Sri Lakshmi Narayana Institute of Medical Sciences

Date 02/07/2021

From
Dr.K.R.Jothikumar,
Professor and Head,
otorhinolaryngology,
SLIMS
Bharath Institute of Higher Education and Research,
Puducherry.

To
The Dean,
SLIMS
Bharath Institute of Higher Education and Research,
Puducherry.

Sub: Permission to conduct value-added course: : Ototoxicity and Audiology reg.

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: Audiological Rehabilitation on July 2021 to Dec 2021. We solicit your kind permission for the same.
Kind Regards

Dr.K.R. Jothikumar

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:
The Dean:
The HOD:
The Expert:

The committee has discussed about the course and is approved.

Dean

(Sign&Seal)
DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

Dr.R. VENKATARAMANAN, MS.,
Reg. No: 72549
Professor ENT
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Kudapakkam, Puducherry-605 502.

SUBJECT EXPERT
(Sign &Seal)

Seal & Signature of the HOD
PROFESSOR & HOD
DEPARTMENT OF E.N.T
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY - 605 502

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.

[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Ref. No. SLIMS/Dean Off/VAC/024 **Date:03/07/21**

From
The Dean
Sri Lakshmi Narayana Institute of Medical sciences,
Pondicherry – 605502

To
The Registrar,
Bharath Institute of Higher Education and Research,
Chennai - 600073.

Respected Sir

Sub: Request for permission and approval of Syllabus for certificate course (Value Added course) for the academic year 2021-22 - Reg
Ref: Requesting letter received from Departments

*****

With reference to the above, herewith forwarding the proposed list of Value-added courses for necessary permission and approval of syllabus to conduct the same.

This is for your kind information and needful action.

Thankingyou

Yours faithfully

[DEAN]

DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

Encl's:

1. Requesting letter received from department
2. Syllabus of thecourse
3. Details of faculty handlingcourse

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

VALUE ADDED COURSE : Ototoxicity and Audiology

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr. K.Venkataramanan

Email ID:e n t s l i m s @ g m a i l . c o m

Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed - to - be - University under section 3 of UGC Act 1956)

Ref. No. BHIER/ VAC/B-02 **Date:05.07.2021**

From

The Registrar,
Bharath Institute of Higher Education and Research,
Chennai - 600073.

To

The Dean
Sri Lakshmi Narayana Institute of Medical sciences,
Pondicherry – 605502

Sir / Madam,

Sub: Approval of Syllabus to conduct certificate course (Value Added course) for the academic year 2021 -2022 – Reg.

Ref: Ref. No. SLIMS/Dean Off/VAC /024 Dated: 03.07.2021

*****

With reference to the above, it is to inform that the proposal submitted to conduct Value Added Course has been accepted and approved by BIHER, council meeting. List of the VAC are mentioned below for the academic year 2021– 2022. The abstract of the VAC course completion detail should be submitted to the Registrar office.

Thanking you

Yours faithfully

REGISTRAR

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.

[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

.

07/07/2021

Sub: Organising Value-added Course: Ototoxicity and Audiology **reg.**

With reference to the above mentioned subject, it is to bring to your notice that SLIMS,**Bharath Institute of Higher Education and Research**, is organising **"Ototoxicity and Audiology"**. The course content and registration form is enclosed below.

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before 15/07/2021. Applications received after the mentioned date shall not be entertained under any circumstances.

DEAN

DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme &Code

Ototoxicity and Audiology– A value added course for the medical students.

&ENT 03

2. Duration &Period

30 hrs & July 2021-Dec 2021

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Pre test and post test which includes 10 mcqs - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time July 2021 · Dec 2021

8. Year of discontinuation:2021

9. Summary report of each program year-wise

Value Added Course- July 2021- Dec 2021					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	ENT 03	Ototoxicity and Audiology– A value added course for the medical students.	1.Dr.Venkataramanm 2. Dr. Sreedhar.B 3.Dr. Jayagar.P	3rd year MBBS students	11 students & 2021

10. Course FeedBack

Enclosed as Annexure- V

RESOURCEPERSON

1. **Dr.K.R.Jothikumar**
2. **Dr. B.Sreedhar**

COORDINATOR

Dr.R.Venkataramanan

COURSE PROPOSAL

NAME OF THE PROGRAMME

Ototoxicity and Audiology– A value added course for the medical students & **ENT03**

2. AIM

Training the students on Ototoxicity and Audiology

3. OBJECTIVES

a) To teach the students about the impact of ototoxicity

b) To teach the students hands on use of audiology in interpreting ototoxicity

4. METHODOLOGY

Students who are interested in participating in value added course are enrolled and the course is conducted for them during the non college hours for a period of 30 hours from July 2021 – Dec 2021 . This course is conducted every 6 months.

Course Audience: 3rd year MBBS students

Course Coordinator: Dr.K.Venkataramanan

Course Faculties with Qualification and Designation:

1.Dr.K.R. jothikumar

2.Dr. Sreedhar.B

3.Dr. Jayagar.P

Schedule followed during the course

No	Topic	Title	Duration	Date and time
1	Ototoxicity and audiology	Introduction & Learning outcomes	6hrs	4pm-6pm(20/7/21),4pm-6pm(30/7/21),4pm-6pm(9/8/21)
		Ototoxic drugs and its action on ears	6hrs	4pm-6pm(17/8/21)),4pm-6pm(25/8/21),4pm-6pm(3/9/21))
		Medical negligence in using ototoxic drugs	6hrs	4pm-6pm(15/9/21),4pm-6pm(27/9/21),4pm-6pm(4/10/21))
		Hospital based study on ototoxic drugs on vulnerable patients	6hrs	4pm-6pm(20/10/21),4pm-6pm(29/10/21),4pm-6pm(9/11/21)
		Prevention and management of ototoxic drugs	6hrs	4pm-6pm(18/11/21),4pm-6pm(27/11/21),4pm-6pm(6/12/21)
		TOTAL	30HRS	

REFERENCE BOOKS: 1) SCOTT BROWN 6th edition

2) ANIRBAN BISWAS 1st edition

OTOTOXICITY

OTOTOXICITY

Definition

- *The tendency of certain therapeutic agents & other chemical substances to cause functional impairment & cellular degeneration of the tissues of the inner ear & especially of the end organs & neurons of the cochlear & vestibular divisions of the VIII cranial nerve".*

Major systemic ototoxic substances

- Aminoglycosides
- Salicylates and nonsteroidal anti-inflammatory drugs
- Loop Diuretics
- Platinum Compounds
- Iron chelating agents
- Macrolides

Major topical ototoxic substances

- Topical Aminoglycosides
- Topical Chloramphenicol
- Topical Polymyxin
- Topical Antifungals
- Surgical Disinfectants and Antiseptics

AMINOGLYCOSIDES

Aminoglycosides:

- Discovered by Waksman- 1944
- Effective against gram –ve bacteria & mycobacteria
- Affect sensory cells of inner ear, kidneys, neural tissue
- Incidence of ototoxicity ranges 20-33% for commonly used aminoglycosides while balance is affected in 18% of cases.

Aminoglycosides

- Cochleotoxic
  - Amikacin, kanamycin, neomycin, netilmicin
- Vestibulotoxic
  - Streptomycin, gentamicin, sisomycin

- Acts by binding to PhIP2, a 2nd messenger system, involved in maintaining membrane integrity.

Toxic levels of aminoglycosides:

Toxic levels of aminoglycosides:

- Streptomycin:
  - </= 1 gm daily dose– toxicity only after prolonged treatment
- Neomycin: Ototoxic dose- 250 gm orally; 7-8 gm parenterally.
- Kanamycin: Tolerable level- 32-134 gm
- Gentamicin: in normal renal function; 1-3 mg/kg/day with peak serum levels < 12 µg/ml is safe
- Tobramycin– side effects are less frequent & less severe.

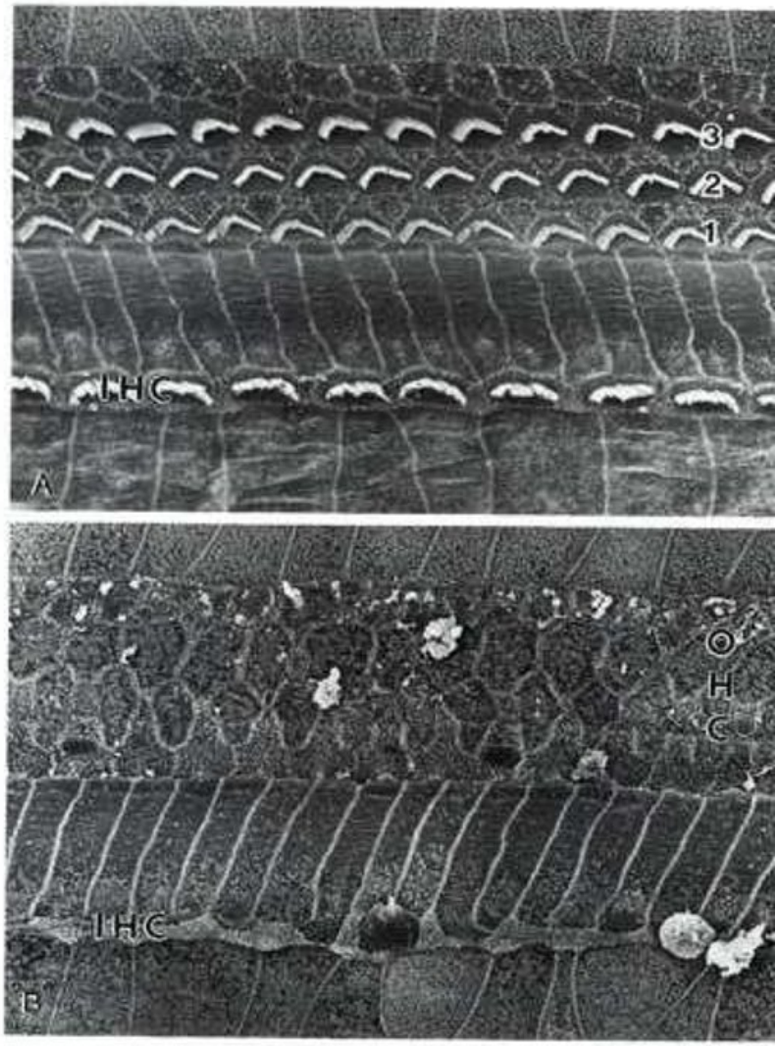
Aminoglycosides

- Reactive Oxygen Species (ROS) formation
- Depletion of anti oxidant Glutathione (GSH) enhances ototoxicity.

- They enter the perilymph slowly (peak concentrations 4 hrs after a single injection) & the endolymph even more slowly.
- Once in the endolymph, they are extremely slow to leave & may be present for days.
- They may also be sequestered in the lysosomal-like bodies within the hair cells & persist for upto an year.

In the cochlea:

In the cochlea:



- Damage spreads radially from the innermost to the outermost row of OHCs.

Aminoglycosides

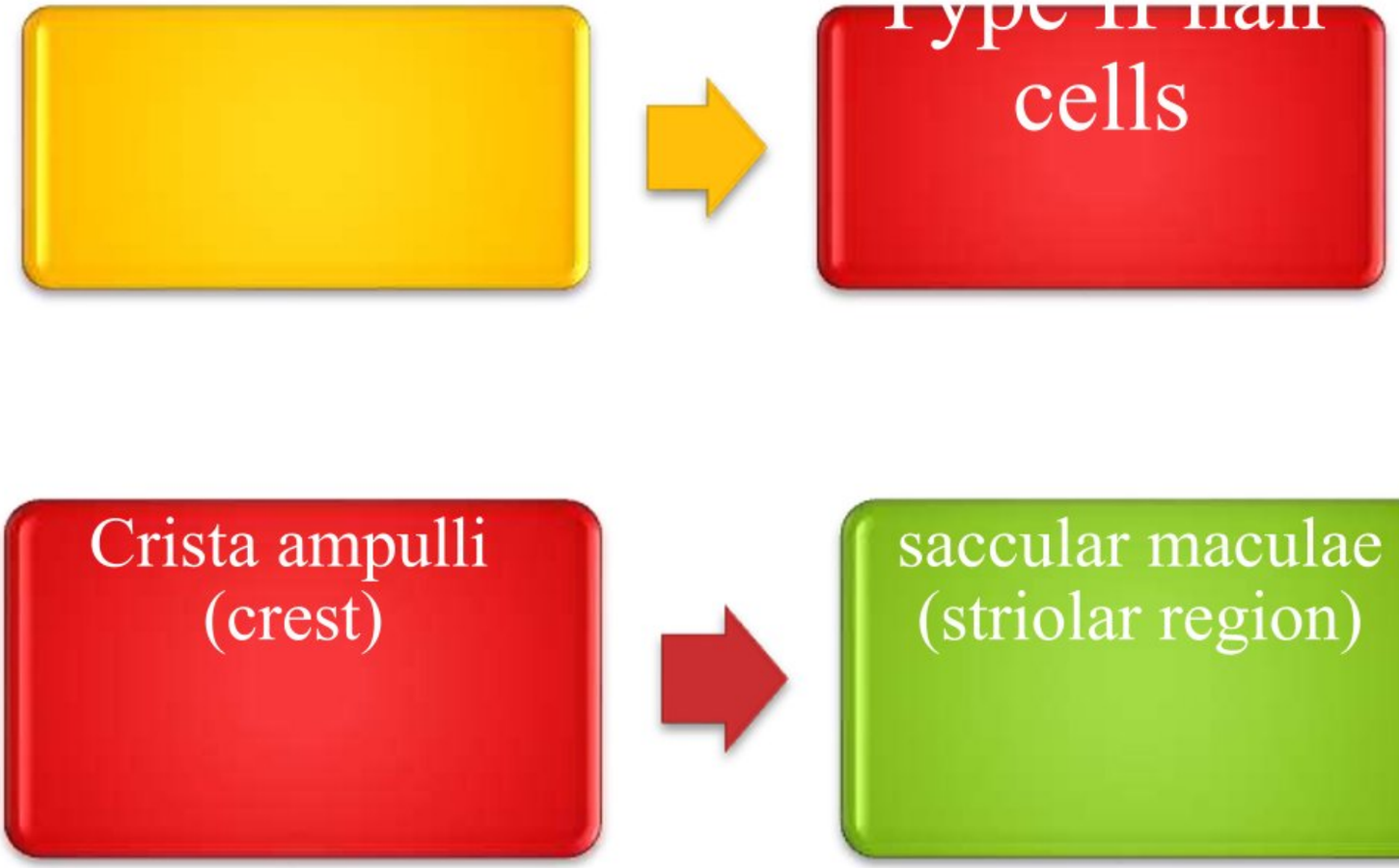
- Cochlear toxicity presentation
  - High frequency SNHL first, then lower frequencies to profound loss
  - Irreversible
  - Damage usually heralded by tinnitus

Aminoglycosides

- Cochlear toxicity
  - Can be familial form of nonsyndromic HL– maternal inheritance
  - Associated with mtDNA 1555A to G point mutation in 12S ribosomal RNA gene– causes increased binding to ribosome

In the vestibule:

In the vestibule:



Aminoglycosides

- Vestibular toxicity
  - Assessment is difficult
  - Dynamic posturography can detect
  - Pathologically
    - Type I hair cells more sensitive
    - Cristae ampullaris then utricle and saccule
  - Clinically
    - Ataxic gait, lose balance when turning
    - Oscillopsia→ postural instability & risk of fall.

Aminoglycosides

- Toxicity generally occurs only after days or weeks of exposure.
- The overall incidence of aminoglycoside auditory toxicity is estimated to be approximately 20%, whereas vestibulotoxicity may occur in about 15%.
- Therapeutic peak serum levels of *10- 12 μg/mL* for Gentamicin are generally considered safe but may still be toxic in some patients.

- Monitor serum levels
- High frequency audiometry
- Electronystagmography
- Oto acoustic emissions
- Vestibulo-ocular reflex

- Continuing to monitor the patient for cochleotoxic and vestibulotoxic effects up to 6 months after cessation of aminoglycoside treatment is important.

Drug interactions:

Drug interactions:

- Loop diuretics→ increasespermeability of strial vessels→ increased conc. of aminoglycosides in scala media.

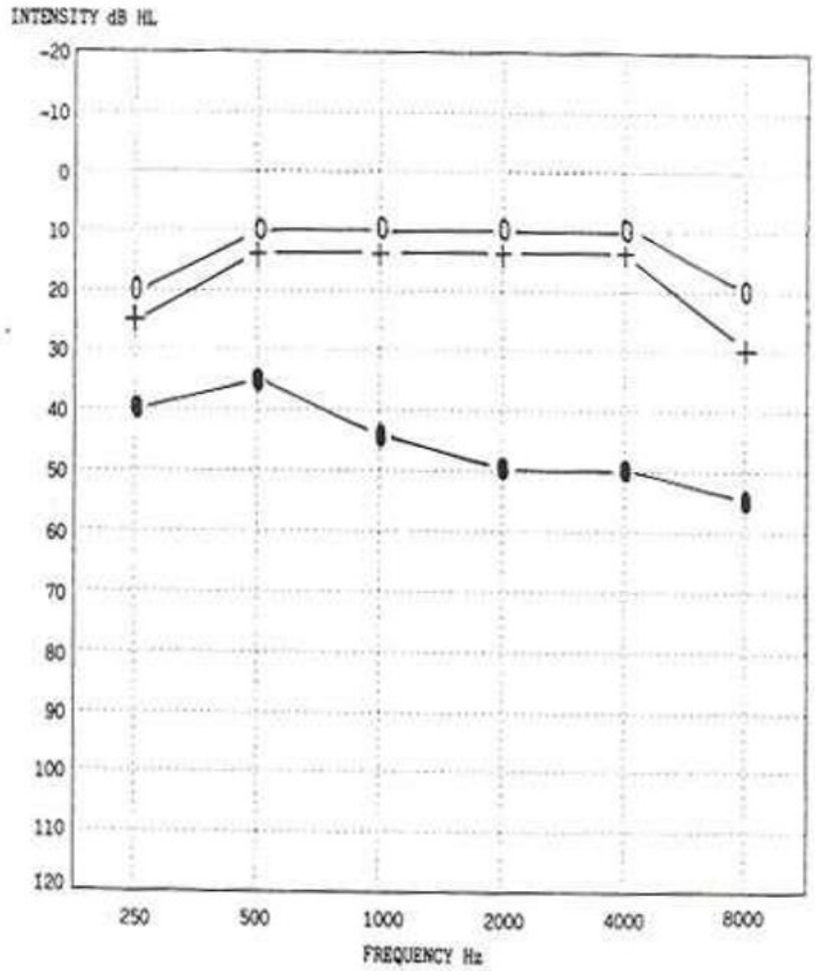
Risk factors

- larger doses
- higher blood levels
- longer duration of therapy
- elderly patients
- renal insufficiency
- preexisting hearing problems
- family history of ototoxicity
- receiving loop diuretics or other ototoxic or nephrotoxic medications.

Macrolides:

Macrolides:

- Discovered erythromycin 1952
- Clinically
  - B/L high frequency hearing loss
  - Blowing tinnitus
  - All frequencies, recovery after stopping (2 wks later)
  - Rarely permanent (hepatic)
  - Incidence unknown



- Ototoxicity more common in
  - > 60 yrs of age
  - Associated renal/ hepatic compromise
- In patients with renal failure, to prevent ototoxicity
  - Daily audiograms with discontinuation of therapy if new hearing loss is recognised
  - Daily dosage < 1.5 gm
  - Avoid combining other ototoxic drugs.

Vancomycin:

Vancomycin:

- Glycopeptide antibiotic - 1956.
- Serum level > 80-100 μg/ml→ ototoxicity
- Bilateral high frequency SNHL, progresses later to bilateral profound deafness in all frequencies; which is irreversible.
- Tinnitus is usually high pitched.
- Vestibular dysfunction is rare.
- Avoid toxicity
  - Follow serum levels
  - Check serial audiograms
  - Avoid combination with other ototoxic drugs.

Other antibiotics:

Other antibiotics:

- Minocycline produces vestibular toxicity- nausea, vomiting & ataxia without nystagmus occurs, which is reversible.
- Viomycin & Capreomycin, in high doses, cause irreversible cochleotoxicity & vestibulotoxicity.

Chemotheraputic Agents & Ototoxicity - *Cisplatin*

Chemotheraputic Agents & Ototoxicity - Cisplatin

- *Introduced in the 1970s and is effective against germ cell, ovarian, endometrial, cervical, urothelial, head and neck, brain and lung cancers.*
- *Highest ototoxic potential and is the most ototoxic drug in clinical use.*
- *Symptoms of ototoxicity begin with tinnitus and high frequency hearing loss.*

- *Incidence of hearing loss has been reported at 11-91% with an overall incidence of 69%.*
- *In patients with head and neck cancer treated with Cisplatin, about 50% develop hearing loss.*

Risk Factors for Cisplatin Ototoxicity

Risk Factors for Cisplatin Ototoxicity

- *Intravenous bolus administration or high cumulative dose*
- *Young children, under 5 years, or older > 46 years*
- *Renal insufficiency*
- *Prior cranial irradiation*
- *Co-administration of vincristin*

- Transient tinnitus and hearing loss are commonly observed for cumulative doses greater than 200 mg/m2.
- Detection of the earliest signs of toxicity requires ultra-high frequency audiometry or otoacoustic emission testing.
- Vestibulotoxicity may be detected on balance testing following cumulative doses of cisplatin exceeding 400 mg/m2.

- Hearing loss affected by free radical formation and anti-oxidant inhibition.
- The best predictor of cisplatin ototoxicity is cumulative dose.
- The critical dose is 3-4 mg/Kg body weight.

Chemoprotective/blocking agents:

- Agents which reduce/ prevent the unwanted adverse systemic toxicity without altering the antitumour activity of Cisplatin.
  - Examples-
    - Acetazolamide
    - Sulphur nucleophiles
    - free oxygen radical scavengers
    - phosphonic acid antibiotics.

Sites of involvment

Sites of involvment

- Formation of free radicals within the inner ear
- Toxic effect on stria vascularis and organ of corti
- The OHC’s seem to be primarily affected

Characteristics of Cisplatin Ototoxicity

Characteristics of Cisplatin Ototoxicity

- *Bilateral and permanent. High frequencies affected first in 71% cases.*

- *It can occur suddenly. Speech discrimination may be markedly affected.*

Mechanisms of Cisplatin Ototoxicity

- *Hearing loss affected by free radical formation and anti-oxidant inhibition.*
- *Formation of reactive oxygen radicals produces glutathione depletion in the cochlea and lipid peroxidation.*
- *Induced apoptosis in hair cells causing permanent hearing loss.*

Carboplatin

- *Introduced due to its lower nephrotoxicity than cisplatin.*
- *It is used to treat small cell lung cancer, ovarian and head and neck cancers.*

Carboplatin Toxicity

- *The dose limiting factor had been bone marrow toxicity.*
- *Overcome with autologous stem cell rescue allowing larger doses to be used.*
- *Initial reports seemed to indicate less ototoxicity*
- *Increase in dose and effectiveness came at the expense of increased ototoxicity.*

Carboplatin Toxicity

- *The mechanism of carboplatin ototoxicity is related to production of ROS (Reactive Oxygen Species).*
- *In experimental animals, pretreatment with a drug that inhibits glutathione (Guthionine sulfoximine) enhanced carboplatin ototoxicity.*
- *Other experiments have shown pretreatment with anti-oxidant (D-Methionine) reduced the ototoxic effect.*

Carboplatin Toxicity Summary:

Carboplatin Toxicity Summary:

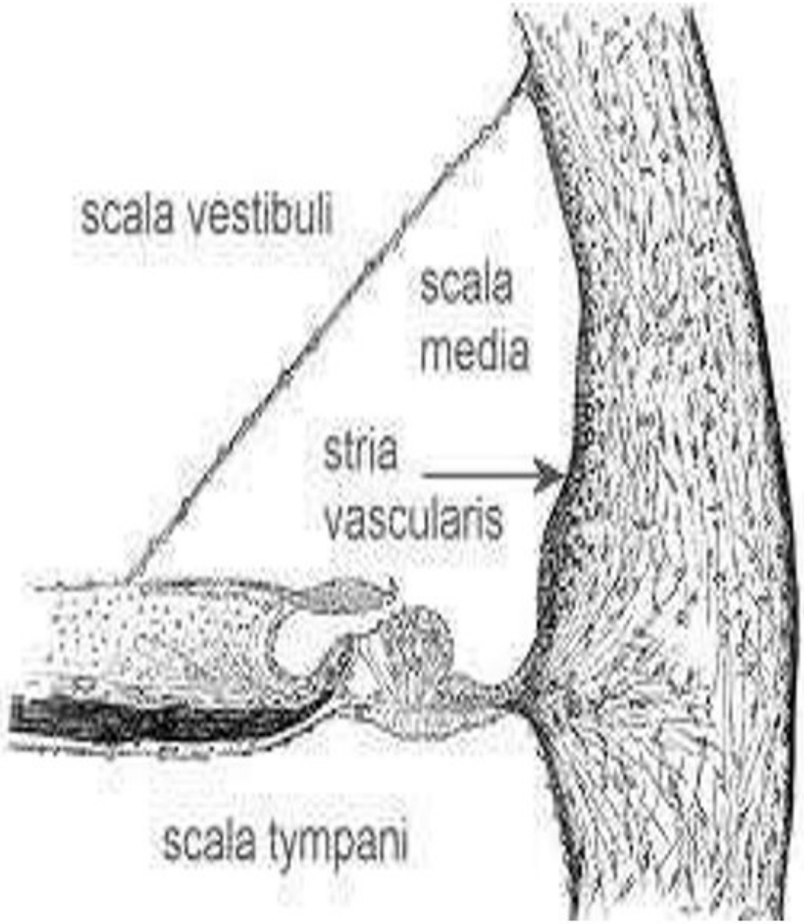
- *For equivalent dosing, carboplatin is less toxic than cisplatin but higher doses of carboplatin are used increasing ototoxicity.*
- The mechanism for ototoxicity is damage to the organ of corti especially the inner hair cells (IHC's).

Loop diuretics:

Loop diuretics:

- Ethacrynic acid-0.7%
- Furosemide-6.4%
- Bumetanide -1.1%

- Oedema of stria vascularis→ loss of endocochlear potential→ destruction of hair cells.

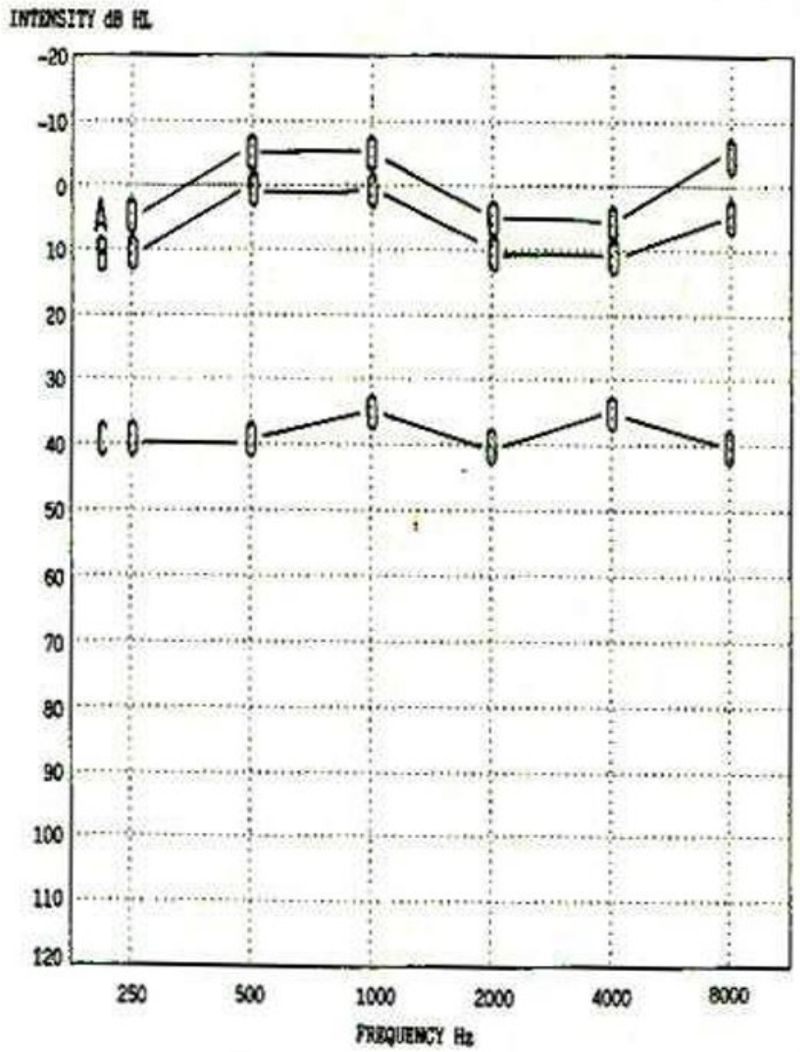


- Reversible, flat SNHL (2-4kHz)
- Ataxia
- Severe tinnitus after an iv bolus
- Prevention of ototoxicity:
  - Avoid rapid iv
  - Avoid concommitant use of aminoglycosides

Salicylates:

Salicylates:

- Blood levels> 20mg/dl
- Mechanism:
  - Direct effect on OHCs
  - Changes in blood supply
- Tinnitus
- Flat hearing loss
- Reversible- within 24-72 hrs after cessation
- Preventing ototoxicity:
  - Minimal doses
  - Alternate drugs



Quinine:

Quinine:

- Degenerative changes in the basal turn of cochlea
- Vasoconstriction in stria
- Reversible B/L SNHL & tinnitus
- Treatment- Withdraw the drug
- Teratogenic– complete anacusis & marked vestibular paresis.

Congenital ototoxic hearing loss:

- The 1st trimester, especially the 6th or 7th week appears to be most vulnerable period for effect on the ear development.
- Streptomycin passes into the fetus & amniotic fluid in concentrations upto 50% of maternal levels; it causes VIII nerve abnormalities.
- Chloroquine, salicylates, thalidomide.

Topical Antimicrobials

- Polymyxin B
- Chloramphenicol
- Neomycin
- Gentamicin
- Ticarcillin
- Ciprofloxacin
- Colistin

- Chloramphenicol (in guinea pigs): Application to RW membrane→ depression of cochlear microphonics→ Progresses for several hrs & recovers only slightly
- Streptomycin: Marked vestibular symptoms within 3-6 hrs with changes in type I hair cells
- Gentamicin: Cochlear hair cell damage.

Ototopical ototoxicity:

Ototopical ototoxicity:

- When possible, topical antibiotic preparations free of potential ototoxicity should be used in preference to ototopical preparations that have the potential for otologic injury if the middle ear or mastoid is open.
- If used, potentially ototoxic antibiotic preparation should be used only in infected ears. Use should be discontinued after the infection has resolved. Round window permeability contributes to ototoxic effects. Animal data suggest that the thickened, edematous middle ear mucosa present in an infected ear may provide protection from ototoxicity.

- If potentially ototoxic antibiotic drops are prescribed for use in the middle ear or mastoid, the patient/parent should be warned of the risk of ototoxicity.
- If the middle ear and mastoid are intact and closed, then the use of potentially ototoxic preparations present no risk of ototoxic injury.

OTOTOXICITY MONITORING

Cochlear Monitoring

- **Basic Audiometry**. It is important and useful but will not detect early changes.
- *Ototoxicity is determined by establishing baseline hearing test data ideally prior to treatment.*
- *Results are compared to serial audiograms allowing the patient to serve as their own control.*

Contin…..

- **High frequency Audiometry** testing threshold above 8000Hz can detect early aminoglycoside and cisplatin ototoxicity.
  - Monitoring 1-2 times per week for patients receiving ototoxic antibiotics.
  - Post treatment evaluations are conducted as soon as possible after dispensing the drug and repeated at 1, 3 and 6 month post treatment.

Cotinue……

Cotinue……

- **OAE** especially transient OAE's and distortion product OAE's (DPOAEs) can be measured easily and detect early ototoxicity. The measuring device is very portable and can be used in very sick patients and even comatosed patients. Generally DPOAE's are more sensitive than transient OAEs.

Vestibular Monitoring

- **Electronystagmography (ENG)** tests only the lateral semicircular canal (SCC) and is a test of low frequency vestibular function. It also has a very poor sensitivity in bilateral vestibular loss as might be the case in early systemic ototoxicity.

- **Rotational chair test** allows for high frequency vestibular function to be tested and also allows for differentiation between central and peripheral impairment. It however tests the vestibular apparatus in the horizontal plane only.
- **Computerized dynamic posturography** measures everyday activity and its very useful in rehabilitation. It however does not provide localization of the site of the

Clinical bedside tests

- ***f*Oscillopsia test** is performed by asking the patient to read the lowest line from a Snellen visual acuity chart at rest.
- The patient's head is then shaken from side to side and the patient asked to read the lowest line that they can read during active head shaking.
- Missing more than three lines on the chart during active head shaking is generally indicative of a bilateral vestibular loss that might occur from ototoxicity ..

Oscillopsia test

- ***f*The head shake test** is performed by asking the patient to close his or her eyes and passively shaking the patient's head in a horizontal plane, back and forth for 20 seconds.
- The presence of post head shake nystagmus when the patient opens his or her eyes is suggestive for peripheral vestibular dysfunction.
- The direction of nystagmus is usually away from the affected side but not always.
- The presence of vertical or rotatory nystagmus after horizontal head shaking is called "cross coupling" and is suggestive of a CNS disorder.
- The headshake test gives information about asymmetrical vestibular loss.

- **The Halmagyi horizontal head trust** consists of rapid, passive head movements from each side to midline while the patient visually fixates on a central object such as examiner's nose.
- Under normal circumstances with rapid head movements there should be an exact equal and opposite movement of the eyes.
- If there is a defect in the VOR then the eyes lag behind head movement and there will be several corrective saccades required to keep focus on the examiner's nose.

CTCAE ototoxicity grades 1-4

- Grade 1 - Threshold shift or loss of 15-25 dB relative to baseline, averaged at two or more contiguous frequencies in at least one ear.
- Grade 2 - Threshold shift or loss of > 25-90 dB, averaged at two contiguous test frequencies in at least one ear
- Grade 3 - Hearing loss sufficient to indicate therapeutic intervention, including hearing aids (eg, > 20 dB bilateral HL in the speech frequencies; > 30 dB unilateral HL; and requiring additional speech-language related services)
- Grade 4 - Indication for cochlear implant and requiring additional speech-language related

services

Brock's hearing loss grades

- Grade 0 - Hearing thresholds less than 40 dB HL at all frequencies
- Grade 1 - Thresholds 40 dB or greater at 8,000 Hz
- Grade 2 - Thresholds 40 dB or greater at 4,000-8,000 Hz
- Grade 3 - Thresholds 40 dB or greater at 2,000-8,000 Hz
- Grade 4 - Thresholds at 40 dB or greater at 1,000-8,000 Hz

MANAGEMENT

MANAGEMENT

- Permanent hearing loss is treated with a hearing aid or a cochlear implant.
- vestibular rehabilitation as this is thought to hasten vestibular compensation and, in the longer term, functional recovery of the labyrinth can occur.
- genetic counselling and testing for the 1555 A to G deletion should be offered to the patient and their family.

- Perinatal exposure to ototoxins requires parental counselling and hearing screening of the infant.
- Behavioural audiometry may need to be supplemented with objective threshold estimation, including otoacoustic emissions and auditory brainstem response or steady state- evoked potentials.

Otoprotective Therapies

- Alpha- phenyl-tert-butyl-nitrone (PBN) is a spin trap molecule which can trap and inactivate reactive oxygen species (ROS) when applied to round window membrane.

- Antioxidants such as glutathione supplements in the diet of animals have been shown to have otoprotective effect but only when the animal was nutritionally deprived. Studies have shown high levels of glutathione in the OHC's to be protective against toxic effect of aminoglycosides.
- Methionine also has antioxidant and metal chelating properties and shown to be otoprotective in animal models

- Deferoxamine as an iron chelating agent has otoprotective effect against ototoxicity of aminoglycosides but unfortunately only at toxic levels.
- Salicylates are the most promising otoprotective agents under study.
- Tanshinone a traditional Chinese herbal medicine contains diterpene quinines and phenolic acids. They are potent antioxidants and early human trials are promising.

- Superoxide dismutase is a naturally occurring antioxidant which has at least in experimental animal otoprotective properties against aminoglycoside ototoxicity.
- Salicylates are the most promising otoprotective agents under study.

Hair cell regeneration:

Hair cell regeneration:

- After noise- or aminoglycoside induced hair cell loss, new hair cells arise spontaneously through damage induced stimulation of mitotic activity among undamaged supporting cells.

  This hair cell regeneration leads to functional recovery.

- Initially, the type 1 hair cells in the striolar regions of utricle are replaced by immature type 2 hair cells; later these become mature & become reinnervated.

Annexure 2

Bharath Institute of Higher Education and Research

SLIMS

1	U13MB169	BALAKRISHNAN.R.
2	U13MB171	BALASUBRAMANIAN.R.
3	U13MB172	BENCY.L.
4	U13MB173	BHARANIDARAN.E.
5	U13MB174	BRINDHA.M.
6	U13MB180	DIVYA.A.
7	U13MB175	CHRIS ANDREW AJAY SRIPATHAM
8	U13MB176	CHRISTOPHER. A.
9	U13MB178	DHATCHAYANI.
10	U13MB177	DEVIKA. G.
11	U13MB179	DINESH KUMAR.P.

ANNEXURE 3

SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES

PUDUCHERRY

TOPIC: ototoxicity and audiology **(ENT 03)**
STUDENT NAME:
UNIVERSITY NO:

1.Ototxic drugs are all except
a.Kanamycin b.Gentamycin
c.Streptomycin d.amoxicillin

2. drugs causing deafness true statements are
a. streptomyin is predominantly vestibulotoxic
b. fursemide causes irreversible deafness
c. salicylates causes reversible deafness
d. cisplatin causes irreversible deafness

3. ototoxic drugs generally affect the hearing of frequencies more than 4000 Hz. All are ototoxic drugs except:
a.streptomycin b. vancomycin
c.frusemide d.atropine

4. All are ototoxic drugs except:
a. streptomycin b. quinine
c. diuretics d. propranolol

5. chemical labryrinthectomy by trans-tympanic route is done in menieres disease using which drug:
a.amikacin b.amoxicillin
c.getamycin d.cyclosporine

6.True about idiopathic sudden sensory neural hearing loss
a.Vertigo always present b.carbogen beneficial
c. hearing loss occur within 24 hrs d.hearing loss within 72 hrs

7.ototoxic drugs affect mostly what frequency hearing
a. 250-500 hz b.2000-3000hz
c.500-1000hz d.4000-5000hz

8.Mild sloping sensory neural loss acquired in
a. menieres b.otoscelrosis
c.ototoxicity d. SOM

9. At which level sound is painful
a.90-100db b.120-130
c.60-70 d. 20-30

10.Temporaray and permanent threshold shift is seen in:
a.ototoxicity b. NIHL
c.Presbycusis d.SSNHL

PRE TEST

5. chemical labryrinthectomy by trans-tympanic route is done in menieres disease using which drug:

a.amikacin b.amoxicillin

X c.getamycin d.cyclosporine

6.True about idiopathic sudden sensory neural hearing loss

a.Vertigo always present b.carbogen beneficial

c. hearing loss occur within 24 hrs d.hearing loss within 72 hrs

7.ototoxic drugs affect mostly what frequency hearing

a. 250-500 hz b.2000-3000hz

X c.500-1000hz d.4000-5000hz

8.Mild sloping sensory neural loss acquired in

a. menieres b.otoscelrosis

X c.ototoxicity d. SOM

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a.90-100db b.120-130

X c.60-70 d. 20-30

10.Temporaray and permanent threshold shift is seen in:

a.ototoxicity b. NIHL

c.Presbycusis d.SSNHL

ANNEXURE 3

SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES

PUDUCHERRY

TOPIC: ototoxicity and audiology **(ENT 03)** (3)

STUDENT NAME: Devika. G

UNIVERSITY NO: U13MBI77

1.Ototxic drugs are all except

a.Kanamycin b.Gentamycin

X c.Streptomycin d.amoxicillin

2. drugs causing deafness true statements are

a. streptomyin is predominantly vestibulotoxic

b. fursemide causes irreversible deafness

X c. salicylates causes reversible deafness

d. cisplatin causes irreversible deafness

3. ototoxic drugs generally affect the hearing of frequencies more than 4000 Hz. All are ototoxic drugs except:

a.streptomycin b. vancomycin

c.frusemide d.atropine

4. All are ototoxic drugs except:

X a. streptomycin b. quinine

c. diuretics d. propranolol

5. chemical labryrinthectomy by trans-tympanic route is done in menieres disease using which drug:

a.amikacin b.amoxicillin

c.getamycin d.cyclosporine

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c.60-70 d. 20-30

10.Temporaray and permanent threshold shift is seen in:

a.ototoxicity b. NIHL

c.Presbycusis d.SSNHL

ANNEXURE 3

SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES

PUDUCHERRY

TOPIC: ototoxicity and audiology **(ENT 03)**

STUDENT NAME: Benny. L

UNIVERSITY NO: U13MB172

5

1.Ototxic drugs are all except

a.Kanamycin b.Gentamycin

c.Streptomycin d.amoxicillin

2. drugs causing deafness true statements are

a. streptomyin is predominantly vestibulotoxic

b. fursemide causes irreversible deafness

c. salicylates causes reversible deafness

d. cisplatin causes irreversible deafness

3. ototoxic drugs generally affect the hearing of frequencies more than 4000 Hz. All are ototoxic drugs except:

a.streptomycin b. vancomycin

c.frusemide d.atropine

4. All are ototoxic drugs except:

X a. streptomycin b. quinine

c. diuretics d. propranolol

POST TEST

5. chemical labryrinthectomy by trans-tympanic route is done in menieres disease using which drug:

a.amikacin b.amoxicillin

c.getamycin d.cyclosporine

6.True about idiopathic sudden sensory neural hearing loss

a.Vertigo always present b.carbogen beneficial

c.hearing loss occur within 24 hrs d.hearing loss within 72 hrs

7.ototoxic drugs affect mostly what frequency hearing

a. 250-500 hz b.2000-3000hz

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c.ototoxicity d. SOM

9. At which level sound is painful

a.90-100db b.120-130

c.60-70 d. 20-30

10.Temporaray and permanent threshold shift is seen in:

a.ototoxicity b. NIHL

c.Presbycusis d.SSNHL

(8)

ANNEXURE 3

SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES

PUDUCHERRY

TOPIC: ototoxicity and audiology **(ENT 03)**

STUDENT NAME: Bency. L

UNIVERSITY NO: U13MB172 .

1.Ototxic drugs are all except

a.Kanamycin b.Gentamycin

c.Streptomycin d.amoxicillin

2. drugs causing deafness true statements are

a. streptomyin is predominantly vestibulotoxic

b. fursemide causes irreversible deafness

c. salicylates causes reversible deafness

d. cisplatin causes irreversible deafness

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a.streptomycin b. vancomycin

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9. At which level sound is painful

a.90-100db b.120-130

c.60-70 d. 20-30

10.Temporaray and permanent threshold shift is seen in:

a.ototoxicity b. NIHL

c.Presbycusis d.SSNHL

(9)

ANNEXURE 3

SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES

PUDUCHERRY

TOPIC: ototoxicity and audiology **(ENT 03)**

STUDENT NAME: Davika · G

UNIVERSITY NO: U13MB177

1.Ototxic drugs are all except

a.Kanamycin b.Gentamycin

c.Streptomycin d.amoxicillin

2. drugs causing deafness true statements are

a. streptomyin is predominantly vestibulotoxic

b. fursemide causes irreversible deafness

c. salicylates causes reversible deafness

d. cisplatin causes irreversible deafness

3. ototoxic drugs generally affect the hearing of frequencies more than 4000 Hz. All are ototoxic drugs except:

a.streptomycin b. vancomycin

c.frusemide d.atropine

4. All are ototoxic drugs except:

a. streptomycin b. quinine

c. diuretics d. propranolol

ANNEXURE 4

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that _____ has actively participated in the Value Added Course on Ototoxicity and Audiology held during July 2021 – Dec 2021 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr.K.R.Jothikumar
RESOURCE PERSON

Dr.R.Venkataramanan
COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research
(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that Dr.L.Bency(U13MB172) has actively participated in the Value Added Course on Ototoxicity and Audiology held during July 2021 – Dec 2021 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr.K.R.Jothikumar
RESOURCE PERSON

Dr.R.Venkataramanan
COORDINATOR

Annexure 5

Course/Training Feedback Form

Student Feedback Form

Course Name: Ototoxicity and Audiology

Subject Code: **ENT03**

Name of Student: _____ Roll No.: _____

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Sl. NO	Particulars	1	2	3	4	5
1	Objective of the course is clear					
2	Course contents met with your expectations					
3	Lecturer sequence was well planned					
4	Lectures were clear and easy to understand					
5	Teaching aids were effective					
6	Instructors encourage interaction and were helpful					
7	The level of the course					
8	Overall rating of the course	1	2	3	4	5

**** Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2– Satisfactory; 1 - Not-Satisfactory***

Suggestions if any:

Annexure 5

Course/Training Feedback Form

Student Feedback Form

Course Name: Ototoxicity and Audiology

Subject Code: **ENT03**

Name of Student: BENCY. I. Roll No.: U13MB172

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Sl. NO	Particulars	1	2	3	4	5
1	Objective of the course is clear					✓
2	Course contents met with your expectations				✓	
3	Lecturer sequence was well planned			✓		
4	Lectures were clear and easy to understand				✓	
5	Teaching aids were effective			✓		
6	Instructors encourage interaction and were helpful		✓			
7	The level of the course			✓		
8	Overall rating of the course	1	2	3	4	5

** Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2- Satisfactory; 1 - Not-Satisfactory*

Suggestions if any:

The Value added course was useful.

ANNEXURE 6

Date : 15/12/2021

From
Dr.K.R. Jothikumar,
Dept of Otorhinolaryngology,
SLIMS
Bharath Institute of Higher Education and Research,
Puducherry.

Through Proper Channel

To
The Dean,
SLIMS,
Bharath Institute of Higher Education and Research,
Puducherry.

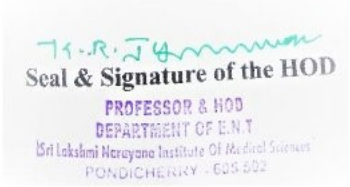
Sub: Completion of value-added course: Ototoxicity and Audiology reg.

Dear Sir,

With reference to the subject mentioned above, the department has conducted thevalue-added course titled:**Ototoxicity and Audiology** on July 2021 to Dec 2021. We solicit your kind action to send certificates for the participants, that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards

Dr.K.R.Jothikumar
<HOD Sign and Seal>



ANEXURE 7


OTOTOXICITY AND AUDIOLOGY