
- ▶ Use of paper covering on work surface clean-up
- ▶ Use of appropriate disinfectant in cabinet and on other work surfaces
- ▶ Substitute plastic for glass
- ▶ Careful pipetting techniques
- ▶ Wash hands often
- ▶ No mouth pipetting
- ▶ No eating or drinking in lab
- ▶ Safe sharps handling
- ▶ Wear applicable PPE

Future Plans :

- The results of our awareness seminars , training workshops are encouraging but more hands on training workshops , seminars , international training programs for our scientists , graduate and postgraduate students , health care personnel to bring about the required level of know how about biosafety and biosecurity Capacity

Thank You Very Much

- **BSAP Master Trainers , participants and all members for the success of our activities .**
- **PMRC for financial assistance and for permission to continue it as a multi-center study throughout Pakistan. All private- and public-sector hospitals / Labs. are acknowledged for their consent help and cooperation .**
- **BSAP designed and implemented the survey project.**