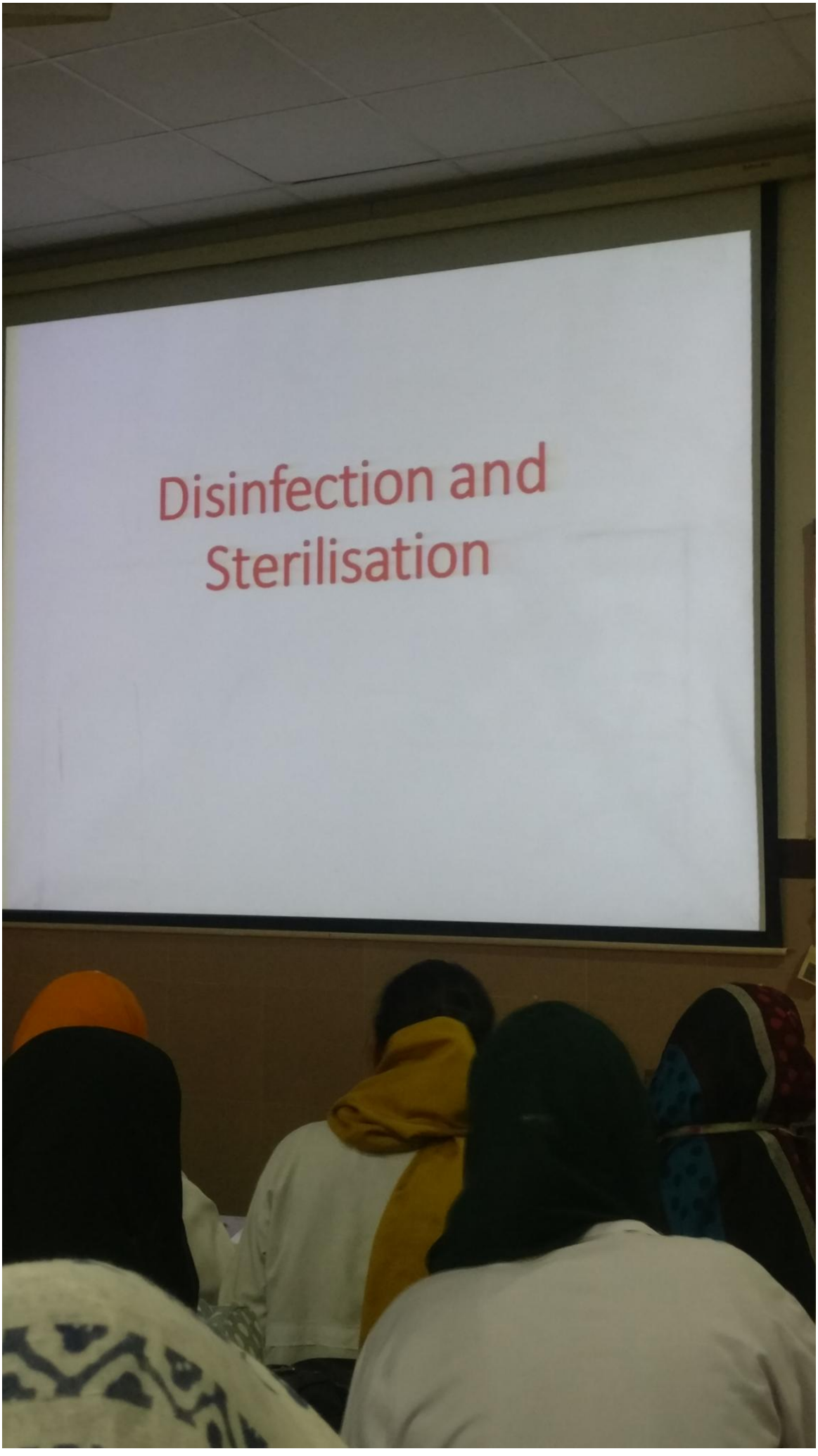
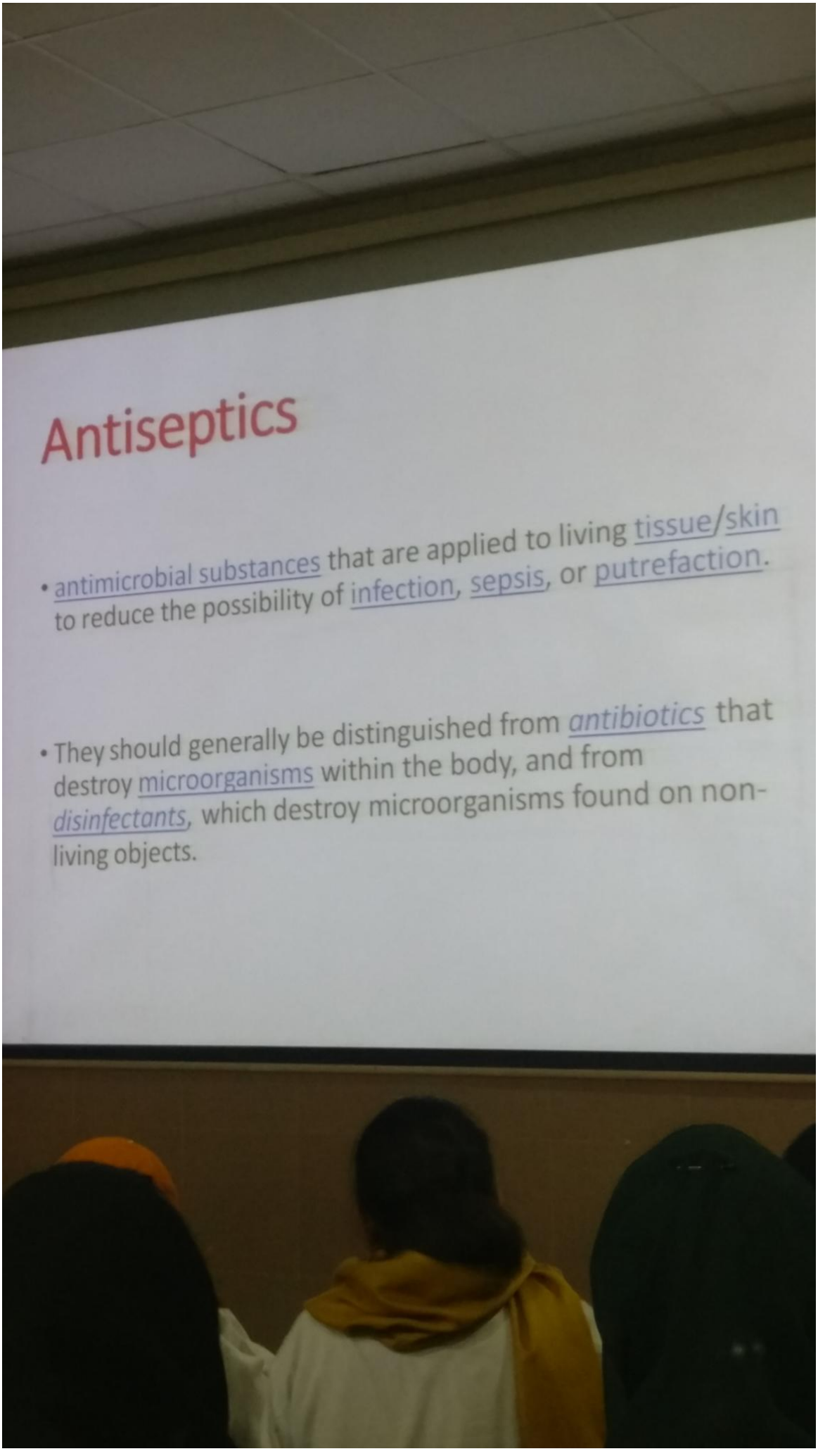
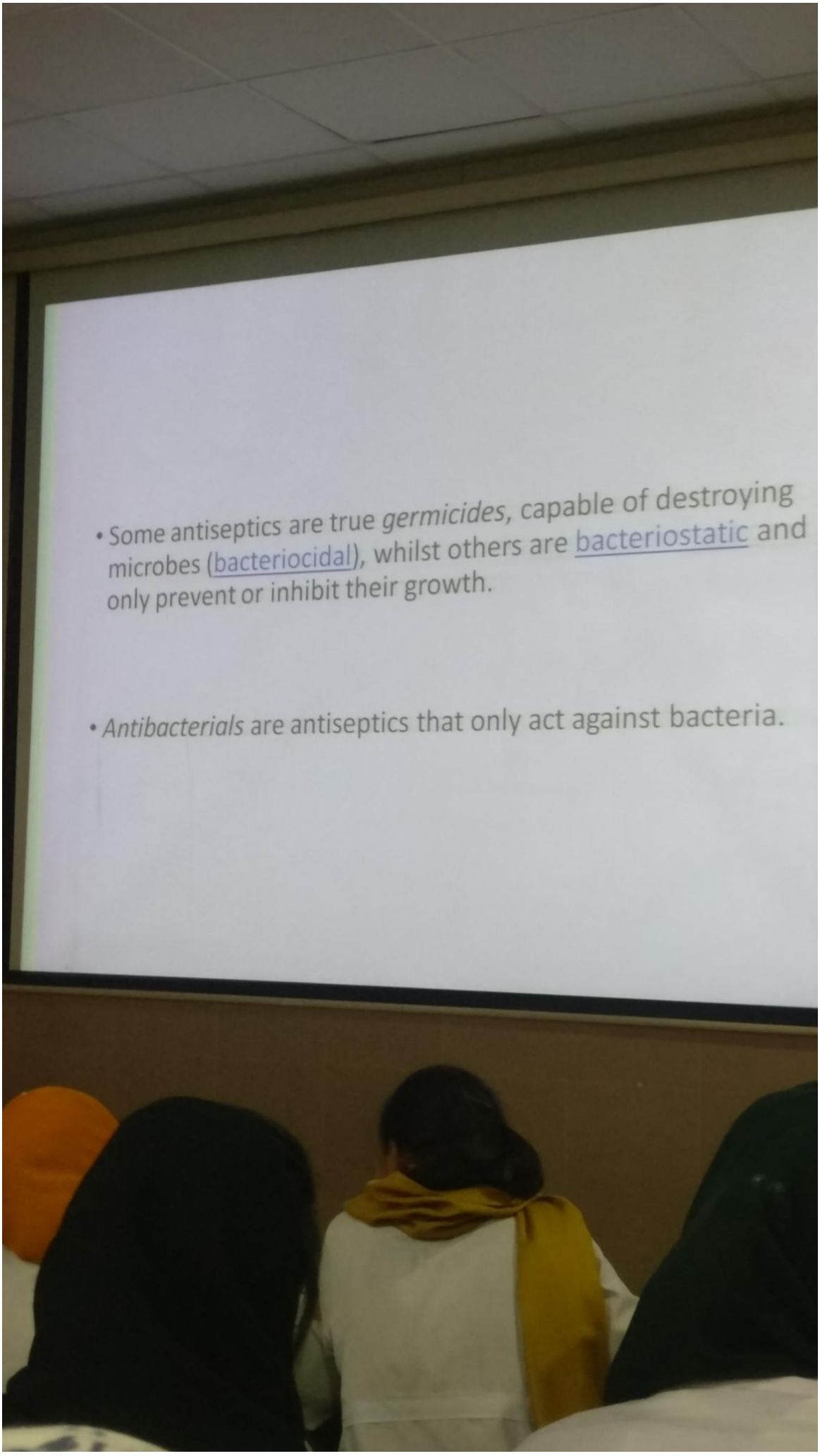
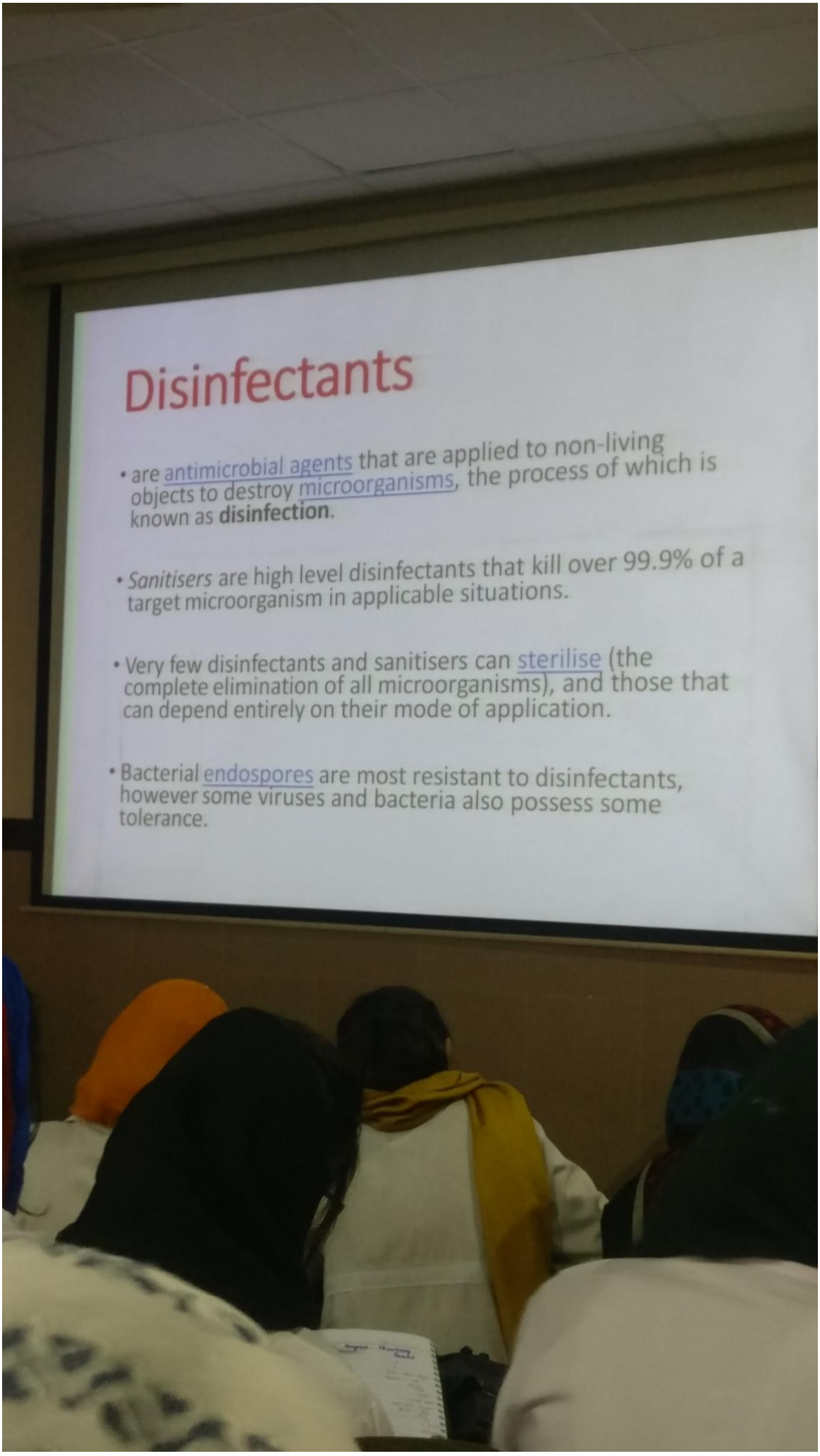
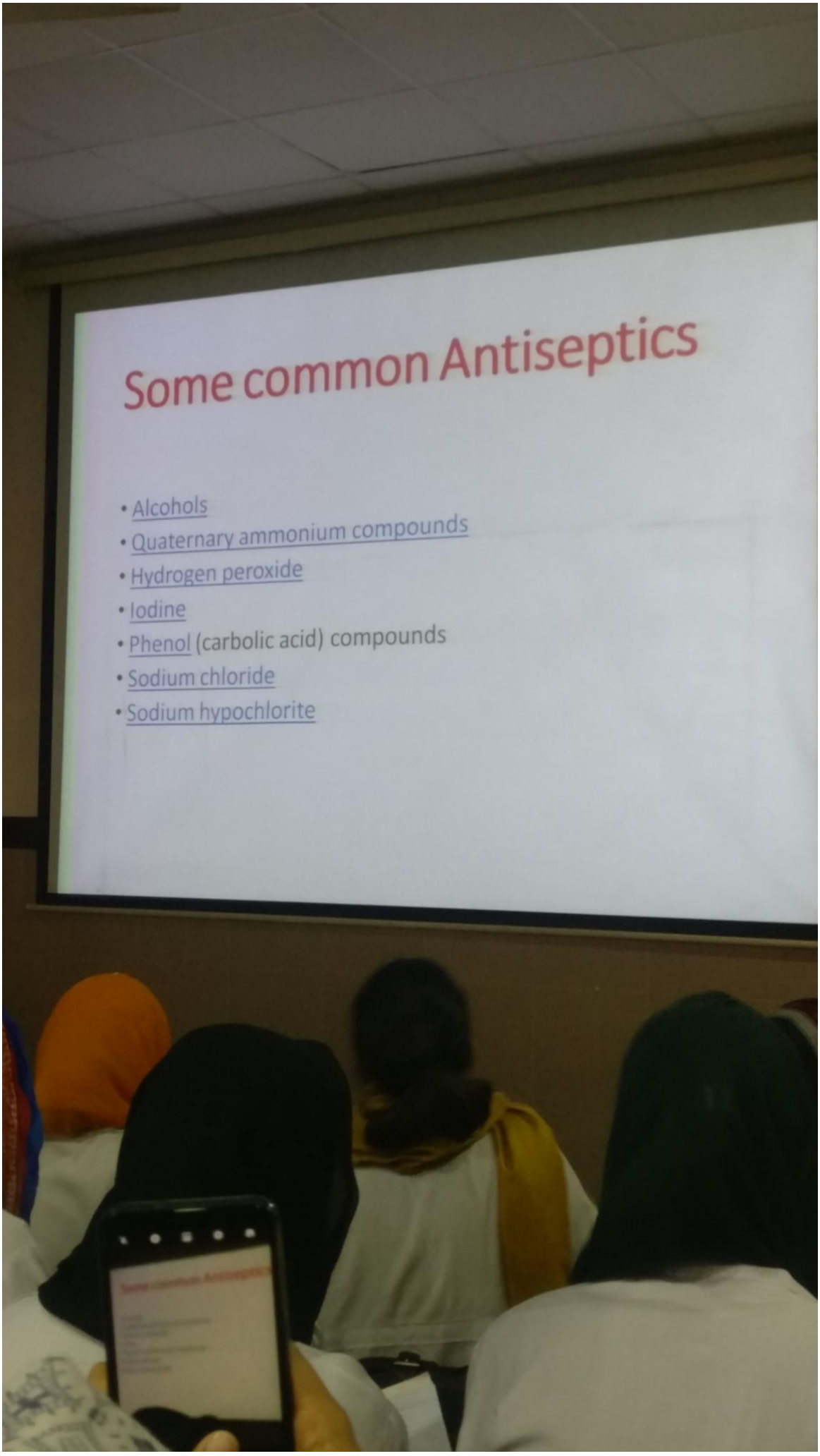
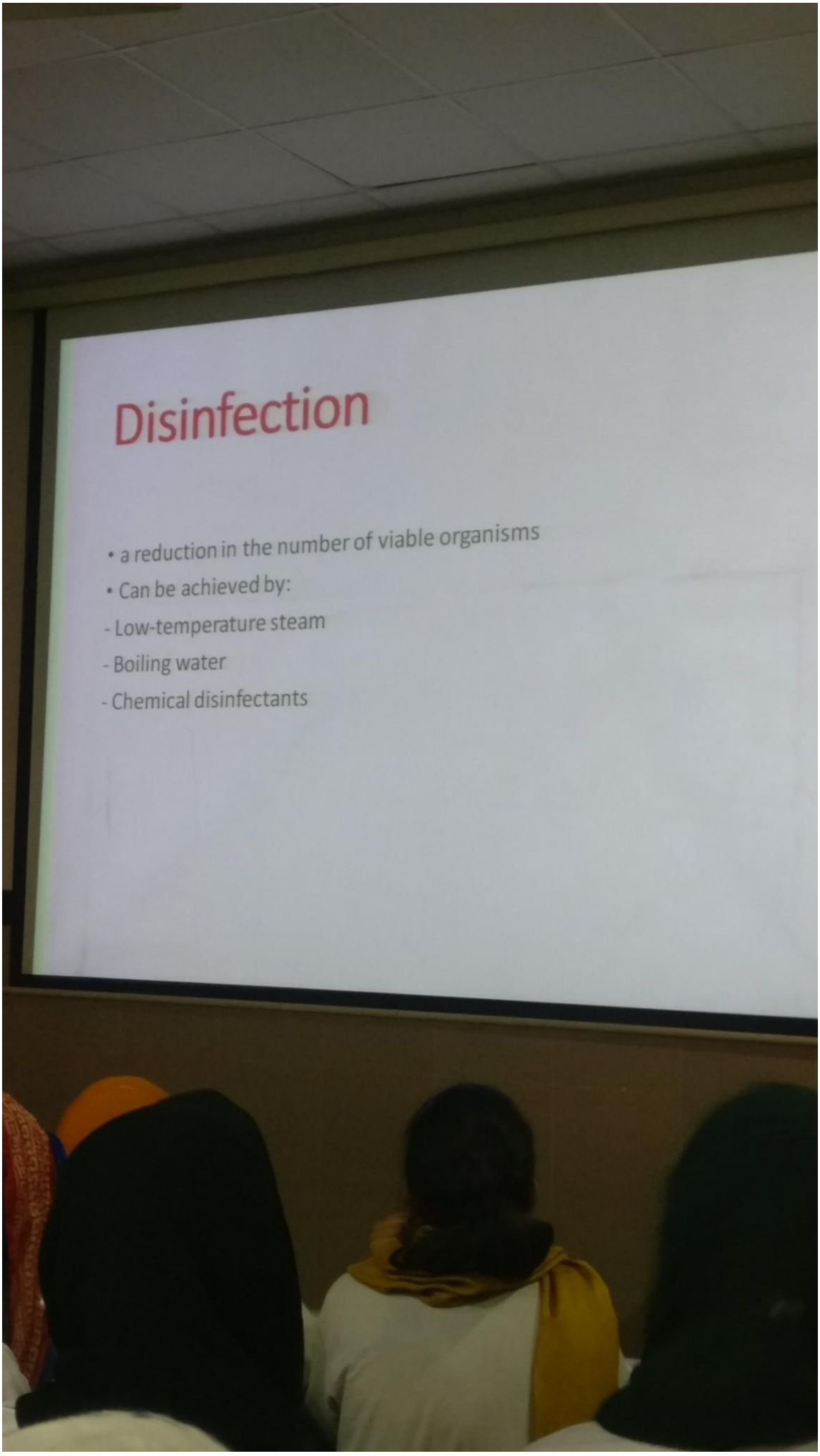

Disinfection and
Sterilisation

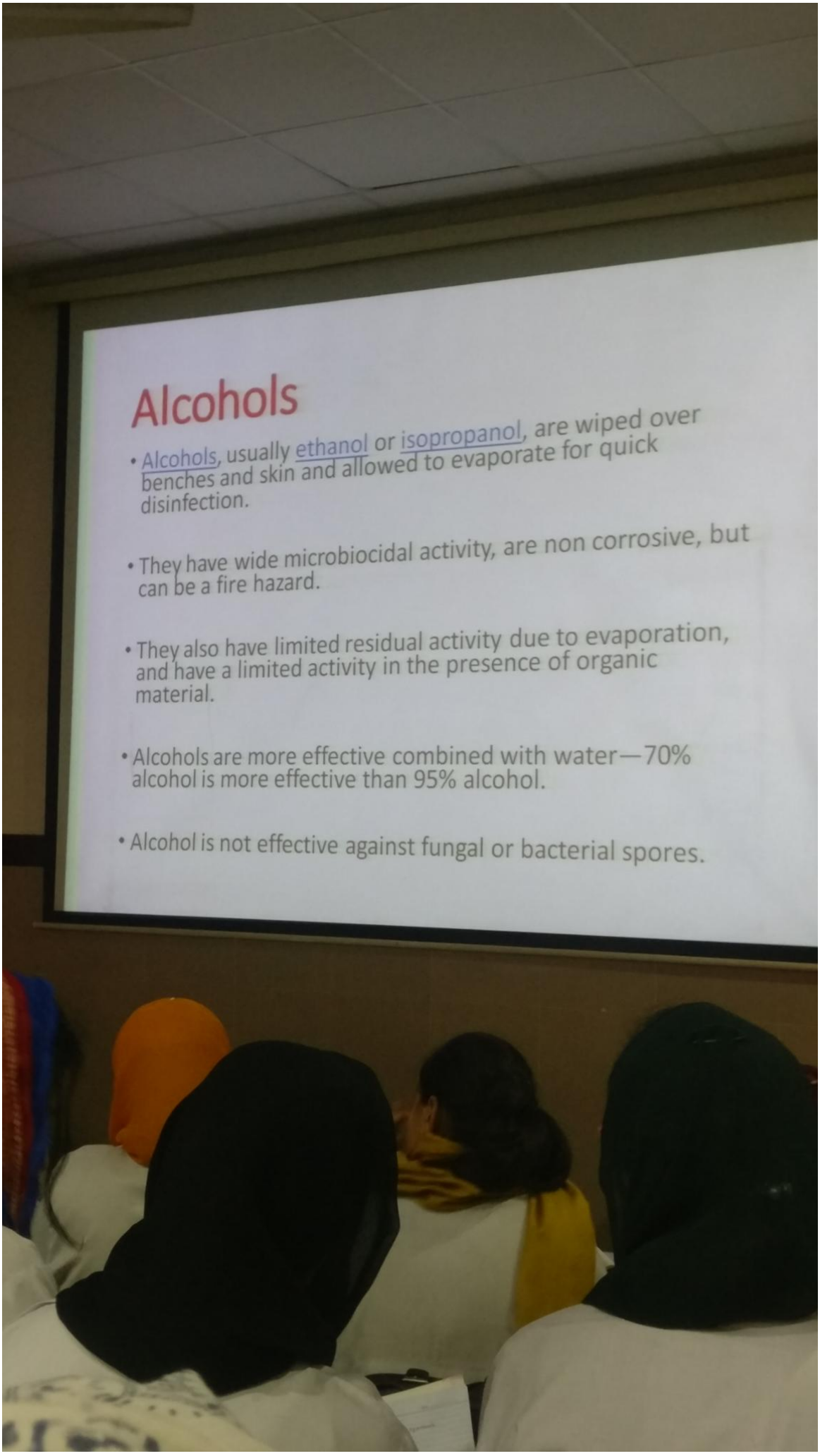

Antiseptics
• antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis, or putrefaction.
• They should generally be distinguished from antibiotics that destroy microorganisms within the body, and from disinfectants, which destroy microorganisms found on non-living objects.

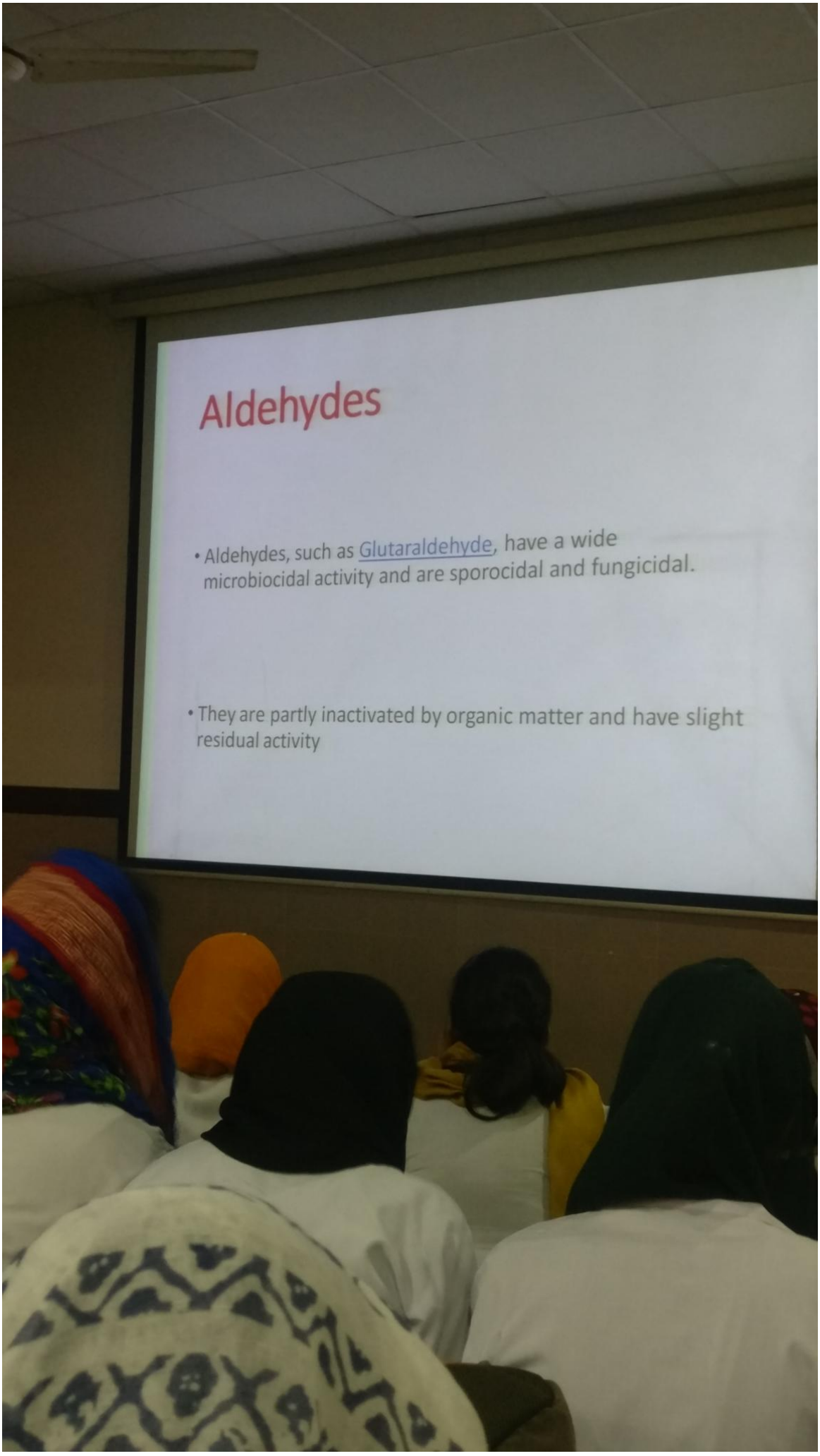

• Some antiseptics are true *germicides*, capable of destroying microbes (bacteriocidal), whilst others are bacteriostatic and only prevent or inhibit their growth.
• *Antibacterials* are antiseptics that only act against bacteria.

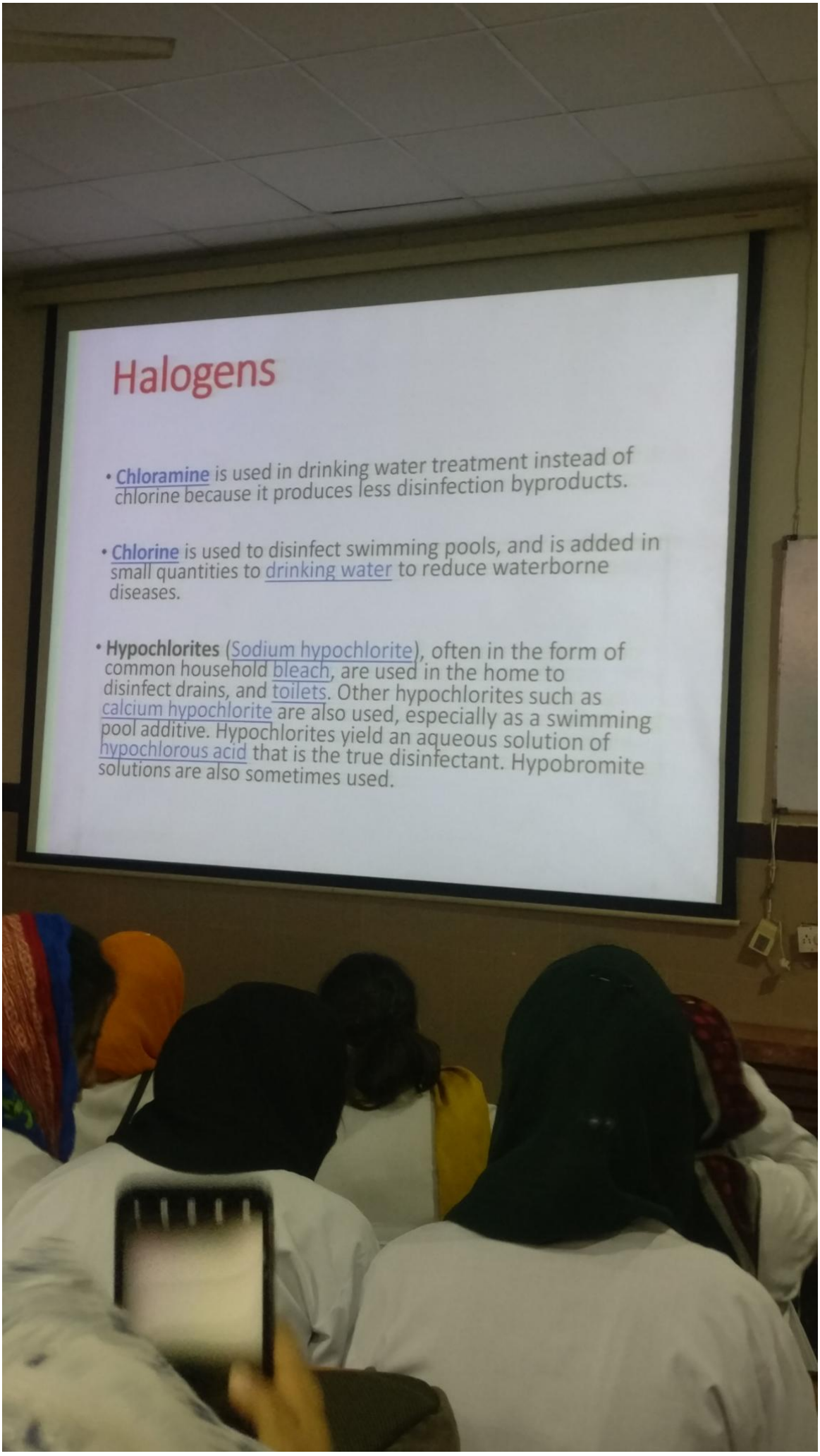

Disinfectants
• are antimicrobial agents that are applied to non-living objects to destroy microorganisms, the process of which is known as **disinfection**.
• *Sanitisers* are high level disinfectants that kill over 99.9% of a target microorganism in applicable situations.
• Very few disinfectants and sanitisers can sterilise (the complete elimination of all microorganisms), and those that can depend entirely on their mode of application.
• Bacterial endospores are most resistant to disinfectants, however some viruses and bacteria also possess some tolerance.

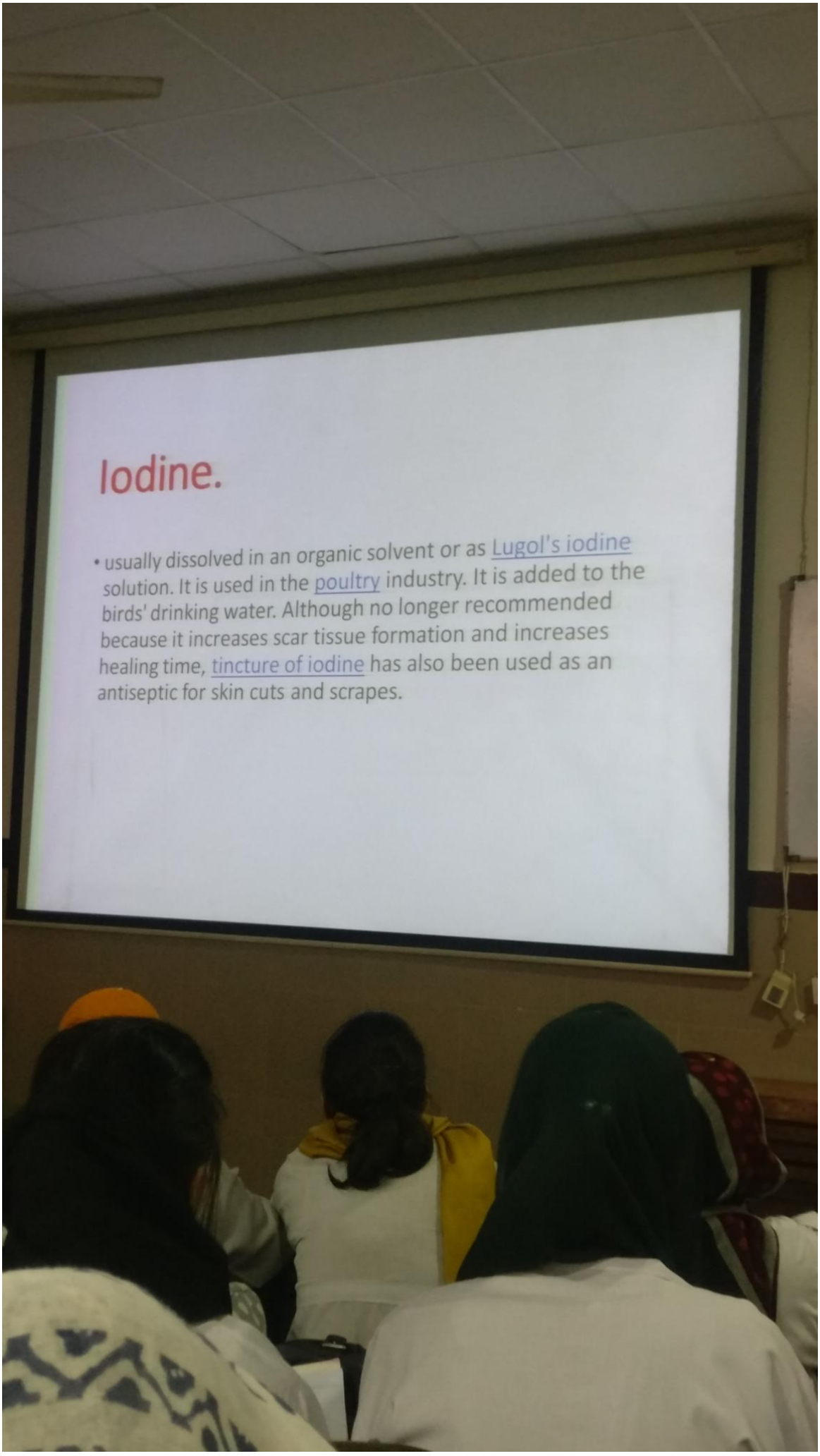

Some common Antiseptics
• Alcohols
• Quaternary ammonium compounds
• Hydrogen peroxide
• Iodine
• Phenol (carbolic acid) compounds
• Sodium chloride
• Sodium hypochlorite

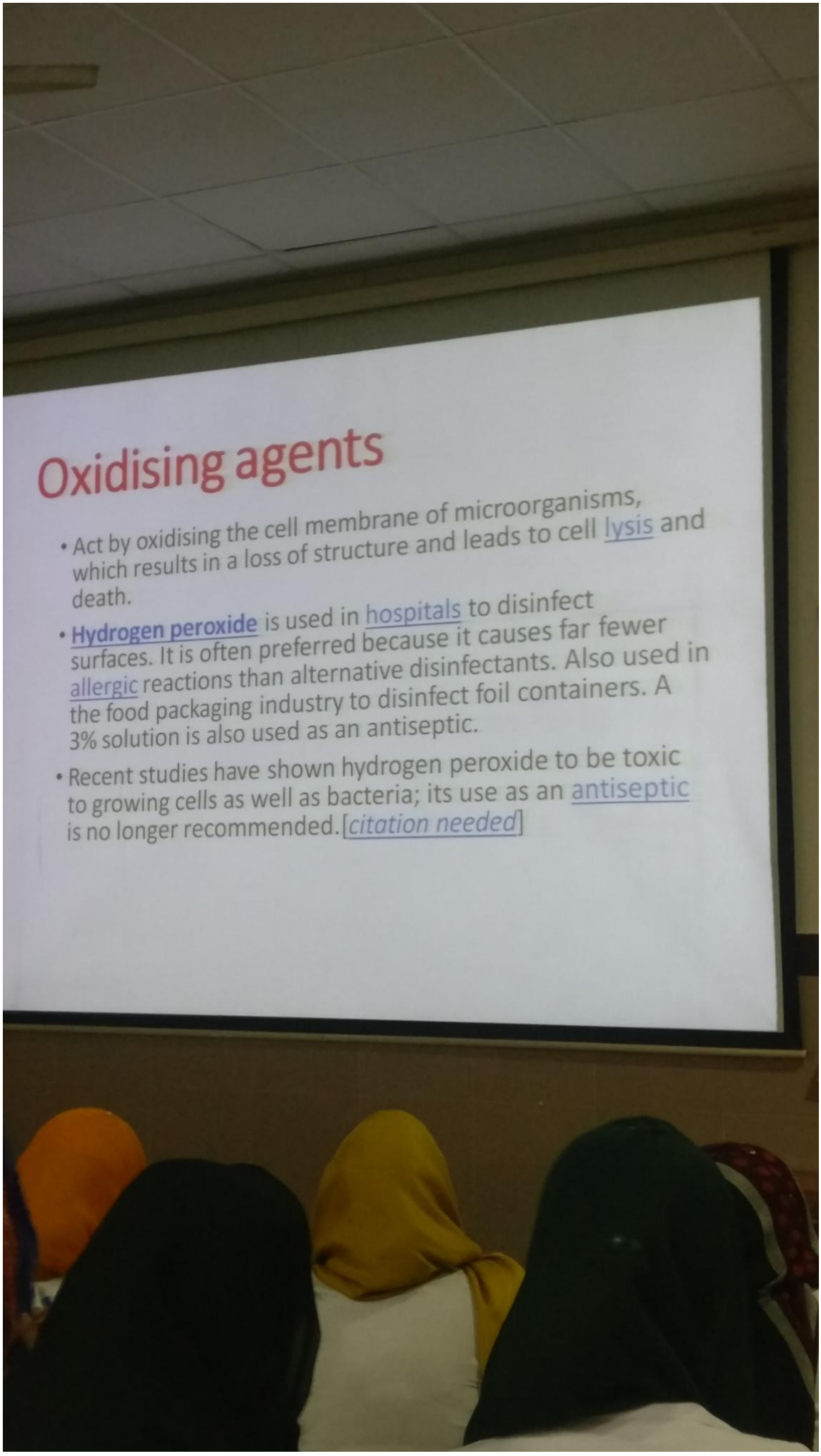

Disinfection
• a reduction in the number of viable organisms
• Can be achieved by:
- Low-temperature steam
- Boiling water
- Chemical disinfectants

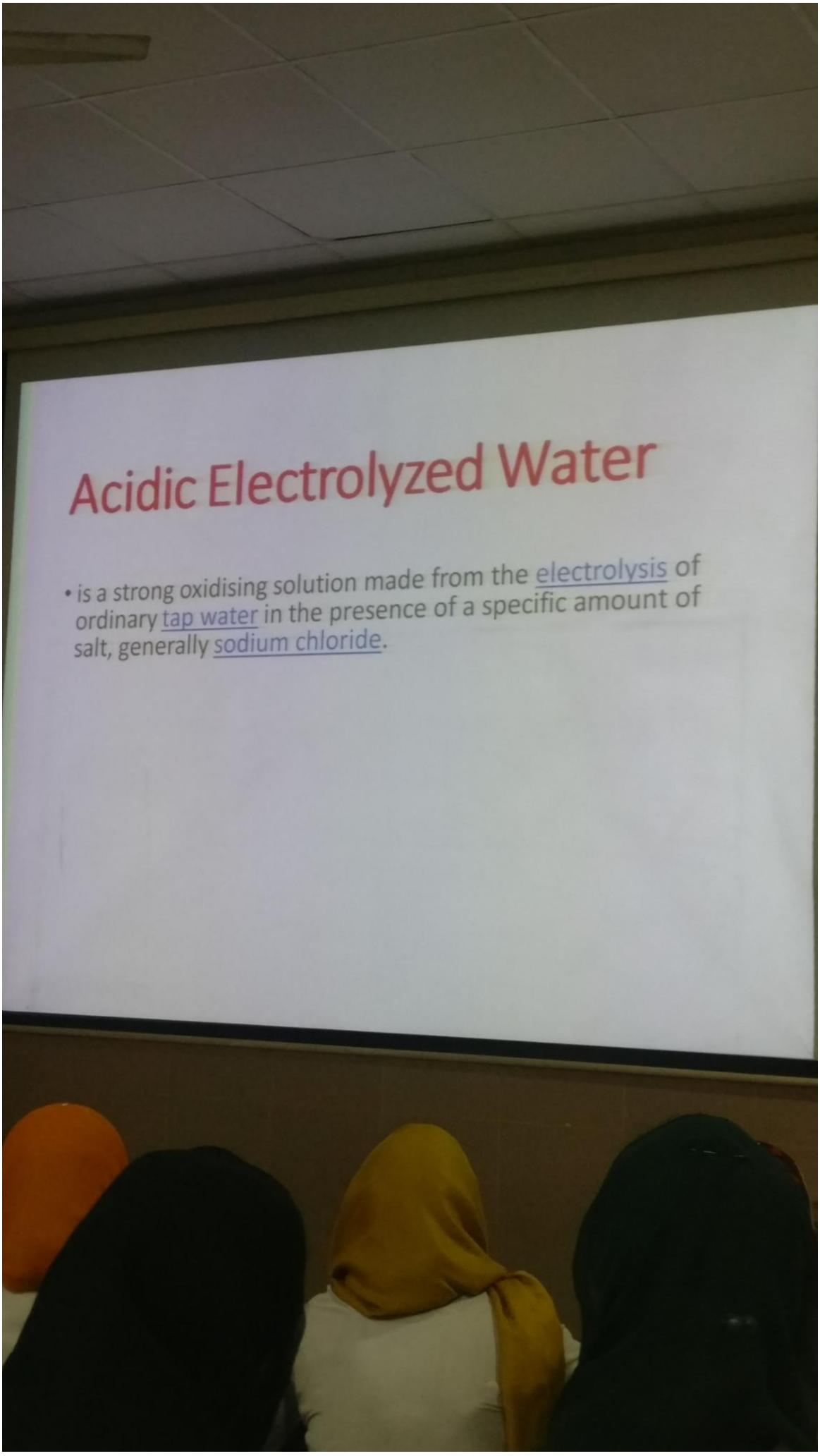

Alcohols
• Alcohols, usually ethanol or isopropanol, are wiped over benches and skin and allowed to evaporate for quick disinfection.
• They have wide microbiocidal activity, are non corrosive, but can be a fire hazard.
• They also have limited residual activity due to evaporation, and have a limited activity in the presence of organic material.
• Alcohols are more effective combined with water—70% alcohol is more effective than 95% alcohol.
• Alcohol is not effective against fungal or bacterial spores.

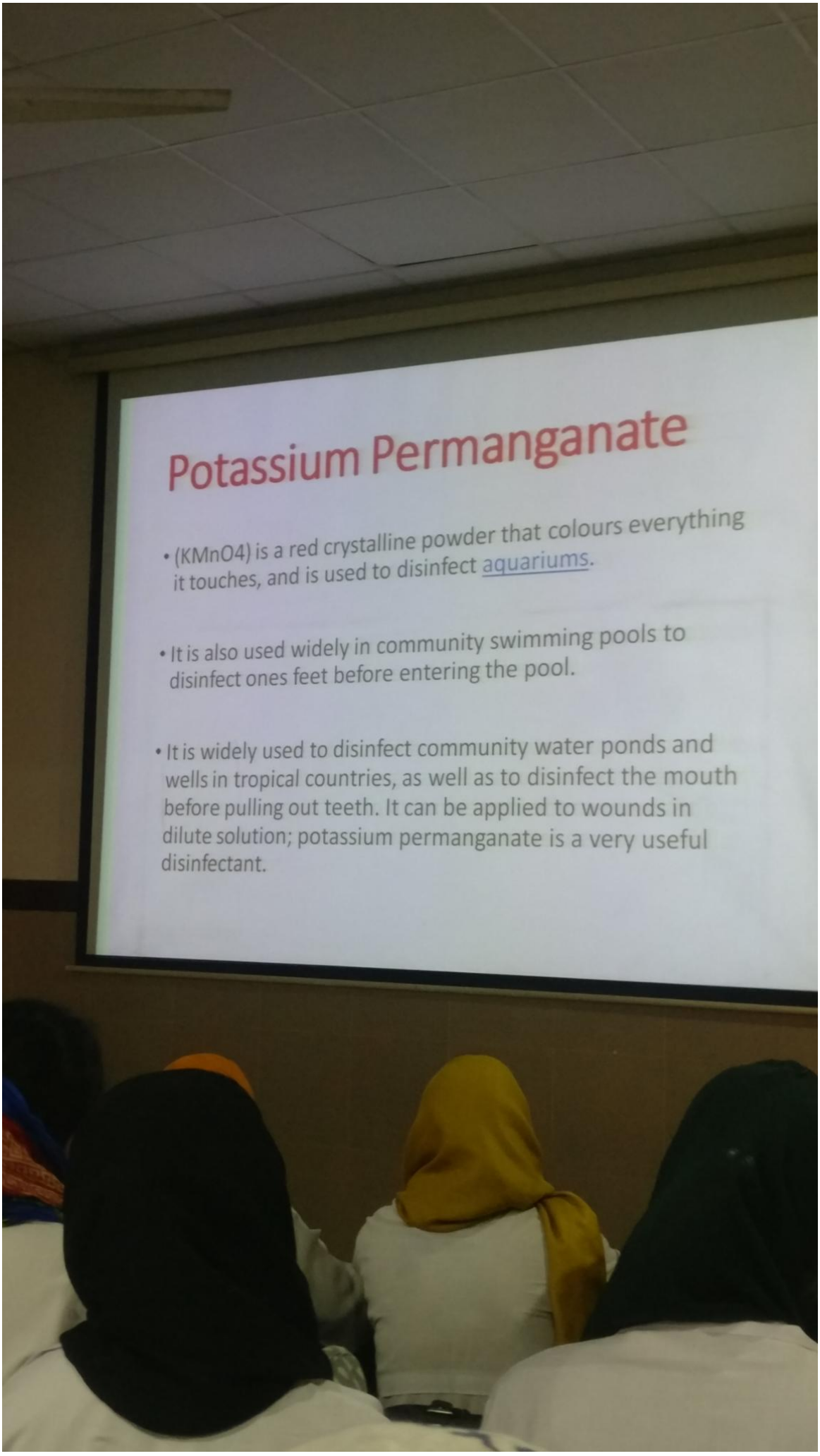

Aldehydes
• Aldehydes, such as Glutaraldehyde, have a wide microbiocidal activity and are sporocidal and fungicidal.
• They are partly inactivated by organic matter and have slight residual activity

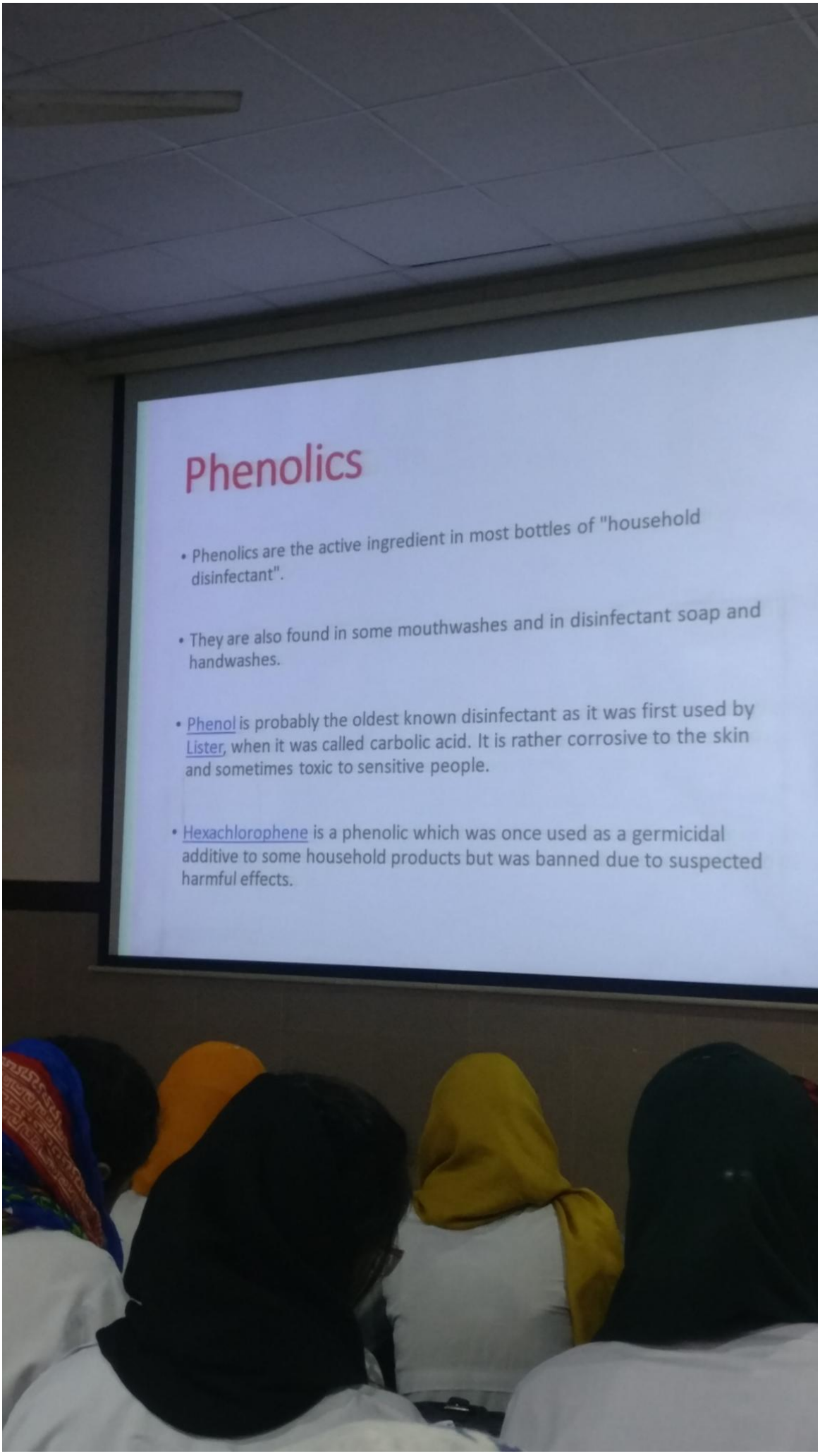

Halogens
• Chloramine is used in drinking water treatment instead of chlorine because it produces less disinfection byproducts.
• Chlorine is used to disinfect swimming pools, and is added in small quantities to drinking water to reduce waterborne diseases.
• Hypochlorites (Sodium hypochlorite), often in the form of common household bleach, are used in the home to disinfect drains, and toilets. Other hypochlorites such as calcium hypochlorite are also used, especially as a swimming pool additive. Hypochlorites yield an aqueous solution of hypochlorous acid that is the true disinfectant. Hypobromite solutions are also sometimes used.

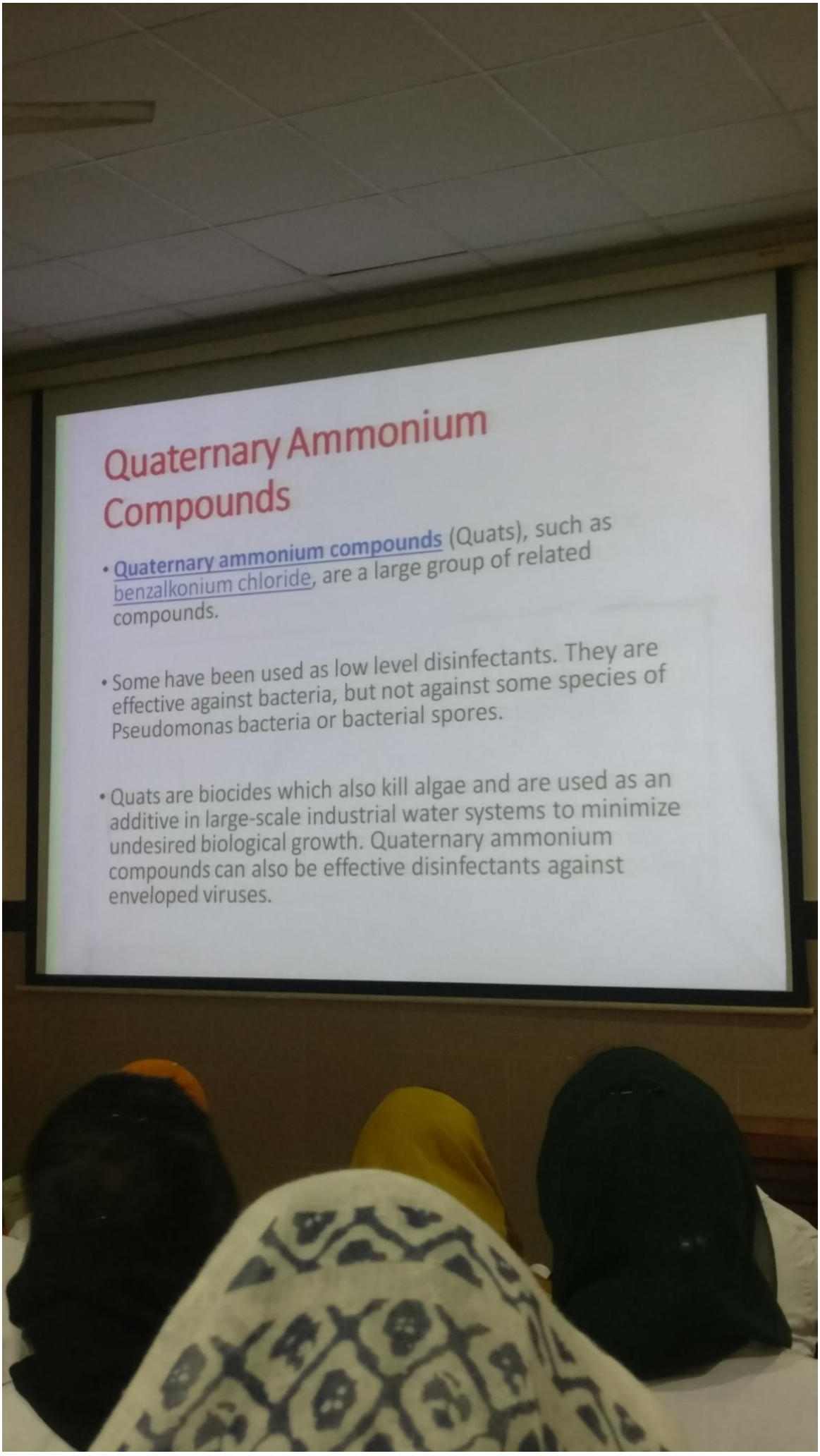

Iodine.
• usually dissolved in an organic solvent or as Lugol's iodine solution. It is used in the poultry industry. It is added to the birds' drinking water. Although no longer recommended because it increases scar tissue formation and increases healing time, tincture of iodine has also been used as an antiseptic for skin cuts and scrapes.

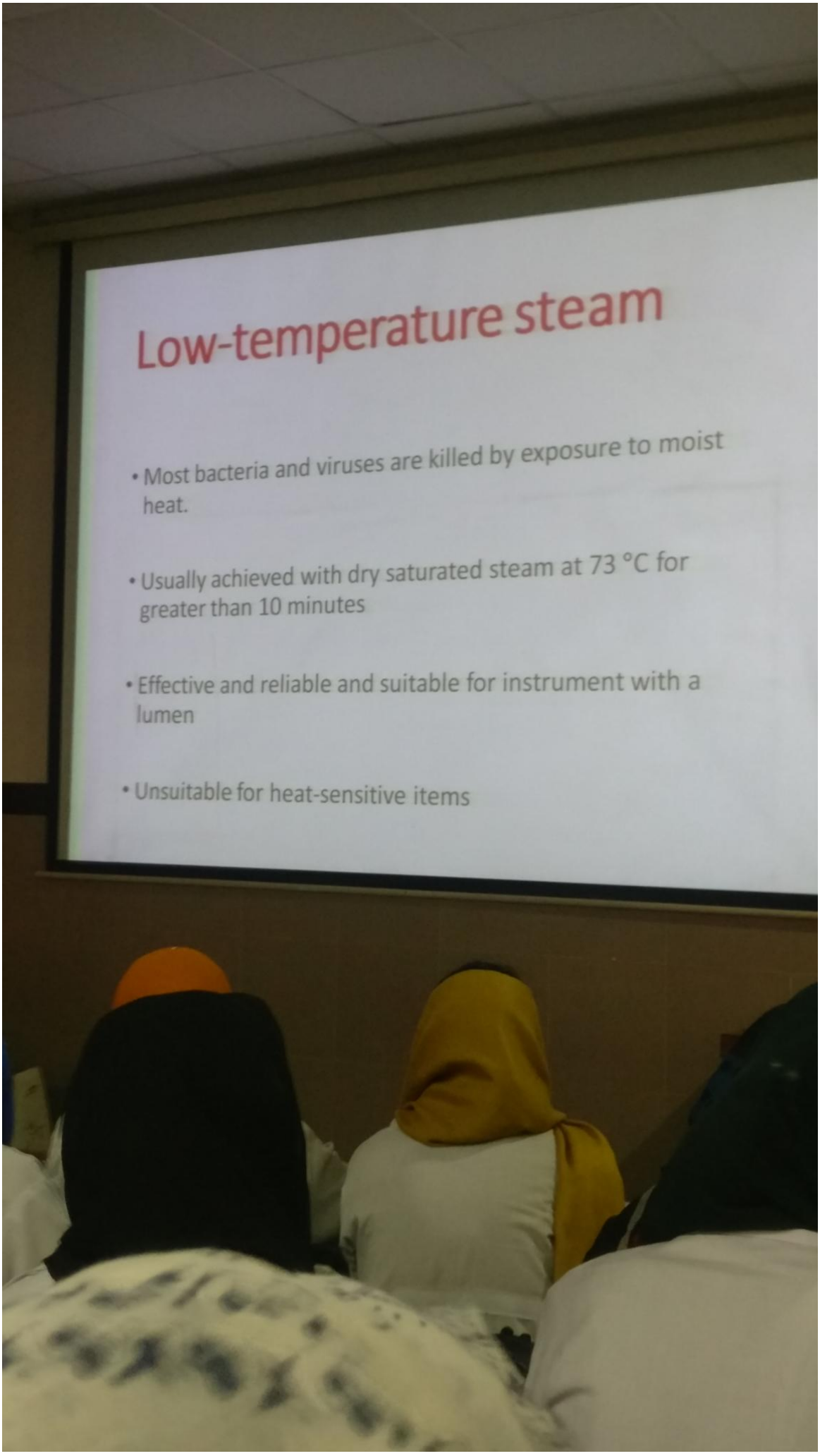

Oxidising agents
• Act by oxidising the cell membrane of microorganisms, which results in a loss of structure and leads to cell lysis and death.
• Hydrogen peroxide is used in hospitals to disinfect surfaces. It is often preferred because it causes far fewer allergic reactions than alternative disinfectants. Also used in the food packaging industry to disinfect foil containers. A 3% solution is also used as an antiseptic.
• Recent studies have shown hydrogen peroxide to be toxic to growing cells as well as bacteria; its use as an antiseptic is no longer recommended.[citation needed]

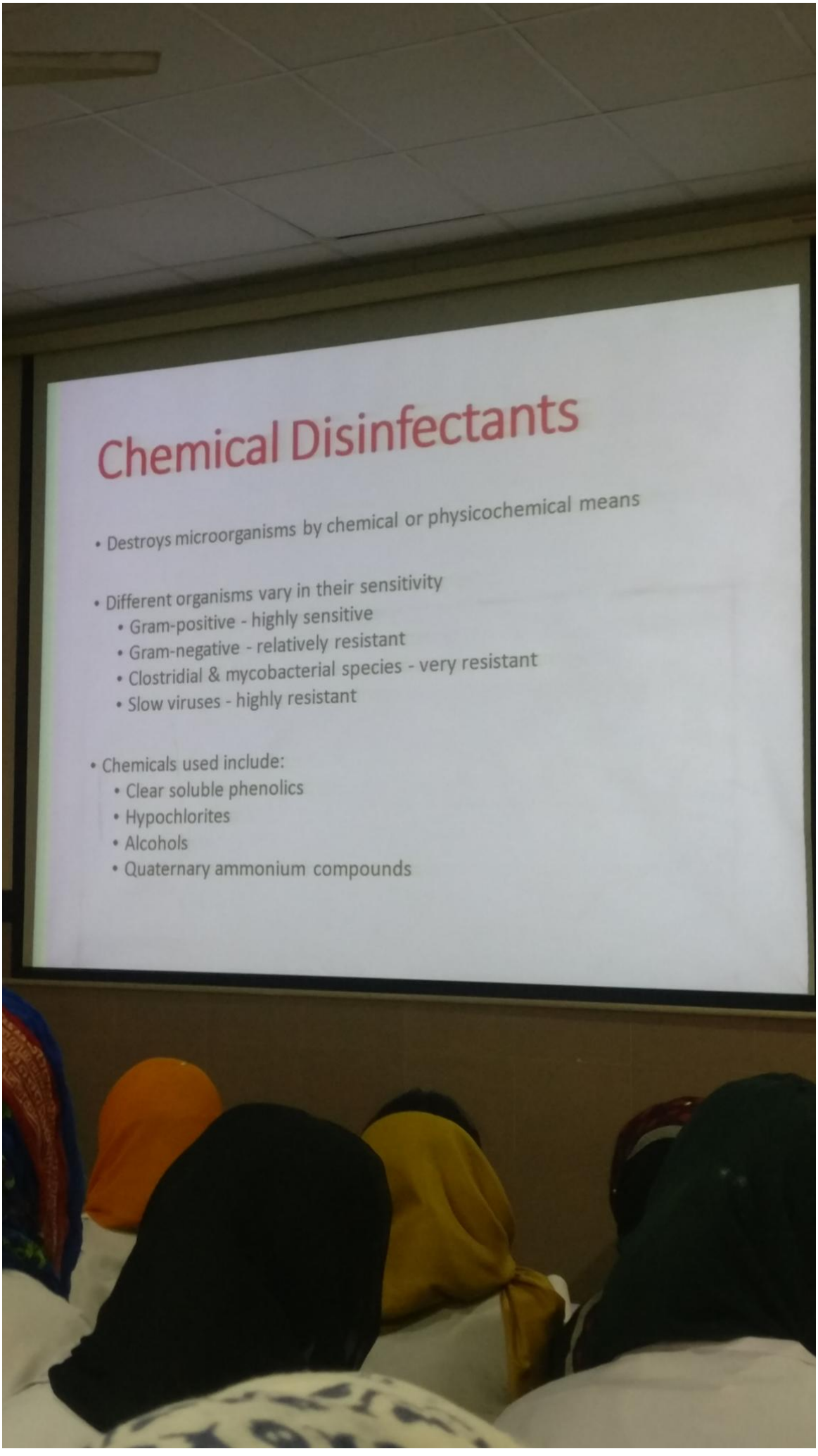

Acidic Electrolyzed Water
• is a strong oxidising solution made from the electrolysis of ordinary tap water in the presence of a specific amount of salt, generally sodium chloride.

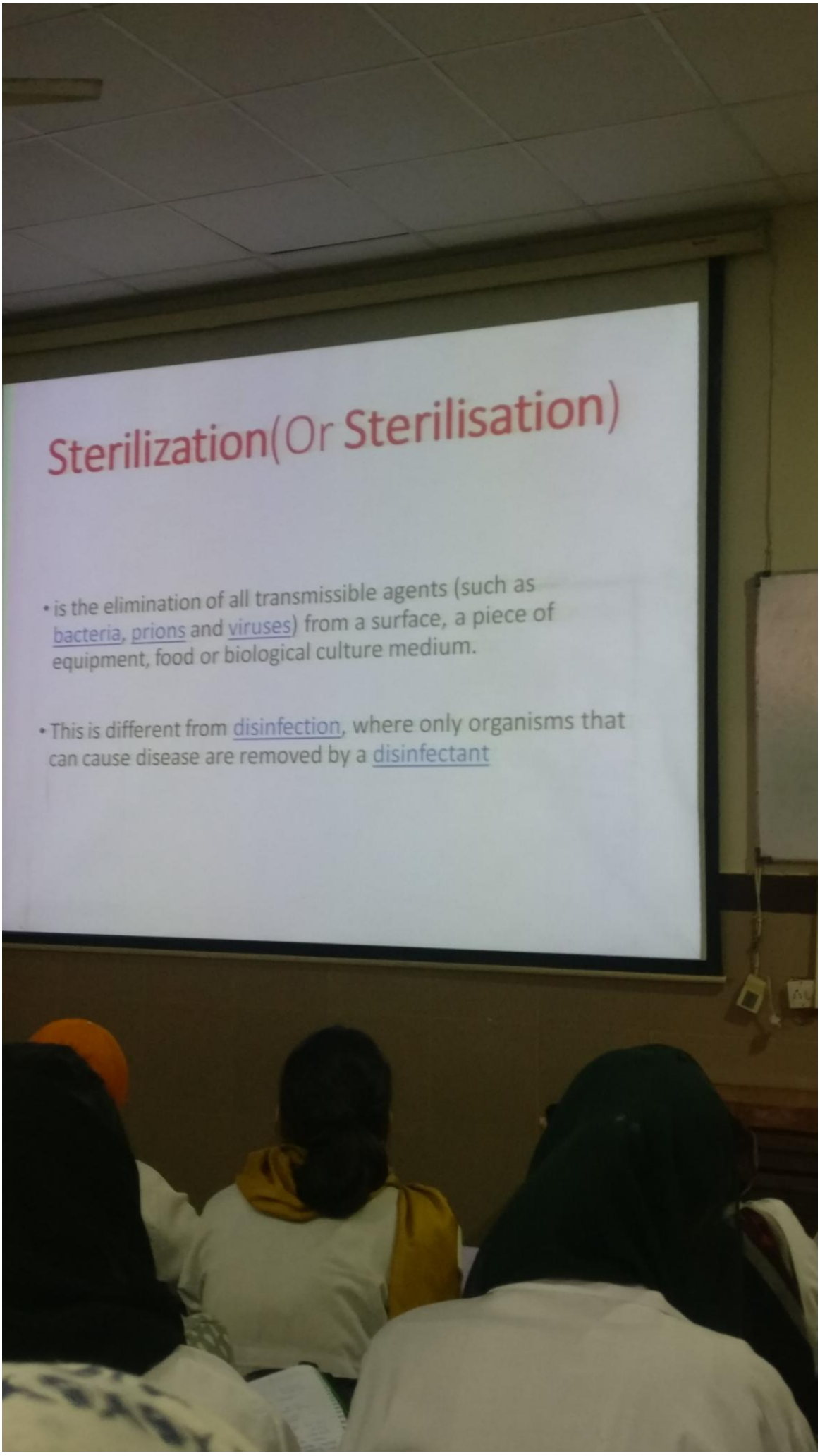

Potassium Permanganate
• (KMnO4) is a red crystalline powder that colours everything it touches, and is used to disinfect aquariums.
• It is also used widely in community swimming pools to disinfect ones feet before entering the pool.
• It is widely used to disinfect community water ponds and wells in tropical countries, as well as to disinfect the mouth before pulling out teeth. It can be applied to wounds in dilute solution; potassium permanganate is a very useful disinfectant.

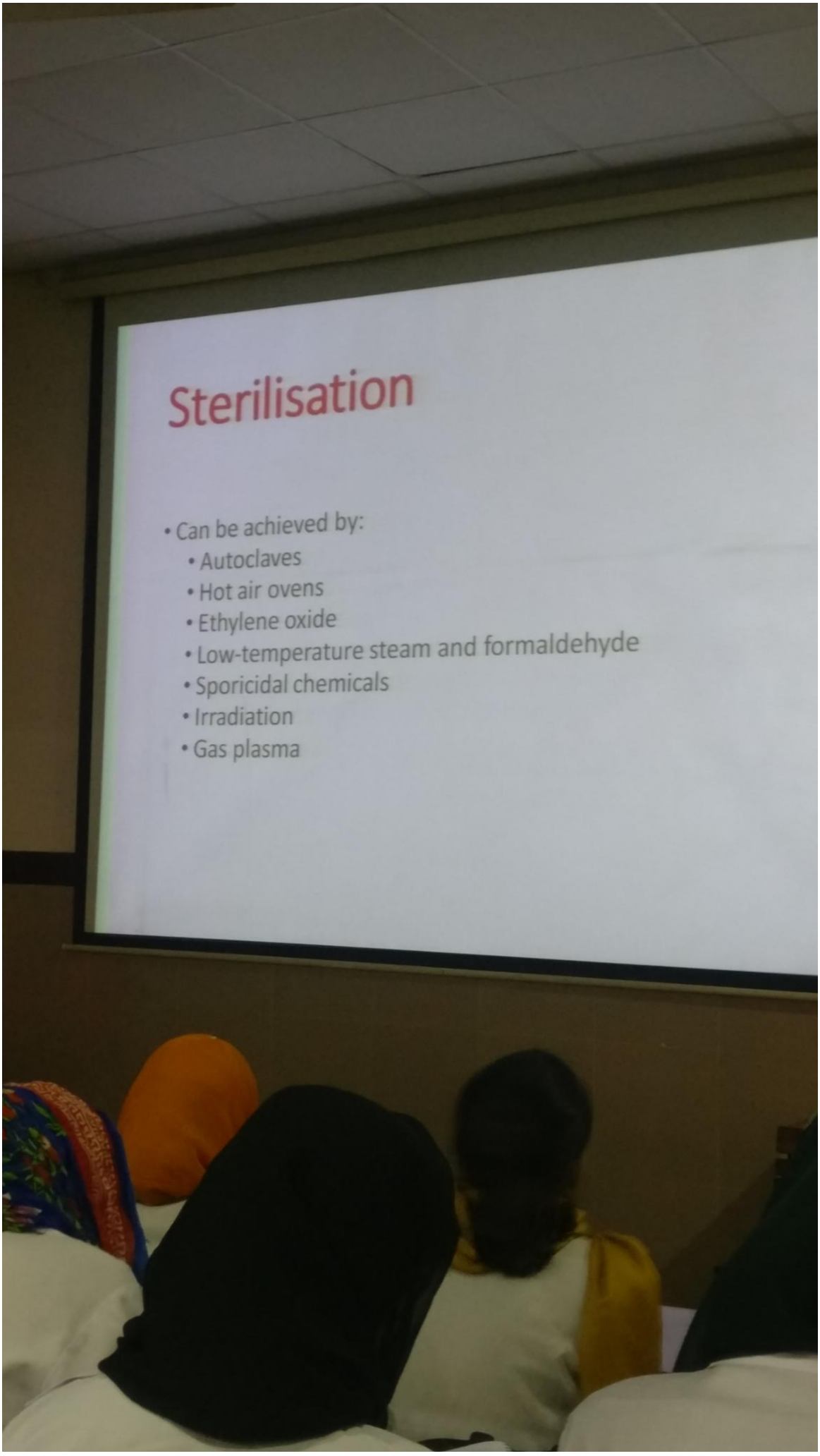

Phenolics
• Phenolics are the active ingredient in most bottles of "household disinfectant".
• They are also found in some mouthwashes and in disinfectant soap and handwashes.
• Phenol is probably the oldest known disinfectant as it was first used by Lister, when it was called carbolic acid. It is rather corrosive to the skin and sometimes toxic to sensitive people.
• Hexachlorophene is a phenolic which was once used as a germicidal additive to some household products but was banned due to suspected harmful effects.

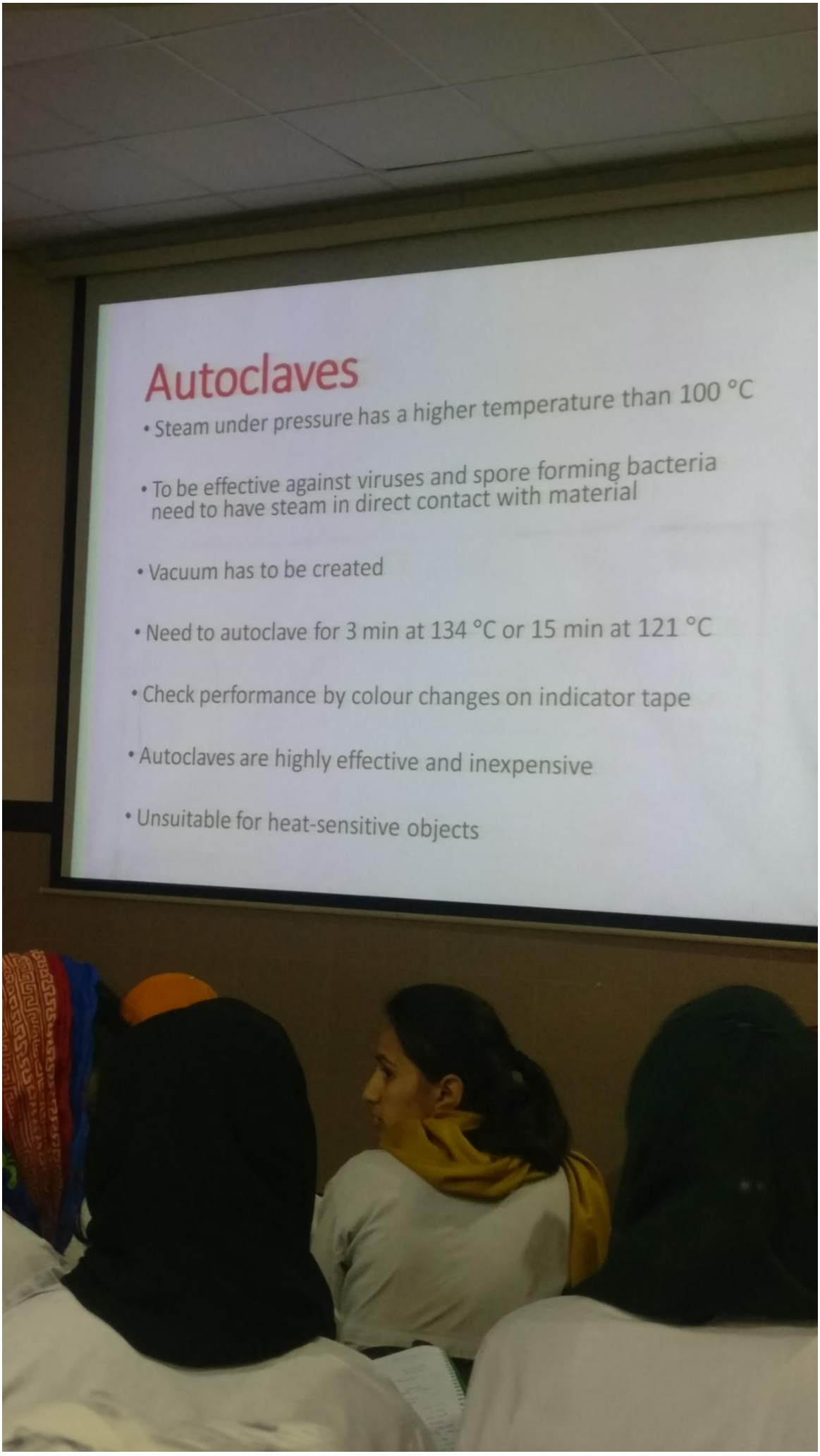

Quaternary Ammonium Compounds
• Quaternary ammonium compounds (Quats), such as benzalkonium chloride, are a large group of related compounds.
• Some have been used as low level disinfectants. They are effective against bacteria, but not against some species of Pseudomonas bacteria or bacterial spores.
• Quats are biocides which also kill algae and are used as an additive in large-scale industrial water systems to minimize undesired biological growth. Quaternary ammonium compounds can also be effective disinfectants against enveloped viruses.


Low-temperature steam
• Most bacteria and viruses are killed by exposure to moist heat.
• Usually achieved with dry saturated steam at 73 °C for greater than 10 minutes
• Effective and reliable and suitable for instrument with a lumen
• Unsuitable for heat-sensitive items

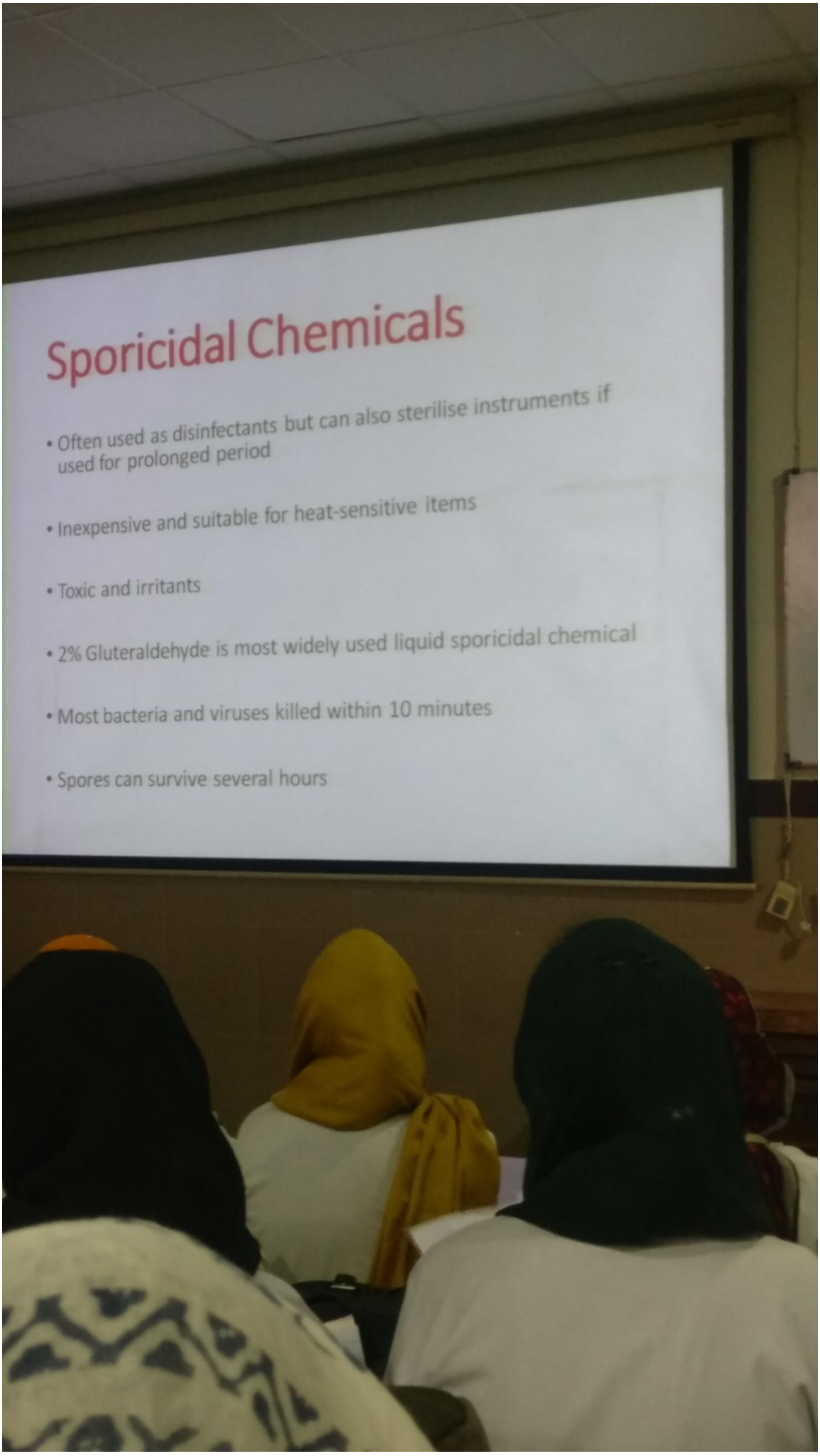

Chemical Disinfectants
• Destroys microorganisms by chemical or physicochemical means
• Different organisms vary in their sensitivity
• Gram-positive - highly sensitive
• Gram-negative - relatively resistant
• Clostridial & mycobacterial species - very resistant
• Slow viruses - highly resistant
• Chemicals used include:
• Clear soluble phenolics
• Hypochlorites
• Alcohols
• Quaternary ammonium compounds

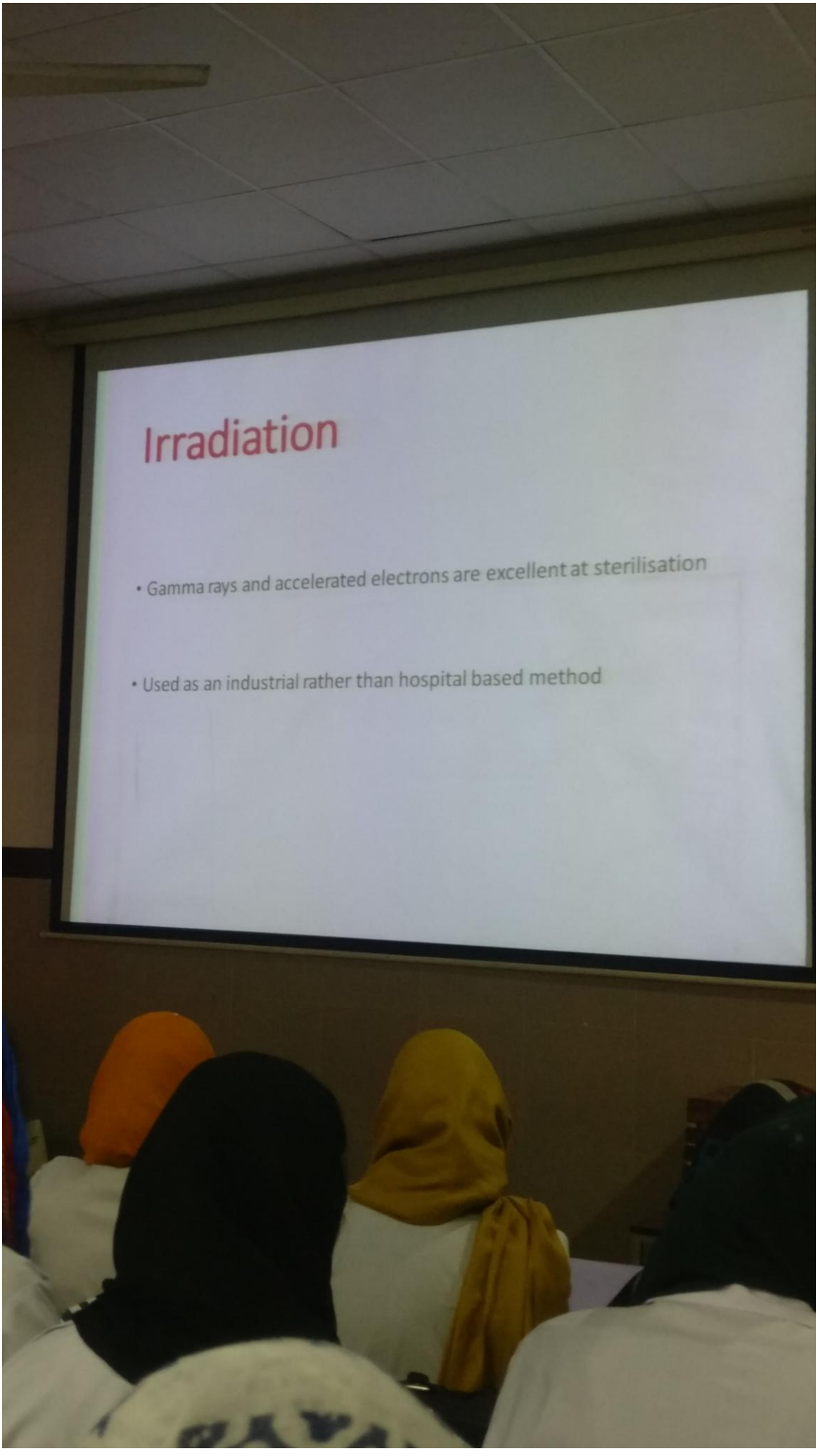

Sterilization(Or Sterilisation)
• is the elimination of all transmissible agents (such as bacteria, prions and viruses) from a surface, a piece of equipment, food or biological culture medium.
• This is different from disinfection, where only organisms that can cause disease are removed by a disinfectant

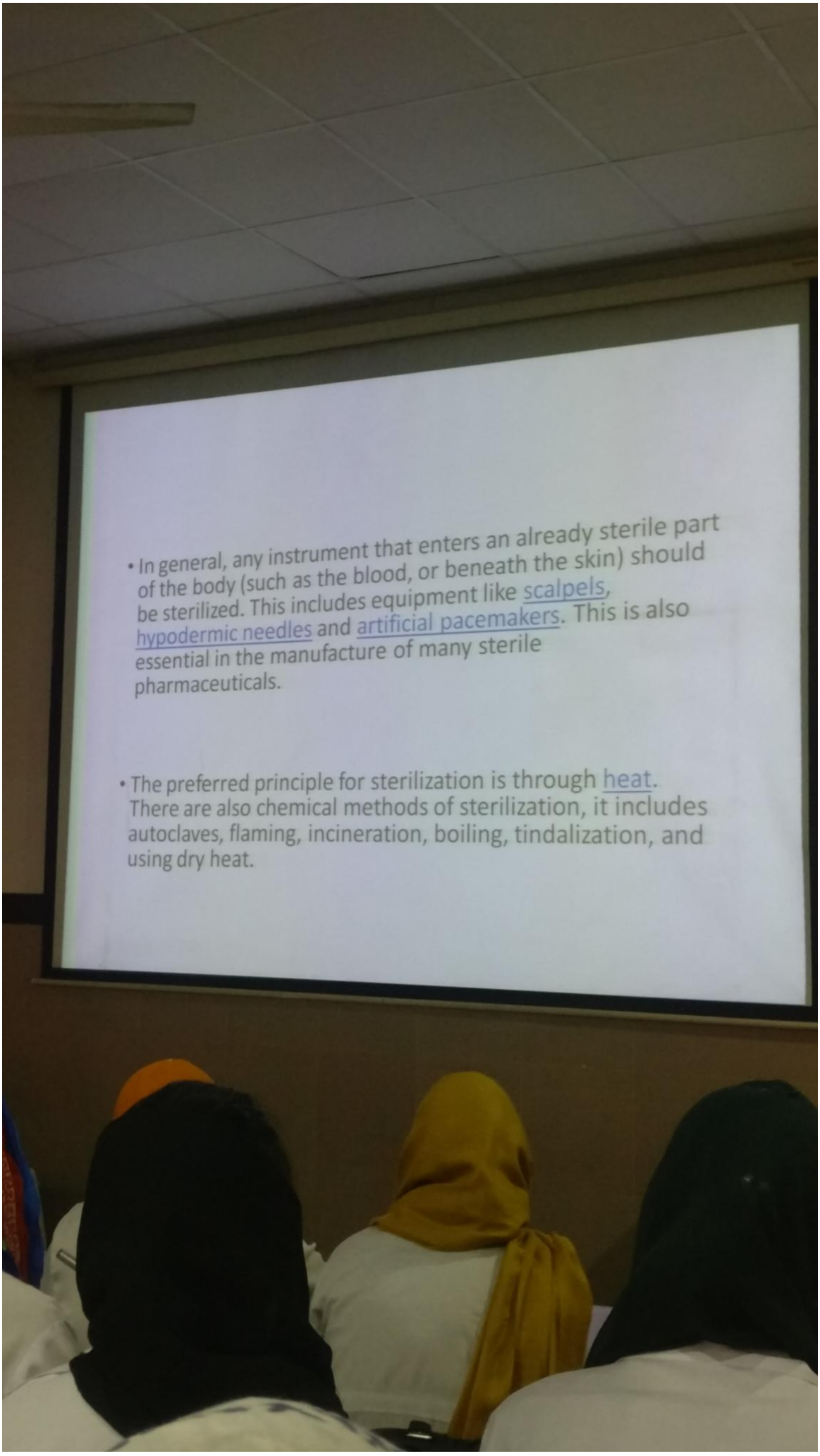

Sterilisation
• Can be achieved by:
• Autoclaves
• Hot air ovens
• Ethylene oxide
• Low-temperature steam and formaldehyde
• Sporicidal chemicals
• Irradiation
• Gas plasma

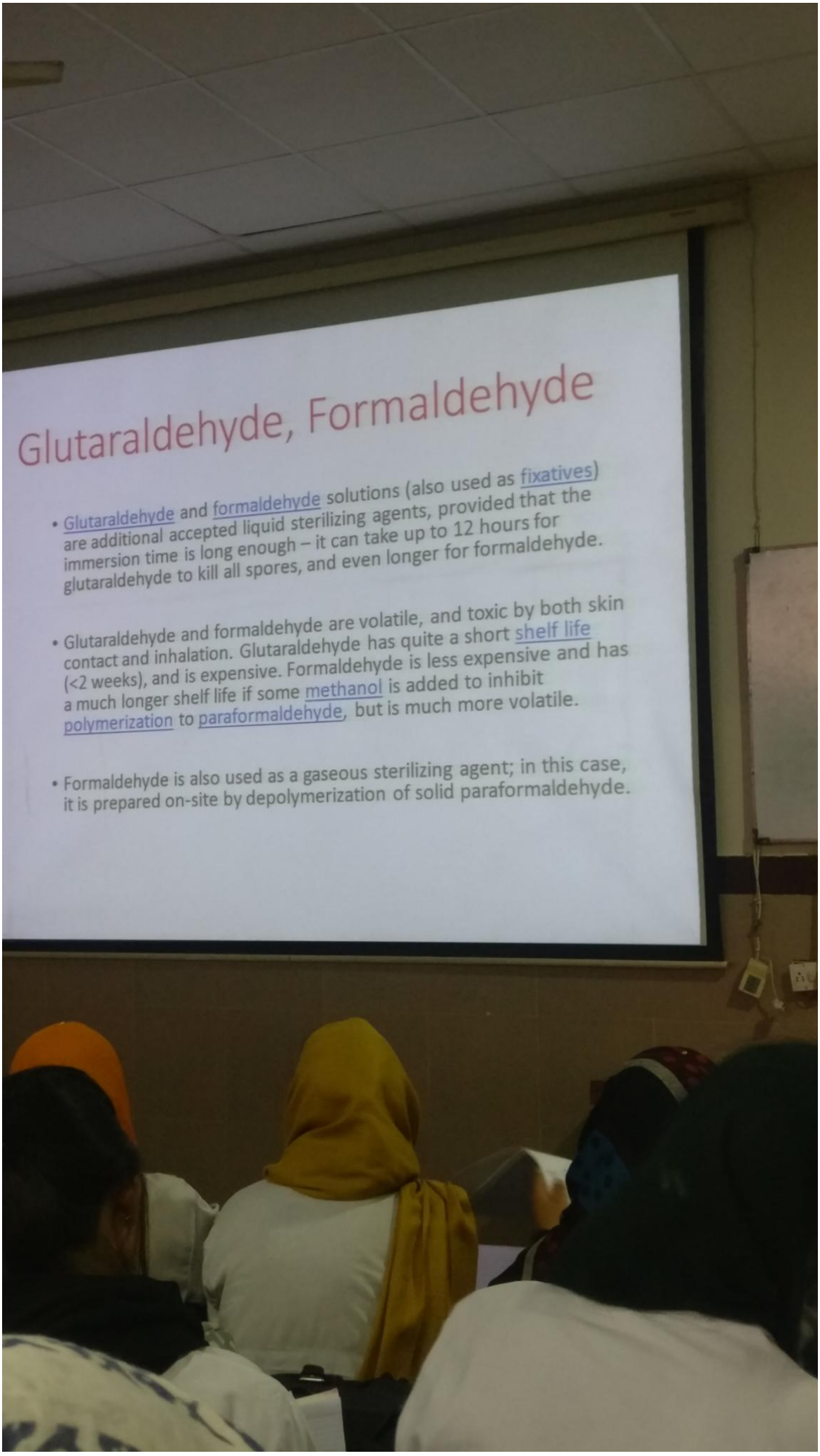

Autoclaves
• Steam under pressure has a higher temperature than 100 °C
• To be effective against viruses and spore forming bacteria need to have steam in direct contact with material
• Vacuum has to be created
• Need to autoclave for 3 min at 134 °C or 15 min at 121 °C
• Check performance by colour changes on indicator tape
• Autoclaves are highly effective and inexpensive
• Unsuitable for heat-sensitive objects

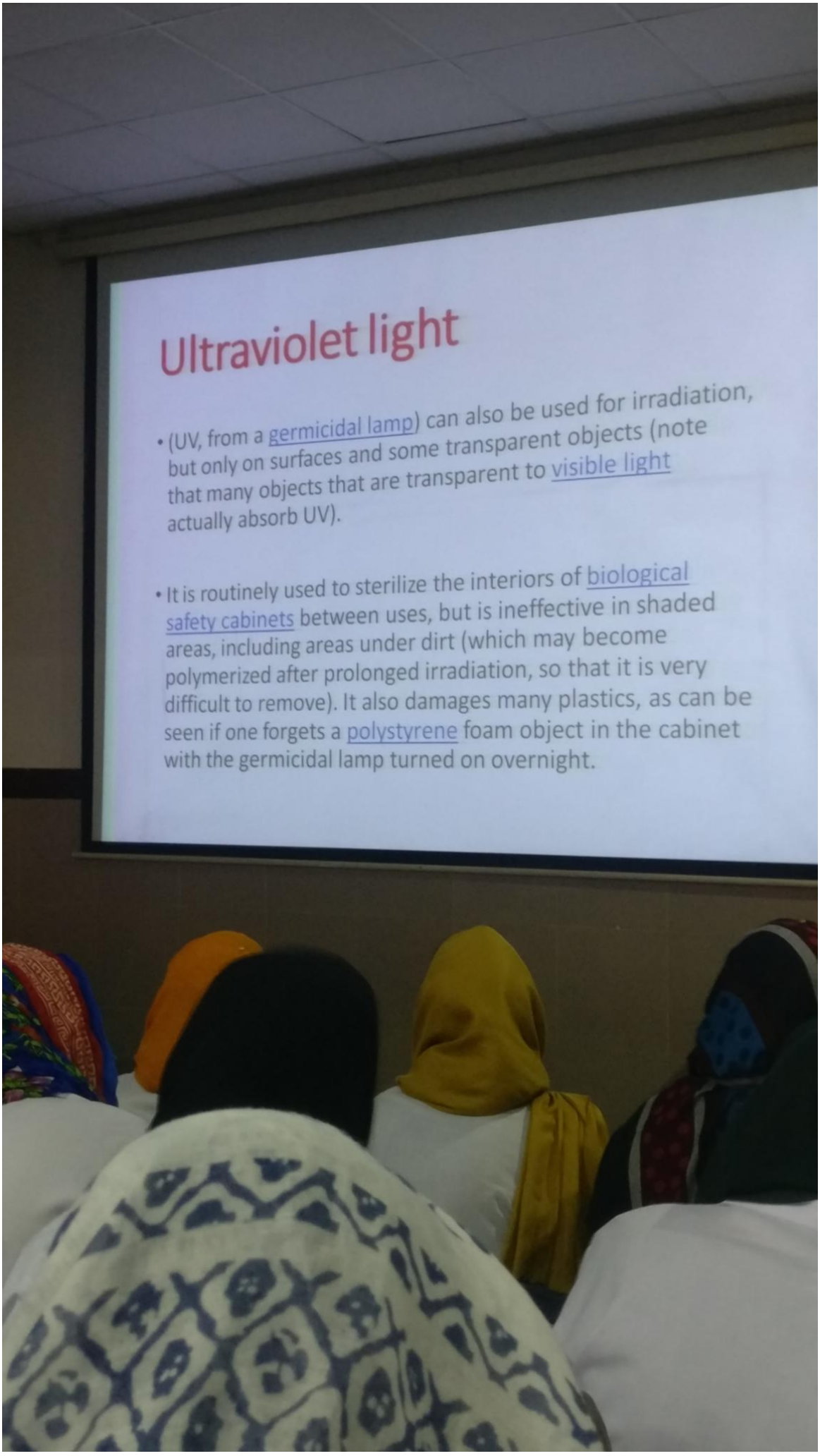

Autoclaves


Sporicidal Chemicals
• Often used as disinfectants but can also sterilise instruments if used for prolonged period
• Inexpensive and suitable for heat-sensitive items
• Toxic and irritants
• 2% Gluteraldehyde is most widely used liquid sporicidal chemical
• Most bacteria and viruses killed within 10 minutes
• Spores can survive several hours


Irradiation
• Gamma rays and accelerated electrons are excellent at sterilisation
• Used as an industrial rather than hospital based method


• In general, any instrument that enters an already sterile part of the body (such as the blood, or beneath the skin) should be sterilized. This includes equipment like scalpels, hypodermic needles and artificial pacemakers. This is also essential in the manufacture of many sterile pharmaceuticals.
• The preferred principle for sterilization is through heat. There are also chemical methods of sterilization, it includes autoclaves, flaming, incineration, boiling, tindalization, and using dry heat.


Glutaraldehyde, Formaldehyde
• Glutaraldehyde and formaldehyde solutions (also used as fixatives) are additional accepted liquid sterilizing agents, provided that the immersion time is long enough – it can take up to 12 hours for glutaraldehyde to kill all spores, and even longer for formaldehyde.
• Glutaraldehyde and formaldehyde are volatile, and toxic by both skin contact and inhalation. Glutaraldehyde has quite a short shelf life (<2 weeks), and is expensive. Formaldehyde is less expensive and has a much longer shelf life if some methanol is added to inhibit polymerization to paraformaldehyde, but is much more volatile.
• Formaldehyde is also used as a gaseous sterilizing agent; in this case, it is prepared on-site by depolymerization of solid paraformaldehyde.


Ultraviolet light
• (UV, from a germicidal lamp) can also be used for irradiation, but only on surfaces and some transparent objects (note that many objects that are transparent to visible light actually absorb UV).
• It is routinely used to sterilize the interiors of biological safety cabinets between uses, but is ineffective in shaded areas, including areas under dirt (which may become polymerized after prolonged irradiation, so that it is very difficult to remove). It also damages many plastics, as can be seen if one forgets a polystyrene foam object in the cabinet with the germicidal lamp turned on overnight.