FAKULTAS KEDOKTERAN
UNIVERSITAS YARSI

BUKU PANDUAN MAHASISWA

BLOK SISTEM INDERA

SEMESTER VI

TAHUN AKADEMIK 2021-2022

UNTUK KALANGAN SENDIRI

FAKULTAS KEDOKTERAN
UNIVERSITAS YARSI
2022

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Fakultas Kedokteran Program Studi Kedokteran Universitas YARSI

Buku Panduan Mahasiswa
Blok Sistem Indera

Rencana Pembelajaran Blok (RPB)

Fakultas Kedokteran Universitas YARSI
2021 – 2022

BUKU PANDUAN MAHASISWA

BLOK SISTEM INDERA

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Dicetak di Jakarta, Indonesia

Cetakan Kedua, Maret 2022

KATA PENGANTAR

Assalamu'alaikum Wr. Wb.

Segala puji bagi Allah SWT yang telah memberikan segala rahmat dan hidayahNya sehingga Buku Panduan Blok Sistem Indera Kurikulum 2018 bagi mahasiswa ini dapat selesai dengan baik.

Buku panduan blok mahasiswa ini disusun dalam rangka pelaksanaan blok sistem indera di Fakultas Kedokteran Universitas YARSI. Blok sistem indera ini terdiri dari 4 skenario, yang masing-masing skenario memiliki sasaran belajar dan kuliah terkait.

Blok ini diberikan pada semester enam dan merupakan bagian dari pemahamam sistem indera, khususnya di FK YARSI serta penerapan *problem based learning* (PBL) sebagai salah satu metode belajar yang efektif untuk meningkatkan kemampuan kognitif, afektif dan psikomotor. Sumber informasi yang dapat digunakan mahasiswa meliputi konsultasi pakar, membaca artikel, jurnal penelitian, asks internet dan buku referensi yang dianjurkan.

Setelah mengikuti blok sistem indera dengan metode PBL, mahasiswa diharapkan memahami sistem tersebut yang akan berguna untuk menyelesaikan pendidikan kedokteran.

Wassalamu'alaikum Wr. Wb.

Jakarta, Maret 2022
Pusat Pendidikan Kedokteran
Fakultas Kedokteran Universitas YARSI

Tim Penyusun

Visi FK Universitas YARSI

Mewujudkan Fakultas Kedokteran Islam yang bermutu tinggi yang mampu beradaptasi dengan perkembangan ilmu pengetahuan dan teknologi serta berkontribusi di bidang kedokteran dan kesehatan dalam fora nasional dan internasional pada tahun 2035.

Misi FK Universitas YARSI

1. Mengembangkan pendidikan kedokteran yang bermutu, diakui secara nasional maupun internasional, serta menghasilkan dokter muslim yang mampu beradaptasi dengan perkembangan ilmu pengetahuan dan teknologi serta berkontribusi di bidang kedokteran dan kesehatan serta mengamalkan profesinya sesuai dengan Islam.
2. Melaksanakan kajian dan penelitian yang bermutu tinggi yang diakui secara nasional maupun internasional, sesuai dengan perkembangan ilmu pengetahuan dan teknologi serta berkontribusi di bidang kedokteran dan kesehatan sesuai dengan Islam.
3. Mengembangkan pendidikan kedokteran yang bermutu, diakui secara nasional maupun internasional, serta menghasilkan dokter muslim yang mampu beradaptasi dengan perkembangan ilmu pengetahuan dan teknologi serta berkontribusi di bidang kedokteran dan kesehatan serta mengamalkan profesinya sesuai dengan Islam.
4. Melaksanakan kajian dan penelitian yang bermutu tinggi yang diakui secara nasional maupun internasional, sesuai dengan perkembangan ilmu pengetahuan dan teknologi serta berkontribusi di bidang kedokteran dan kesehatan sesuai dengan Islam.

Visi Keilmuan Program Studi

Menghasilkan Dokter Muslim bermutu tinggi yang unggul di bidang pencegahan dan komunitas, serta berkontribusi dalam meningkatkan derajat kesehatan masyarakat pada tahun 2035.

TIM PENYUSUN
BUKU PANDUAN SISTEM INDERA TA 2021/2022

Penanggungjawab

Dekan	: Prof. Rika Yuliwulandari, dr., M.Hlt.Sc, PhD
Wakil Dekan 1	: Miranti Pusparini, dr, M.Pd(Ked)
Kaprodi Akademik	: Marisa Riliani, dr., M.Biomed
Sekprodi	: Rita Komalasari, dr, Ph.D
Komisi Kurikulum	: Riyani Wikaningrum, dr., DMM, MSc

Penyunting
Koordinator Blok : dr. Nur Asiah, SpGK

Penulis
Pengampu Materi Anatomi
- Dr. Yenni Zulhamidah, MSc
- Dr. Marisa Riliani, MBiomed

Pengampu Materi Histologi
- Dr. Aan Royhan, MSc.

Pengampu Materi Fisiologi
- Dr. Sony Pamuji Laksono, MKes.
- DR. Dr. Eko Poerwanto, MKes.
- DR. Dr. Diniwati Mukhtar, MKes.
- DR. Dr. Indra Kusuma, MBiomed
- DR. Teguh Yuliadi, SSi, MSi
- Irfan Syarif, SSi. MSi

Pengampu Materi Mikrobiologi
- Dian Widiyanti, SSi. MSi. PhD
- Dr. Eri Dian Maharsi, MKes

Pengampu Materi Parasitologi
- Dr. Rika Ferlianti, MBiomed

Pengampu Materi Farmakologi
- DR. Dra. Risdawati Djohan, Apt. MKes
- Prof. Dr. Rika Yuliwulandari, MHltSc. PhD. DiplDK
- DR. Dr. Wening Sari, MKes

Pengampu Materi Ilmu Penyakit Mata
- Dr. Saskia Nassa Mokoginta, SpM
- Dr. Tri Agus Haryono, SpM
- Dr. Atiek Indriawati, SpM

Pengampu Materi Ilmu Penyakit THT
- Dr. Arroyan Wardhana, SpTHT
- Dr. Hastuti Rahmi, SpTHT

Pengampu Materi Ilmu Penyakit Kulit dan Kelamin
- Dr. Hadi Firmansyah S, SpKK, MKes

Pengampu Materi Ilmu Penyakit Gigi dan Mulut
- Drg. Ardin Amir, DDS
- Drg. Audiawati Surachmin, SpPM

Pengampu Materi Ilmu Agama
- Drs. Arsyad, MA

DAFTAR ISI

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Blok Sistem Indera

Deskripsi:

Blok ini bertujuan supaya mahasiswa belajar tentang konsep dasar Ilmu biomedik yang berkaitan dengan Sistem Indera serta pathogenesis, diagnosis, penatalaksanaan, pencegahan dan rehabilitasi gangguan sistem Indera didalam tubuh manusia, serta aspek non-medik yang meliputi aspek psikologis, sosial budaya lingkungan dan agama yang berkaitan dengan Sistem Indera pada manusia.

Capaian pembelajaran lulusan yang dibebankan pada mata kuliah/blok ini :

Kode	Capaian Pembelajaran
SIKAP (S)	
S1	Bertakwa kepada Tuhan Yang Maha Esa dan mampu menunjukkan sikap religious yang tercermin dalam nilai Universitas YARSI yaitu SCORE
S2	Menjunjung tinggi nilai kemanusiaan dalam menjalankan tugas berdasarkan agama,moral, dan etika
S3	Berkontribusi dalam peningkatan mutu kehidupan bermasyarakat, berbangsa, bernegara, dan kemajuan peradaban berdasarkan Pancasila
PENGETAHUAN (P)	
SK 3.1.P	Mampu memperjelas fenomena medis, kesehatan dan teknologi kesehatan secara ilmiah.
KETERAMPILAN UMUM (KU)	
KU 1	Mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam konteks pengembangan atau implementasi ilmu pengetahuan dan teknologi yang memperhatikan dan menerapkan nilai humaniora yang sesuai dengan bidang keahliannya
KETERAMPILAN KHUSUS (KK)	
SK 2.2.K	Mampu menerapkan karakter pembelajar sepanjang hayat dalam konteks pengembangan diri
SK 3.1.K	Mampu mendemonstransikan fenomena medis, kesehatan dan teknologi kesehatan secara ilmiah
SK..4.2.P	Mampu menganalisa masalah keuangan dan penyelesaiannya (C4)

	UNIVERSITAS YARSI **FAKULTAS KEDOKTERAN** **PROGRAM STUDI KEDOKTERAN UMUM**

RENCANA PEMBELAJARAN SEMESTER

Mata Kuliah/Blok	Kode	Rumpun MK	BOBOT (SKS)	SEMESTER	Tgl Penyusunan
Sistem Indera	KK1106003_18	Kedokteran	6 SKS	Enam	Maret 2021

Capaian Pembelajaran (CP)	**CPL-PRODI**	
	S.1	Bertakwa kepada Tuhan Yang Maha Esa dan mampu menunjukkan sikap religius
	S.2	Menjunjung tinggi nilai kemanusiaan dalam menjalankan tugas berdasarkan agama,moral, dan etika
	S.3	Berkontribusi dalam peningkatan mutu kehidupan bermasyarakat, berbangsa, bernegara, dan kemajuan peradaban berdasarkan Pancasila
	KU.1	Mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam konteks pengembangan atau implementasi ilmu pengetahuan dan teknologi yang memperhatikan dan menerapkan nilai humaniora yang sesuai dengan bidang keahliannya
	KU.6	Mampu memelihara dan mengembang-kan jaringan kerja dengan pembimbing, kolega, sejawat baik di dalam maupun di luar lembaganya
	SK.2..2.K	Mampu menerapkan karakter pembelajar sepanjang hayat dalam konteks pengembangan diri. (P2)
	SK.3.1.P	Mampu memperjelas fenomena medis, kesehatan dan teknologi kesehatan secara ilmiah. (C6)
	SK.3.1.K	Mampu mendemonstransikan fenomena medis, kesehatan dan teknologi kesehatan secara ilmiah.(P3)
	CP-BLOK	
	M1	Mahasiswa mampu menjelaskan konsep dasar Ilmu Biomedik pada Sistem Indera
	M2	Mahasiswa mampu memahami patogenesis, penegakakan diagnosis tata laksana dan pencegahan gangguan Sistem Indera
	M3	Mahasiswa mampu memahami patogenesis, penegakkan diagnosis tata laksana dan pencegahan gangguan Sistem Indera
	M4	Mahasiswa mampu mengenali aspek-aspek non medik yang terkait gangguan Sistem Indera meliputi aspek Psikologi, sosial budaya , lingkungan dan agama
Deskripsi singkat MK/Blok	Blok ini bertujuan supaya mahasiswa mempelajari teori / konsep - konsep dasar Ilmu Biomedik yang berkaitan dengan Sistem Indera serta patogenesis, diagnosis, penatalaksanaan, pencegahan dan rehabilitasi gangguan Sistem Indera didalam tubuh manuasia serta aspek non-medik yang meliputi aspek psikologis, sosial budaya lingkungan dan agama , pembelajaran dilaksanakan dengan menggunakan pendekatan SPICES. Mahasiswa diharuskan aktif mencari dan menemukan pengetahuan serta memperoleh ketrampilan dan sikap yang berkaitan dengan Sistem Indera	

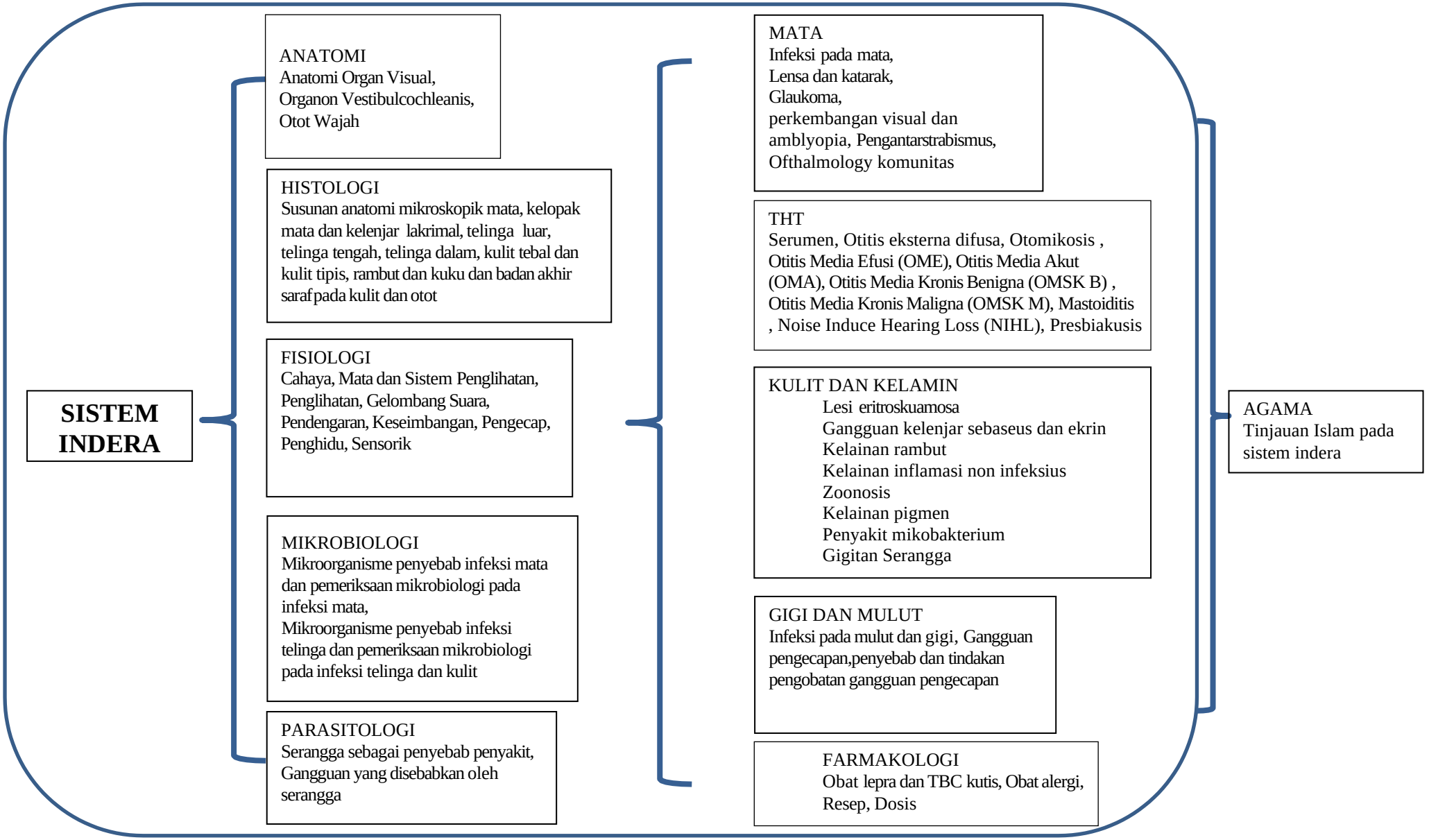
Materi Pembelajaran/Pokok Bahasan	1. Memahami dan mampu menjelaskan struktur anatomi, histologi, fisiologi sistem indera 2. Memahami dan mampu menjelaskan penyebab dan proses patofisiologi gangguan sistem indera akibat proses infeksi dan inflamasi, emergency, gangguan imunologi, proses degenerasi, neoplasma, dan kelainan kongenital 3. Memahami dan mampu menjelaskan patogenesis dan manifestasi klinik gangguan sistem indera 4. Mampu melakukan anamnesis pada gangguan sistem indera 5. Mampu melakukan pemeriksaan fisik pada gangguan sistemindera 6. Mampu memilih dan melakukan pemeriksaan penunjang yang diperlukan pada gangguan sistem indera 7. Mampu membuat diagnosis pada penyakit sistemindera 8. Memahami dan mampu menjelaskan penatalaksanaan gangguan pada sistem indera, meliputi preventif, kuratif dan rehabilitatif 9. Memahami dan mampu menjelaskan pengaruh biopsikososial pada gangguan sistem indera, meliputi faktor psikologis, sosial budaya, agama dan lingkungan 10. Mampu merancang dan melakukan program pencegahan penyakit sistem indera di masyarakat
Pustaka	**Utama :**
	Snell, RS 1986, Anatomi Klinik, 3rd edn, EGC, Jakarta
	Mescher, Anthony, L 2013, 13th edn, Basic Histology Text and Atlas, Mc Graw Hill, New York
	Ganong, WF 2016, 25th edn, Review of Medical Physiology, Mc Graw Hill, Boston
	Guyton, Hall, 2016, 13th edn, Textbook of medical physiology, Elsevier Inc, Philadelphia
	Sherwood, L 2017, 9th edn, From Cells to System. Human Physiology, Brooks Cole Thomson Learning Inc, Belmont, USA
	Kanski JJ and Bowling B, Cornea, Clinical Ophthalmology a Systemic Approach. Edisi7 London; Elsevier; 2011 Vaughan DG, Asbury.T dan Riordan-Eva P : Ophthalmology Umum.EGC. Edisi 17; 2009
	Moore GF, Ogren FP, Yonkers AJ. Anatomy and embryology of the ear. Dalam: Lee KJ, Ed. Textbook of otolaryngology and head and neck surgery. New York : Elsevier Science Publishing,1989.h.10-20. Adenan A. Kumpulan kuliah telinga. Bagian THT FK USU/RS Dr.Pirngadi. Medan. Wright A. Anatomy and ultrastructure of the human ear. Dalam : Gleeson M,Ed. Scott Brown's Basic sciences. 6th Ed. Great Britain: Butterworth-Heinemann, 1997.h.1/1/28-49. Liston SL, Duvall AJ. Embriologi, anatomi dan fisiologi telinga. Dalam: Adams GL, Boies LR, Higler PH, Ed. Buku ajar penyakit THT. Edisi ke-6. Jakarta: Penerbit Buku Kedokteran EGC, 1997.h.27-38. Kelainan telinga tengah. Djaafar ZA, Helmi, Restuti RD. Dalam: Buku ajar ilmu kesehatan. Telinga Hidung Tenggorok kepala dan Leher. Edisi ke enam. Editor: Soepardi EA, Iskandar N, Bashiruddin J, Restuti RD. Balai penerbit FKUI, Jakarta 2008 hal 64-77.
	Martin AG, Kobayashi GS. Fungal disease with cutaneous involvement in

	dermatology. Dalam: Fitzpatrick TB, Eisen AZ, Wolff K, Freedberg I, Austen KF, editor. Dermatology in general medicine; NewYork: Mc Graw Hill. Elgart ML, Warren NG. The superficial and subcutaneous mycoses. Dalam: Mochella SL, Hurley HJ, editor. Dermatology, Philadelphia: WB Saunders Co. Arnold HL,Odom RB, James WD: Diseases due to fungi and yeast. Dalam: Andrew's Disease of the Skin, clinical Dermatology. W.B Saunders Company.
	Pendukung :
	American Academy of Ophthalmology. External disease and Cornea. San Fransisco, 2010 J Dauglas Rhee. P Mark F, The Wills Eye Manual office and Emergency Room. Diagnosis and treatment of Eye Disease. Third edition. Lippincot William and Wilkins. Philadelphia, 2003
	Penyakit telinga tengah dan mastoid. Paparella MM, Adams GL, Levine SC. In: BOIES Buku ajar Penyakit THT. Edisi 6. Editor: Adams GL, Boies LR, Higler PA. Penerbit Buku kedokteran EGC Jakarta 1994 hal: 88-118.
	Richardson MD, Warnock DW, editor, Fungal Infection: Diagnosis and Management, Oxford: Blackwell Scientifi Publishing, Deepika T, Lakshmipathy, Kannabiran K. Review on Dermatomycosis: Pathogenesis and Treatment. Natural Science 2010; 7 (2): 726-731.

Media Pembelajaran	**Perangkat lunak:**	**Perangkat keras:**
	Media elektronik	Buku teks Buku ajar Jurnal Buku referensi lainnya Ruang tutorial Lab anatomi,Lab Histo,PK,PA

Team Blok	Anatomi, Histologi, Fisiologi, Parasitologi, Mikrobiologi, Farmakologi, Ilmu Penyakit THT, Ilmu Penyakit Mata, Ilmu Penyakit Kulit dan Kelamin, Gigi dan Mulut, Agama
Matakuliah syarat/blok terkait	Blok prinsip biomedik1,Blok prinsip biomedik 2,Blok Homeostasis dan cairan,Blok Mekanisme Penyakit 1,Blok Mekanisme Penyakit 2,Blok Mekanisme Pertahanan Tubuh, Blok Muskuloskeletal, Blok Respirasi, Blok kardiovaskular, Blok Hematopoetik dan Limfatik, Blok Ginjal dan Saluran Kemih, Blok Gatrointestinal, Blok Forensik

PETA KONSEP


SISTEM INDERA
ANATOMI
Anatomi Organ Visual, Organon Vestibulcochleanis, Otot Wajah
HISTOLOGI
Susunan anatomi mikroskopik mata, kelopak mata dan kelenjar lakrimal, telinga luar, telinga tengah, telinga dalam, kulit tebal dan kulit tipis, rambut dan kuku dan badan akhir saraf pada kulit dan otot
FISIOLOGI
Cahaya, Mata dan Sistem Penglihatan, Penglihatan, Gelombang Suara, Pendengaran, Keseimbangan, Pengecap, Penghidu, Sensorik
MIKROBIOLOGI
Mikroorganisme penyebab infeksi mata dan pemeriksaan mikrobiologi pada infeksi mata,
Mikroorganisme penyebab infeksi telinga dan pemeriksaan mikrobiologi pada infeksi telinga dan kulit
PARASITOLOGI
Serangga sebagai penyebab penyakit, Gangguan yang disebabkan oleh serangga
MATA
Infeksi pada mata,
Lensa dan katarak,
Glaukoma,
perkembangan visual dan amblyopia, Pengantarstrabismus,
Ofthalmology komunitas
THT
Serumen, Otitis eksterna difusa, Otomikosis , Otitis Media Efusi (OME), Otitis Media Akut (OMA), Otitis Media Kronis Benigna (OMSK B) , Otitis Media Kronis Maligna (OMSK M), Mastoiditis , Noise Induce Hearing Loss (NIHL), Presbiakusis
KULIT DAN KELAMIN
Lesi eritroskuamosa
Gangguan kelenjar sebaseus dan ekrin
Kelainan rambut
Kelainan inflamasi non infeksius
Zoonosis
Kelainan pigmen
Penyakit mikobakterium
Gigitan Serangga
GIGI DAN MULUT
Infeksi pada mulut dan gigi, Gangguan pengecapan,penyebab dan tindakan pengobatan gangguan pengecapan
FARMAKOLOGI
Obat lepra dan TBC kutis, Obat alergi, Resep, Dosis
AGAMA
Tinjauan Islam pada sistem indera

CAPAIAN PEMBELAJARAN BLOK

CP-BLOK	SUB-CP BLOK	INDIKATOR
Memahami anatomi mata	• Memahami cavum orbita dan kedudukan alat-alat didalamnya • Memahami morfologi dan fungsi palpebra, konjungtiva dan aparatus lakrimalis • Memahami morfologi dan fungsi dari bola mata dan N. Opticus	• Mengidentifikasi komponen tulang yang membentuk cavum orbita dan hubungan cavum orbita dengan ruang-ruang disekitarnya • Mendefinisikan sumbu optika dan sumbu orbita • Mengidentifikasi palpebra, kedudukan dan gerakan, serta otot-otot yang berperan. • Mengidentifikasi konjungtiva, bagian dan fungsinya. • Mengidentifikasi glandula lakrimalis dan saluran air mata • Mengidentifikasi pembuluh darah dan persarafan pada palpebra, konjungtiva dan aparatus lakrimalis • Mengidentifikasi lapisan-lapisan pembentuk dinding bola mata: kornea, sklera, iris, korpus siliaris, koroid, dan retina • Mengidentifikasi isi bola mata: humor aquous, lensa dan korpus vitreum • Mengidentifikasi bangunan-bangunan pada fundus oculi • Mengidentifikasi N. Opticus dan perjalanannya sampai ke otak • Menjelaskan lintasan impuls pengelihatan untuk jalur kesadaran pengelihatan dan jalur refleks, serta kelainan-kelainan yang mempengaruhi lintasan tersebut • Mengidentifikasi pembuluh darah dan persarafan pada bola mata • Mengidentifikasi jaringan retrobulber dan M. Orbitalis, serta peranannya terhadap kedudukan bola mata • Memahami macam-macam gerakan bola mata pada ketiga sumbunya
Memahami anatomi telinga	• Memahami morfologi auris eksterna dan auris media sebagai organ penghantar getaran bunyi • Memahami morfologi auris interna sebagai organ pendengaran dan keseimbangan	• Mengidentifikasi bangunan, ruang dan saluran pada pars tympanica ossis temporalis dan pars petrosa ossis temporalis • Mengidentifikasi auricula dan meatus acusticus externus, dihubungkan dengan fungsi nya • Mengidentifikasi cavum tympani, bangunan pada dinding dan bangunan didalam cavum tympani • Menjelaskan mekanisme penghantaran getaran bunyi oleh: auricula, meatus acusticus externus, membrane tympani, ossicula auditiva dan fenestra bestibuli • Menjelaskan peranan tuba auditiva, M. Tensor Tympani dan M. Stapedius terhadap hantaran tersebut, serta kelainan-kelainan yang dapat terjadi. • Mengidentifikasi pembuluh darah dan persarafan pada auris eksterna dan auris media • Mengidentifikasi bangunan, ruang dan saluran pada pars petrosa ossis temporalis • Menguraikan susunan dan fungsi labyrinthus membranaceu • Menunjukkan kedudukan pada labyrinthus osseus • Menjelaskan kedudukan dan fungsi endolimfe dan perilimfe

		• Menguraikan susunan dan perjalanan N. Cochlearis dan N. Vestibularis mulai dari reseptor pendengaran dan keseimbangan sampai kedalam otak • Menjelaskan lintasan impuls pendengaran dan keseimbangan untuk jalur kesadaran dan jalur refleks • Menjelaskan gangguan yang dapat terjadi pada N. Cochlearis dan N. Vestibularis dan akibatnya terhadap fungsi pendengaran dan keseimbangan
Memahami anatomi daerah penecap pada lidah	• Memahami morfologi dan susunan otot ekstrinsik dan otot intrinsik lidah	• Menguraikan macam-macam papillae pada lidah • Menguraikan persarafan sensoris dan motoris lidah
Memahami anatomi otot-otot wajah	• Memahami morfologi dan susunan otot – otot wajah	• Menguraikan otot-otot wajah, perdarahan dan persarafan
Mahasiswa mampu memahami teori/konsep-konsep dasar ilmu biomedik pada histologi organ mata, palpebra dan kelenjar lakrimal	• Mengenal susunan mikroskopik tunika fibrosa dan kamera okuli anterior	• Menjelaskan morfologi susunan mikroskopis konjungtiva bulbi • Menjelaskan morfologi susunan mikroskopis setiap lapisan kornea • Menjelaskan morfologi susunan mikroskopis sklera • Menjelaskan morfologi susunan mikroskopis limbus kornea dan kanal Schlemm • Menjelaskan morfologi kamera okuli anterior dan aliran drainase aquos humor
	• Mengenal susunan mikroskopik tunika vaskulosa (uvea) , lensa dan kamera okuli posterior	• Menjelaskan susunan mikroskopis iris • Menjelaskan susunan mikroskopis corpus siliaris • Menjelaskan susunan mikroskopis processus siliaris • Menjelaskan susunan mikroskopis zonula zinii • Menjelaskan susunan mikroskopis lensa • Menjelaskan morfologi kamera okuli posterior dan produksi aquos humor
	• Mengenal susunan mikroskopik tunika interna dan corpus vitreus	• Menjelaskan susunan mikroskopis corpus vitreus • Menjelaskan susunan mikroskopis setiap lapisan retina • Menjelaskan susunan mikroskopis foveola sentralis • Menjelaskan susunan mikroskopis papila nervus opticus
	• Mengenal susunan mikroskopis palpebra	• Menjelaskan bagian-bagian palpebra • Menjelaskan susunan mikroskopis konjungtiva palpebra • Menjelaskan susunan mikroskopis kelenjar-kelenjar palpebra • Menjelaskan susunan mikroskopis jaringan ikat palpebra
	• Mengenal susunan mikroskopis kelenjar lakrimal	• Menjelaskan morfologi pars terminalis kelenjar lakrimal • Menjelaskan letak dan morfologi saluran keluar kelenjar lakrimal • Menjelaskan susunan mikroskopis jaringan ikat pada

		kelenjar lakrimal
Mahasiswa mampu memahami teori/konsep-konsep dasar ilmu biomedik	• Mengenal susunan mikroskopik telinga luar (daun telinga dan liang telinga)	• Menjelaskan morfologi susunan mikroskopis daun telinga • Menjelaskan morfologi susunan mikroskopis liang telinga dan kelenjar seruminosa
	• Mengenal susunan mikroskopik membrana timpani	• Menjelaskan bagian-bagian membrana timpani • Menjelaskan susunan mikroskopik serat-serat penyusun membrana timpani
	• Mengenal susunan mikroskopis telinga dalam (bagian keseimbangan)	• Menjelaskan morfologi mikroskopis labirin osea pada bagian keseimbangan • Menjelaskan morfologi mikroskopis labirin mebranasea bagian keseimbangan • Menjelaskan morfologi mikroskopis reseptor keseimbangan macula • Menjelaskan morfologi mikroskopis reseptor keseimbangan krista ampularis
	• Mengenal susunan mikroskopis telinga dalam (bagian pendengaran)	• Menjelaskan morfologi mikroskopik labirin osea pada bagian pendengaran • Menjelaskan morfologi mikroskopis labirin membranasea bagian pendengaran • Menjelaskan susunan mikroskopis ruangan-ruangan pada labirin osea dan membranasea • Menjelaskan morfologi mikroskopis sel-sel penyokong pada labirin membranasea • Menjelaskan morfologi mikroskopis sel-sel pada organ corti
Mahasiswa mampu memahami teori/konsep-konsep dasar ilmu biomedik pada histologi organ kulit dan rambut	• Mengenal jenis kulit secara histologi dan lapisan-lapisan kulit secara mikroskopik	• Menjelaskan jenis-jenis kulit berdasarkan ketebalan lapisannya • Menjelaskan susunan mikroskopis setiap lapisan epidermis • Menjelaskan susunan mikroskopis setiap lapisan dermis • Menjelaskan susunan mikroskopis lapisan hypodermis beserta kelenjar-kelenjarnya
	• Mengenal susunan mikroskopis kulit tebal	• Menjelaskan morfologi mikroskopis epidermis kulit tebal • Menjelaskan morfologi mikroskopis dermis kulit tebal
	• Mengenal susunan mikroskopis kulit tipis	• Menjelaskan morfologi mikroskopis epidermis kulit tipis • Menjelaskan morfologi mikroskopis dermis kulit tipis • Menjelaskan morfologi mikroskopik sel melanosit dan produksi melanin
	• Mengenal susunan mikroskopis reseptor -reseptor pada kulit	• Menjelaskan morfologi mikroskopik badan meissner • Menjelaskan morfologi mikroskopik badan vater paccini

		• Menjelaskan morfologi mikroskopik free nerve ending
	• mengenal susunan mikroskopis rambut dan folikel rambut	• Menjelaskan bagian-bagian rambut dan folikel rambut yang merupakan modifikasi dari kulit • Menjelaskan susunan mikroskopis rambut • Menjelaskan susunan mikroskopis folikel rambut
Mahasiswa mampu memahami fungsi sistem penghidu dan pengecap	• Memahami fungsi penghidu dan odoran sampai ke selaput lender penghidu	• Menjelaskan rangsang penghidu / odoran • Menjelaskan jalannya lintasan persarafan penghidu • Menjelaskan terjadinya mekanisme penghidu • Menjelaskan pemeriksaan penghidu • Menjelaskan anosmia
	• Memahami fungsi sistem pengecap dan rangsang tastan di putik kecap	• Menjelaskan 4 reseptor rasa kecap • Menjelaskan jalannya lintasan persarfan pengecap • Menjelaskan percobaan waktu sirkulasi darah dari rangsang kecap • Menjelaskan kelainan rangsang kecap
Mahasiswa mampu memahami dan menjelaskan mikroorganisme penyebab infeksi pada mata, telinga, dan kulit	• Memahami dan mengetahui mikroorganisme berupa bakteri,virus dan jamur penyebab infeksi mata	• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen serta factor virulensi mikroorganisme penyebab infeksi mata • Memahami dan mengidentifikasi pemeriksaan mikrobiologi mikroorganisme penyebab infeksi mata)
	• Memahami dan mengetahui mikroorganisme berupa bakteri,virus dan jamur penyebab infeksi telinga	• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen serta factor virulensi mikroorganisme penyebab infeksi pada kulit • Memahami dan mengidentifikasi pemeriksaan mikrobiologi mikroorganisme penyebab infeksi kulit
	• Memahami dan mengetahui mikroorganisme berupa bakteri,virus dan jamur penyebab infeksi pada kulit	• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen serta factor virulensi mikroorganisme penyebab infeksi pada telinga • Memahami dan mengidentifikasi pemeriksaan mikrobiologi mikroorganisme penyebab infeksi pada telinga
Menguasai artropoda penyebab alergi dan toksik	• Memahami artropoda penyebab alergi dan toksik melalui kontak	• Mendiagnosis penyakit yang disebabkan artropoda yang menyebabkan alergi dan toksik melalui kontak • Mengidentifikasi jenis artropoda yang menyebabkan alergi dan toksik melalui kontak • Memerinci daur hidup dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui kontak • Membedakan morfologi dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui kotak • Menganalisa patologi dan gejala klinis penyakit yang timbulkan oleh artropoda yang menyebabkan alergi dan toksik melalui kontak • Merencanakan pengobatan untuk penyakit yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui kontak • Merencanakan pencegahan yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui kontak
	• Memahami artropoda penyebab alergi dan toksik	• Mendiagnosis penyakit yang disebabkan artropoda yang menyebabkan alergi dan toksik melalui

	melalui sengatan	sengatan • Mengidentifikasi jenis artropoda yang menyebabkan alergi dan toksik melalui sengatan • Memerinci daur hidup dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui sengatan • Membedakan morfologi dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui sengatan • Menganalisa patologi dan gejala klinis penyakit yang timbulkan oleh artropoda yang menyebabkan alergi dan toksik melalui sengatan • Merencanakan pengobatan untuk penyakit yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui sengatan • Merencanakan pencegahan yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui sengatan
	• Memahami artropoda penyebab alergi dan toksik melalui gigitan	• Mendiagnosis penyakit yang disebabkan artropoda yang menyebabkan alergi dan toksik melalui gigitan • Mengidentifikasi jenis artropoda yang menyebabkan alergi dan toksik melalui gigitan • Memerinci daur hidup dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui gigitan • Membedakan morfologi dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui gigitan • Menganalisa patologi dan gejala klinis penyakit yang timbulkan oleh artropoda yang menyebabkan alergi dan toksik melalui gigitan • Merencanakan pengobatan untuk penyakit yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui gigitan • Merencanakan pencegahan yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui gigitan
Menguasai artropoda penyebab penyakit	• Memahami Tungau sebagai penyebab penyakit di Blok Panca Indera	• Mendiagnosis penyakit yang disebabkan oleh tungau • Megidentifikasi spesies tungau yang menyebabkan penyakit • Memerinci daur hidup dari tungau yang menyebabkan penyakit • Membedakan morfologi dari tungau yang menyebabkan penyakit • Menganalisa patogenesis dan gejala klinis dari penyakit yang disebabkan oleh tungau • Merencanakan pencegahan dari penyakit yang disebabkan oleh tungau • Merencanakan pengobatan penyakit yang disebabkan oleh tungau • Mengidentifikasi morfologi dari tungau yang menyebabkan penyakit (telur, larva, nimfa, dewasa) di ruang praktikum
	• Memahami Tuma sebagai penyebab penyakit di Blok Panca Indera	• Mendiagnosis penyakit yang disebabkan tuma • Mengidentifikasi spesies tuma yang menyebabkan penyakit

		• Memerinci daur hidup dari tuma yang menyebabkan penyakit • Membedakan morfologi dari tuma yang menyebabkan penyakit • Menganalisa patologi dan gejala klinis dari penyakit yang disebabkan tuma • Merencanakan pencegahan dari penyakit yang disebabkan tuma • Merencanakan pengobatan penyakit yang disebabkan tuma • Mengidentifikasi morfologi dari tuma yang menyebabkan penyakit (telur, larva, nimfa, dewasa) di ruang praktikum
	• Memahami Larva lalat penyebab miasis di Blok Panca Indera	• Membedakan spesies larva lalat penyebab miasis berdasarkan sifat dan klinis • Memerinci daur hidup dari lalat yang menyebabkan miasis • Membedakan morfologi dari masing-masing spirakel posterior larva lalat penyebab miasis • Menganalisa patogenesis dan gejala klinis dari miasis • Mendiagnosis miasis • Merencanakan pencegahan penyakit miasis • Merencanakan pengobatan penyakit miasis • Mengidentifikasi morfologi masing-masing spesies berdasarkan spirakel posterior larva dan lalat dwasa saat praktikum
Mahasiswa mampu memahami konsep dasar Sistem Indera	• Memahami Gangguan pengecap pada Lidah & penyebabnya	• Mampu menjelaskan struktur mikroskopis dan makroskopis dan topografi organ, jaringan penyusun dari Lidah secara terpadu • Mampu menguasai konsep teoritis tentang Patogenesis penyakit atau kelainan yang meliputi, infeksi, dan non infeksi pada Lidah • Mampu menjelaskan ilmu pengetahuan biomedik yang relevan antara ilmu kedokteran dasar dengan bidang kedokteran gigi untuk menegakkan diagnosis, menetapkan prognosis dan merencanakan tindakan yang tepat.
Mahasiswa mampu memahami dan menulis resep secara bijak dan rasional, jelas, lengkap, dan dapat dibaca	• Memahami perihal resep dan tatacara penulisan resep secara bijak dan rasional, jelas, lengkap dan dapat dibaca	• Menjelaskan definisi dan pengertian preskripsi/resep dokter • Menjelaskan macam-macam formula preskripsi/resep dokter • Menjelaskan pengertian resep rasional • Menjelaskan dan mendemokan cara menulis resep yang jelas, lengkap dan dapat dibaca • Memahami ketentuan dan peraturan tentang resep, apograph (salinan resep) dan obat
	• Memahami dan menghitung dosis obat	• Menjelaskan pengertian umum tentang dosis obat dan macam-macam dosis obat • Menjelaskan factor-faktor yang mempengaruhi dosis • Menjelaskan macam-macam sediaan obat utuk sistemik. • Mejelaskan dan cara menghitung dosis untuk anak dan dewasa

Mahasiswa mampu memahami konsep Maqasid Assyari'ah	Memahami lima bentuk Maqasid Assyari'ah : • Hifzhuddin • Hifzhul Mal • Hifzhunnafs • Hifzhunnsl • Hifzhul 'Aql	• Menjelaskan pengertian, ruang lingkup dan Contoh konsep Hifzhuddin • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhul Mal • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhunnafs • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhunnasl • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhul 'Aql
Mahasiswa Mampu memahami hukum penggunaan Panca Indera dalam perspektif fiqih dan perspektif akhlak/Etika lalu mengimplementasikannya dalam praktik pembelajaran	Memahami bentuk-bentuk penggunaan panca indera dan Hukumnya : • Wajib • Haram • Sunnah • Mubah • Makruh	• Menjelaskan hukum dan penggunaan masing-masing panca indera yang Wajib • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Haram • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Sunnah • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Mubah • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Makruh

RINCIAN RENCANA KEGIATAN

Pert/ Mggke	Capaian Pembelajaran (Sub-CPMK)	Indikator	Materi	Kegiatan pembelajaran (Metode)	Alokasi waktu	Sumber dan Media/alat	Penilaian/ Tugas
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	• Memahami cavum orbita dan kedudukan alat-alat didalamnya • Memahami morfologi dan fungsi palpebra, konjungtiva dan aparatus lakrimalis • Memahami morfologi dan fungsi dari bola mata dan N. Opticus	• Mengidentifikasi komponen tulang yang membentuk cavum orbita dan hubungan cavum orbita dengan ruang-ruang disekitarnya • Mendefinisikan sumbu optika dan sumbu orbita • Mengidentifikasi palpebra, kedudukan dan gerakan, serta otot-otot yang berperan. • Mengidentifikasi konjungtiva, bagian dan fungsinya. • Mengidentifikasi glandula lakrimalis dan saluran air mata • Mengidentifikasi pembuluh darah dan persarafan pada palpebra, konjungtiva dan aparatus lakrimalis • Mengidentifikasi lapisan-lapisan pembentuk dinding bola mata: kornea, sklera, iris, korpus siliaris, koroid, dan retina • Mengidentifikasi isi bola mata: humor aquous, lensa dan korpus vitreum • Mengidentifikasi bangunan-bangunan pada fundus oculi • Mengidentifikasi N. Opticus dan perjalanannya sampai ke otak • Menjelaskan lintasan impuls pengelihatan untuk jalur kesadaran pengelihatan dan jalur refleks, serta kelainan-kelainan yang mempengaruhi lintasan tersebut • Mengidentifikasi pembuluh darah dan persarafan pada bola mata • Mengidentifikasi jaringan retrobulber dan M. Orbitalis, serta peranannya terhadap kedudukan bola mata • Memahami macam-macam gerakan bola mata pada ketiga sumbunya	Anatomi mata	Kuliah dan praktikum	Kuliah : 3x50 mnt Dr. Yenni Zulhamidah, M.Sc Praktikum : 1x150 mnt	Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
1	• Memahami morfologi auris eksterna dan auris media sebagai organ penghantar getaran bunyi • Memahami morfologi auris interna sebagai organ pendengaran dan keseimbangan	• Mengidentifikasi bangunan, ruang dan saluran pada pars tympanica ossis temporalis dan pars petrosa ossis temporalis • Mengidentifikasi auricula dan meatus acusticus externus, dihubungkan dengan fungsinya • Mengidentifikasi cavum tympani, bangunan pada dinding dan bangunan didalam cavum tympani • Menjelaskan mekanisme penghantaran getaran bunyi oleh: auricula, meatus acusticus externus, membrane tympani, ossicula auditiva dan fenestra bestibuli • Menjelaskan peranan tuba	Anatomi telinga	Kuliah dan praktikum	Kuliah : 2x50 mnt Dr. Marisa Riliani, M.Biomed Praktikum : 1x150 mnt	Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum

		auditiva, M. Tensor Tympani dan M. Stapedius terhadap hantaran tersebut, serta kelainan-kelainan yang dapat terjadi. • Mengidentifikasi pembuluh darah dan persarafan pada auris eksterna dan auris media • Mengidentifikasi bangunan, ruang dan saluran pada pars petrosa ossis temporalis • Menguraikan susunan dan fungsi labyrinthus membranaceu • Menunjukkan kedudukan pada labyrinthus osseus • Menjelaskan kedudukan dan fungsi endolimfe dan perilimfe • Menguraikan susunan dan perjalanan N. Cochlearis dan N. Vestibularis mulai dari reseptor pendengaran dan keseimbangan sampai kedalam otak • Menjelaskan lintasan impuls pendengaran dan keseimbangan untuk jalur kesadaran dan jalur refleks • Menjelaskan gangguan yang dapat terjadi pada N. Cochlearis dan N. Vestibularis dan akibatnya terhadap fungsi pendengaran dan keseimbangan					
1	Memahami morfologi dan susunan otot ekstrinsik dan otot intrinsik lidah	• Menguraikan macam-macam papillae pada lidah • Menguraikan persarafan sensoris dan motoris lidah	Anatomi lidah	praktikum	Praktikum : 1x150 mnt	Computer, layar yarsi, buku atlas	Ujian praktikum
1	Memahami morfologi dan susunan otot – otot wajah	• Menguraikan otot-otot wajah, perdarahan dan persarafan	Anatomi otot-otot wajah	praktikum		Computer, layar yarsi, buku atlas	Ujian praktikum
	Mengenal susunan mikroskopik tunika fibrosa dan kamera okuli anterior	• Menjelaskan morfologi susunan mikroskopis konjungtiva bulbi • Menjelaskan morfologi susunan mikroskopis setiap lapisan kornea • Menjelaskan morfologi susunan mikroskopis sklera • Menjelaskan morfologi susunan mikroskopis limbus kornea dan kanal Schlemm • Menjelaskan morfologi kamera okuli anterior dan aliran drainase aquos humor	Anatomi mikroskopik mata	Kuliah dan praktikum	Kuliah : 5x 50 mnt Dr. Aan Royhan, M.Biomed Praktikum : 3x 150 mnt	Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopik tunika vaskulosa (uvea) , lensa dan kamera okuli posterior	• Menjelaskan susunan mikroskopis iris • Menjelaskan susunan mikroskopis corpus siliaris • Menjelaskan susunan	Anatomi mikroskopik mata	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum

		mikroskopis processus siliaris • Menjelaskan susunan mikroskopis zonula zinii • Menjelaskan susunan mikroskopis lensa • Menjelaskan morfologi kamera okuli posterior dan produksi aquos humor					
	Mengenal susunan mikroskopik tunika interna dan corpus vitreus	• Menjelaskan susunan mikroskopis corpus vitreus • Menjelaskan susunan mikroskopis setiap lapisan retina • Menjelaskan susunan mikroskopis foveola sentralis • Menjelaskan susunan mikroskopis papila nervus opticus					
	Mengenal susunan mikroskopis palpebra	• Menjelaskan bagian-bagian palpebra • Menjelaskan susunan mikroskopis konjungtiva palpebra • Menjelaskan susunan mikroskopis kelenjar-kelenjar palpebra • Menjelaskan susunan mikroskopis jaringan ikat palpebra	Anatomi mikroskopik mata	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopis kelenjar lakrimal	• Menjelaskan morfologi pars terminalis kelenjar lakrimal • Menjelaskan letak dan morfologi saluran keluar kelenjar lakrimal • Menjelaskan susunan mikroskopis jaringan ikat pada kelenjar lakrimal	Anatomi mikroskopik mata	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopik telinga luar (daun telinga dan liang telinga)	• Menjelaskan morfologi susunan mikroskopis daun telinga • Menjelaskan morfologi susunan mikroskopis liang telinga dan kelenjar seruminosa	Anatomi mikroskopik telinga	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopik membrana timpani	• Menjelaskan bagian-bagian membrana timpani • Menjelaskan susunan mikroskopik serat-serat penyusun membrana timpani	Anatomi mikroskopik telinga	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopis telinga dalam (bagian	• Menjelaskan morfologi mikroskopis labirin osea pada bagian keseimbangan	Anatomi mikroskopik telinga	Kuliah dan praktikum		Computer, layar yarsi,	Ujian Tulis dan

	keseimbangan)	• Menjelaskan morfologi mikroskopis labirin mebranasea bagian keseimbangan • Menjelaskan morfologi mikroskopis reseptor keseimbangan macula • Menjelaskan morfologi mikroskopis reseptor keseimbangan krista ampularis				buku atlas	Ujian praktikum
	Mengenal susunan mikroskopis telinga dalam (bagian pendengaran)	• Menjelaskan morfologi mikroskopik labirin osea pada bagian pendengaran • Menjelaskan morfologi mikroskopis labirin membranasea bagian pendengaran • Menjelaskan susunan mikroskopis ruangan-ruangan pada labirin osea dan membranasea • Menjelaskan morfologi mikroskopis sel-sel penyokong pada labirin membranasea • Menjelaskan morfologi mikroskopis sel-sel pada organ corti	Anatomi mikroskopik telinga	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal jenis kulit secara histologi dan lapisan-lapisan kulit secara mikroskopik	• Menjelaskan jenis-jenis kulit berdasarkan ketebalan lapisannya • Menjelaskan susunan mikroskopis setiap lapisan epidermis • Menjelaskan susunan mikroskopis setiap lapisan dermis • Menjelaskan susunan mikroskopis lapisan hypodermis beserta kelenjar-kelenjarnya	Anatomi mikroskopik kulit	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopis kulit tebal	• Menjelaskan morfologi mikroskopis epidermis kulit tebal • Menjelaskan morfologi mikroskopis dermis kulit tebal	Anatomi mikroskopik kulit	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	Mengenal susunan mikroskopis kulit tipis	• Menjelaskan morfologi mikroskopis epidermis kulit tipis • Menjelaskan morfologi mikroskopis dermis kulit tipis • Menjelaskan morfologi mikroskopik sel melanosit dan produksi melanin	Anatomi mikroskopik kulit	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum

	Mengenal susunan mikroskopis reseptor -reseptor pada kulit	• Menjelaskan morfologi mikroskopik badan meissner • Menjelaskan morfologi mikroskopik badan vater paccini • Menjelaskan morfologi mikroskopik free nerve ending	Anatomi mikroskopik kulit	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
	mengenal susunan mikroskopis rambut dan folikel rambut	• Menjelaskan bagian-bagian rambut dan folikel rambut yang merupakan modifikasi dari kulit • Menjelaskan susunan mikroskopis rambut • Menjelaskan susunan mikroskopis folikel rambut	Anatomi mikroskopik kulit	Kuliah dan praktikum		Computer, layar yarsi, buku atlas	Ujian Tulis dan Ujian praktikum
2	Memahami Mahasiswa mampu memahami fungsi system penghidu dan pengecap	• Menjelaskan rangsang penghidu / odoran • Menjelaskan jalannya lintasan persarafan penghidu • Menjelaskan terjadinya mekanisme penghidu • Menjelaskan pemeriksaan penghidu • Menjelaskan anosmia	Sistem penghidu dan odoran	Kuliah dan praktikum	K: 1x50' (Dr.dr.Diniwati Mukhtar MKes) P : 2 x100'	Komputer, LCD, video, dan bahan dan alat praktikum	Ujian tulis, Ujian praktikum
		• Menjelaskan 4 reseptor rasa kecap • Menjelaskan jalannya lintasan persarfan pengecap • Menjelaskan percobaan waktu sirkulasi darah dari rangsang kecap • Menjelaskan kelainan rangsang kecap	Memahami fungsi sistem pengecap dan rangsang tastan di putik kecap	Kuliah dan praktikum	T: 1x50' Feedback: 1x50' (Dr. dr. Diniwati Mukhtar MKes) P: 1x 150'	Komputer, LCD, video	Ujian tulis, Tugas baca
	Memahami dan mengetahui mikroorganisme berupa bakteri,virus dan jamur penyebab infeksi mata	• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen bakteri penyebab infeksi mata • Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen virus penyebab infeksi mata • Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen jamur penyebab infeksi mata • Memahami dan mengidentifikasi pemeriksaan mikrobiologi bakteri penyebab infeksi saluran pencernaan (kultur, rapid test, serologi, tes sensitivitas)	Blepaharitis et causa bacterial Conjungtivitis et causa bacterial Conjungtivitis et causa virus Conjungtivitis et causa jamur Keratitis et causa bacterial Vitritis Korioretinitis	Kuliah Dr. Er Dian Maharsi, M.Kes Praktikum (pemeriksaan mikroorganisme penyebab infeksi pada mata,telinga dan kulit)	K: 50' (1x50') P: 300' (2x 150')	Komputer, LCD,	Ujian blok (2 soal) UPI (2 soal)
	Memahami dan mengetahui mikroorganisme berupa bakteri,virus dan jamur penyebab infeksi kulit	• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen bakteri penyebab infeksi kulit • Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen virus penyebab infeksi kulit	Impetigo, folikulitis, karbunkel, furunkel, lepr P. acne, Varisela, herpes zoster morbili,	Kuliah Dian Widianti, PhD	K: 50' (1x50') P: 300'	Komputer, LCD	Kuis , Ujian blok UPI

		• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen jamur penyebab infeksi kulit • Memahami dan mengidentifikasi pemeriksaan mikrobiologi bakteri, virus dan jamur penyebab infeksi kulit (kultur, rapid test, serologi, tes sensitivitas)	rubella, herpe simplex 1, HP mikosis superfisial, tinea, mikosis subkutan	Praktikum (pemeriksaan mikroorganisme penyebab infeksi pada mata,telinga dan kulit)	(2x 150')		
	Memahami dan mengetahui mikroorganisme penyebab infeksi telinga	• Memahami dan Menjelaskan klasifikasi, nomenklatur, morfologi dan komponen mikroorganisme penyebab infeksi telinga • Memahami dan mengidentifikasi pemeriksaan mikrobiologi mikroorganisme penyebab telinga	Otitis media Akut, otitis media kronik, otitis eksterna	Kuliah Dian Widianti, PhD Praktikum (pemeriksaan mikroorganisme penyebab infeksi pada mata,telinga dan kulit	K: 50' (1x50') P: 300' (2x 150')	Komputer, LCD	Kuis, Ujian Blok UPI
	Memahami artropoda penyebab alergi dan toksik melalui kontak	• Mendiagnosis penyakit yang disebabkan artropoda yang menyebabkan alergi dan toksik melalui kontak • Mengidentifikasi jenis artropoda yang menyebabkan alergi dan toksik melalui kontak • Memerinci daur hidup dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui kontak • Membedakan morfologi dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui kotak • Menganalisa patologi dan gejala klinis penyakit yang timbulkan oleh artropoda yang menyebabkan alergi dan toksik melalui kontak • Merencanakan pengobatan untuk penyakit yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui kontak • Merencanakan pencegahan yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui kontak	parasit	Kuliah dan praktikum	Kuliah : 2x50 mnt Dr. Rika Ferlianti, MBiomed Praktikum : 1x150 mnt	Komputer, LAYAR YARSI	Ujian tulis dan ujian praktikum
	Memahami artropoda	• Mendiagnosis penyakit yang disebabkan artropoda yang	parasit	Kuliah dan praktikum			

	penyebab alergi dan toksik melalui sengatan	menyebabkan alergi dan toksik melalui sengatan • Mengidentifikasi jenis artropoda yang menyebabkan alergi dan toksik melalui sengatan • Memerinci daur hidup dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui sengatan • Membedakan morfologi dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui sengatan • Menganalisa patologi dan gejala klinis penyakit yang timbulkan oleh artropoda yang menyebabkan alergi dan toksik melalui sengatan • Merencanakan pengobatan untuk penyakit yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui sengatan • Merencanakan pencegahan yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui sengatan					
	Memahami artropoda penyebab alergi dan toksik melalui gigitan	• Mendiagnosis penyakit yang disebabkan artropoda yang menyebabkan alergi dan toksik melalui gigitan • Mengidentifikasi jenis artropoda yang menyebabkan alergi dan toksik melalui gigitan • Memerinci daur hidup dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui gigitan • Membedakan morfologi dari masing-masing artropoda yang menyebabkan alergi dan toksik melalui gigitan • Menganalisa patologi dan gejala klinis penyakit yang timbulkan oleh artropoda yang menyebabkan alergi dan toksik melalui gigitan • Merencanakan pengobatan untuk penyakit yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui gigitan • Merencanakan pencegahan yang disebabkan oleh artropoda yang menyebabkan alergi dan toksik melalui gigitan	parasit	Kuliah dan praktikum			
	Memahami Tungau sebagai penyebab penyakit di Blok Panca Indera	• Mendiagnosis penyakit yang disebabkan oleh tungau • Megidentifikasi spesies tungau yang menyebabkan penyakit • Memerinci daur hidup dari tungau yang menyebabkan penyakit • Membedakan morfologi dari tungau yang menyebabkan penyakit • Menganalisa patogenesis dan gejala klinis dari penyakit yang disebabkan oleh tungau • Merencanakan pencegahan dari penyakit yang disebabkan oleh	parasit	Kuliah dan praktikum			

		tungau • Merencanakan pengobatan penyakit yang disebabkan oleh tungau • Mengidentifikasi morfologi dari tungau yang menyebabkan penyakit (telur, larva, nimfa, dewasa) di ruang praktikum					
	Memahami Tuma sebagai penyebab penyakit di Blok Panca Indera	• Mendiagnosis penyakit yang disebabkan tuma • Mengidentifikasi spesies tuma yang menyebabkan penyakit • Memerinci daur hidup dari tuma yang menyebabkan penyakit • Membedakan morfologi dari tuma yang menyebabkan penyakit • Menganalisa patologi dan gejala klinis dari penyakit yang disebabkan tuma • Merencanakan pencegahan dari penyakit yang disebabkan tuma • Merencanakan pengobatan penyakit yang disebabkan tuma • Mengidentifikasi morfologi dari tuma yang menyebabkan penyakit (telur, larva, nimfa, dewasa) di ruang praktikum	parasit	Kuliah dan praktikum			
	Memahami Larva lalat penyebab miasis di Blok Panca Indera	• Membedakan spesies larva lalat penyebab miasis berdasarkan sifat dan klinis • Memerinci daur hidup dari lalat yang menyebabkan miasis • Membedakan morfologi dari masing-masing spirakel posterior larva lalat penyebab miasis • Menganalisa patogenesis dan gejala klinis dari miasis • Mendiagnosis miasis • Merencanakan pencegahan penyakit miasis • Merencanakan pengobatan penyakit miasis • Mengidentifikasi morfologi masing-masing spesies berdasarkan spirakel posterior larva dan lalat dwasa saat praktikum	parasit	Kuliah dan praktikum			
	Memahami Gangguan pengecap pada Lidah & penyebabnya	• Mampu menjelaskan struktur mikroskopis dan makroskopis dan topografi organ, jaringan penyusun dari Lidah secara terpadu • Mampu menguasai konsep teoritis tentang Patogenesis penyakit atau kelainan yang meliputi, infeksi, dan non infeksi pada Lidah • Mampu menjelaskan ilmu pengetahuan biomedik yang relevan antara ilmu kedokteran dasar dengan bidang kedokteran gigi untuk menegakkan diagnosis, menetapkan prognosis dan merencanakan tindakan yang tepat.	Gangguan pengecap dan penyebabnya	Kuliah dan Tugas Baca	K: 2x50' (drg. Audiawati, Sp.PM)	Komputer, LAYAR YARSI	Ujian tulis
	Memahami perihal resep dan tatacara penulisan resep secara bijak dan	• Menjelaskan definisi dan pengertian preskripsi/resep dokter • Menjelaskan macam-macam formula preskripsi/resep dokter	Penulisan resep	Kuliah dan praktikum	K: 2x50' ((Dr. dra	Komputer, LCD, video,	Ujian tulis, Ujian

	rasional, jelas, lengkap dan dapat dibaca	• Menjelaskan pengertian resep rasional • Menjelaskan dan mendemokan cara menulis resep yang jelas, lengkap dan dapat dibaca • Memahami ketentuan dan peraturan tentang resep, apograph (salinan resep) dan obat			Risdawati Djohan,M. Kes.apt) P : 1x150'	dan bahan dan alat praktikum	praktikum
	Mahasiswa mampu memahami dan menghitung dosis obat	• Menjelaskan pengertian umum tentang dosis obat dan macam-macam dosis obat • Menjelaskan factor-faktor yang mempengaruhi dosis • Menjelaskan macam-macam sediaan obat utuk sistemik. • Mejelaskan dan cara menghitung dosis untuk anak dan dewasa	Dosis Obat	Kuliah dan praktikum	K: 2x50' ((Dr. dra Risdawati Djohan,M. Kes.apt) P : 1x150'	Komputer, LCD, video, dan bahan dan alat praktikum	Ujian tulis, Ujian praktikum
	Memahami lima bentuk Maqasid Assyari'ah : Hifzhuddin Hifzhul Mal Hifzhunnafs Hifzhunnsl Hifzhul 'Aql	• Menjelaskan pengertian, ruang lingkup dan Contoh konsep Hifzhuddin • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhul Mal • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhunnafs • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhunnasl • Menjelaskan pengertian, ruang lingkup dan contoh Hifzhul 'Aql	Tinjauan islam pd pancaindera	kuliah	Kuliah : 3x50 mnt Drs. M. Arsyad, MA	Komputer, LAYAR YARSI	Ujian tulis
	Memahami bentuk-bentuk penggunaan panca indera dan Hukumnya : Wajib Haram Sunnah Mubah Makruh	• Menjelaskan hukum dan penggunaan masing-masing panca indera yang Wajib • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Haram • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Sunnah • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Mubah • Menjelaskan hukum dan penggunaan masing-masing panca indera yang Makruh	Tinjauan islam pd pancaindera				

EVALUASI PEMBELAJARAN

FORMULA ASSESMEN BLOK (%)	
Nilai Ujian Teori	
Nilai tugas	
Nilai praktikum	
Nilai kuis dan wrap up	

	Rentang Nilai		Arti
Range	Angka	Huruf	
≥75	4.00	A	Lulus
72,50 – 74,99	3.75	A-	Lulus
70,00 – 72,49	3.50	AB	Lulus
67,50 - 69,99	3.25	B+	Lulus
65,00 – 67,49	3.00	B	Lulus
62,50 – 64,99	2.75	B-	Lulus
60,00 – 62,49	2.50	BC	Lulus
57,50 – 59,99	2.25	C+	Lulus
55,00 – 57,49	2.00	C	Lulus
52,50 – 54,99	1.75	C-	Tidak Lulus
50,00 – 52,49	1.50	CD	Tidak Lulus
47,50 – 49,99	1.25	D+	Tidak Lulus
45,00 – 47,49	1.00	D	Tidak Lulus
≤ 45	0.00	E	Tidak Lulus

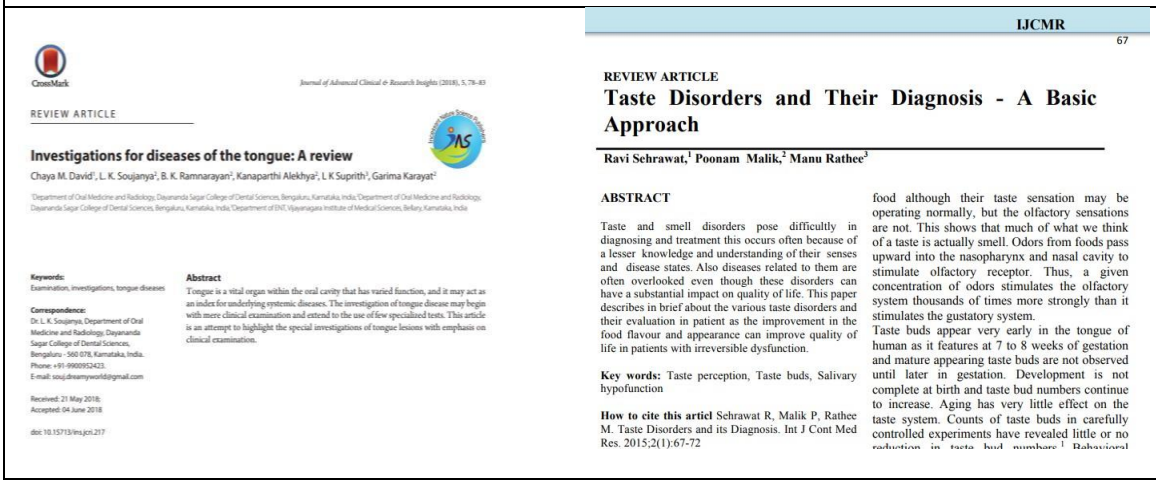
PANDUAN TUGAS MAHASISWA

Tugas. 1 : Sensory profile of adults with reduced food intake and the potential roles of nutrition and physical activity intervention

	UNIVERSITAS YARSI **FAKULTAS KEDOKTERAN** **PROGRAM STUDI KEDOKTERAN UMUM**				
MATA KULIAH	Fisiologi Blok Sistem Indera				
KODE	KK1106003_18	SKS	6	Semester	6
DOSEN PENGAMPU	DR. dr. Diniwati Mukhtar, MKes. AIFM				
BENTUK TUGAS					
Membaca sebuah topik dari jurnal seperti pada daftar bacaan					
JUDUL TUGAS					
Sensory profile of adults with reduced food intake and the potential roles of nutrition and physical activity intervention					
SUB CAPAIAN PEMBELAJARAN MATA KULIAH					
Mahasiswa mampu menjelaskan mekanisme penuaan pada system penghidu dan pengecap yang mempengaruhi status nutrisi lansia					
DISKRIPSI TUGAS					
Membaca jurnal yang ada pada daftar bacaan dan membuat pertanyaan dengan identifikasi hal-hal yang belum dipahami. Pertanyaan diemailkan ke alamat email yang tercantum dibawah					
METODE PENGERJAAN TUGAS					
Mencatat dan mempersiapkan bahan diskusi.					
BENTUK DAN FORMAT LUARAN					
Kuis dan feedback					
INDIKATOR, KRETERIA DAN BOBOT PENILAIAN					
Penilaian kuis menggunakan kunci yang disediakan oleh Pengampu mata kuliah					
JADWAL PELAKSANAAN					
• Membaca	2 hari sebelum feedback				
• Identifikasi hal yang belum dipahami	Di email ke diniwati.mukhtar@yarsi.ac.id paling lambat 2 hari sebelum feedback				
• Kuis dan Feedback	Kelas online				
LAIN-LAIN					
Feedback dilaksanakan dikelas online					
DAFTAR RUJUKAN					
Artikel terlampir					

Tugas. 2 Investigations for diseases of the tongue: A review
REVIEW ARTICLE Taste Disorders and Their Diagnosis - A Basic Approach

	UNIVERSITAS YARSI **FAKULTAS KEDOKTERAN** **PROGRAM STUDI KEDOKTERAN UMUM**				
MATA KULIAH	Gigi dan Mulut Blok Sistem Indera				
KODE	KK1106003_18	SKS	6	Semester	6
DOSEN PENGAMPU	drg. Audiawati, Sp.PM				
BENTUK TUGAS					
Membaca dua artikel jurnal seperti pada daftar bacaan					
JUDUL TUGAS					
Investigations for diseases of the tongue: A review REVIEW ARTICLE Taste Disorders and Their Diagnosis - A Basic Approach					
SUB CAPAIAN PEMBELAJARAN MATA KULIAH					
Memahami Gangguan pengecap pada Lidah & penyebabnya					
DISKRIPSI TUGAS					
Membaca artikel pada jurnal yang ada pada daftar bacaan dan membuat pertanyaan dengan identifikasi hal-hal yang belum dipahami. Pertanyaan diemailkan ke alamat email yang tercantum dibawah					
METODE PENGERJAAN TUGAS					
Mencatat dan mempersiapkan bahan diskusi.					
BENTUK DAN FORMAT LUARAN					
• Kuis dan feedback					
INDIKATOR, KRETERIA DAN BOBOT PENILAIAN					
Penilaian kuis menggunakan kunci yang disediakan oleh Pengampu mata kuliah.					
JADWAL PELAKSANAAN					
• Membaca					
• Identifikasi hal yang belum dipahami	Di email ke audiawati.surachmin@yarsi.ac.id				
• Kuis	online				
• Feedback	Kelas online				
LAIN-LAIN					
Feedback dilaksanakan dikelas online					
DAFTAR BACAAN					



REVIEW ARTICLE

Investigations for diseases of the tongue: A review

Chaya M. David[1], L. K. Soujanya[2], B. K. Ramnarayan[2], Kanaparthi Alekhya[2], L K Suprith[3], Garima Karayat[2]

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Keywords:
Examination, investigations, tongue diseases

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Abstract

Tongue is a vital organ within the oral cavity that has varied function, and it may act as an index for underlying systemic diseases. The investigation of tongue disease may begin with mere clinical examination and extend to the use of few specialized tests. This article is an attempt to highlight the special investigations of tongue lesions with emphasis on clinical examination.

IJCMR
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REVIEW ARTICLE

Taste Disorders and Their Diagnosis - A Basic Approach

Ravi Sehrawat,[1] Poonam Malik,[2] Manu Rathee[3]

ABSTRACT

Taste and smell disorders pose difficultly in diagnosing and treatment this occurs often because of a lesser knowledge and understanding of their senses and disease states. Also diseases related to them are often overlooked even though these disorders can have a substantial impact on quality of life. This paper describes in brief about the various taste disorders and their evaluation in patient as the improvement in the food flavour and appearance can improve quality of life in patients with irreversible dysfunction.

Key words: Taste perception, Taste buds, Salivary hypofunction

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food although their taste sensation may be operating normally, but the olfactory sensations are not. This shows that much of what we think of a taste is actually smell. Odors from foods pass upward into the nasopharynx and nasal cavity to stimulate olfactory receptor. Thus, a given concentration of odors stimulates the olfactory system thousands of times more strongly than it stimulates the gustatory system.

Taste buds appear very early in the tongue of human as it features at 7 to 8 weeks of gestation and mature appearing taste buds are not observed until later in gestation. Development is not complete at birth and taste bud numbers continue to increase. Aging has very little effect on the taste system. Counts of taste buds in carefully controlled experiments have revealed little or no reduction in taste bud numbers.[1] Behavioral

SKENARIO 1

Mata Merah

Seorang perempuan berusia 35 tahun datang ke poliklinik dengan keluhan mata kanan merah sejak 6 hari yang lalu. Keluhan disertai dengan penglihatan buram, silau dan nyeri . Sebelumnya mata kanan tertusuk batang padi

Pada pemeriksaan oftalmologis:

VOD: 6/30 pinhole tetap , VOS: 6/6

Segmen anterior OD: palpebra edema (+), lakrimasi (+), **blefarospame** (+), konjungtiva tarsalis superior : **hiperemis** , konjungtiva bulbi: **injeksi siliar** (+), Kornea : **infiltrat disertai lesi satelit** (+) di sentral, Bilik Mata Depan : dalam, **hipopion 10%** , permukaan tidak rata. Lainnya sulit dinilai.

Segmen anterior OS : tak ada kelainan. Segmen posterior OD: tak dapat dinilai. OS : refleks fundus (+), Papil : bulat batas tegas, warna merah kekuningan, Cup / Disc Ratio :0,3. Arteri/ Vena ratio : 2/3 .Retina : tak ada kelainan, Makula : refleks fovea (+).

Pasien sudah mencoba mengobati dengan obat warung tapi tidak ada perubahan.

Setelah mendapatkan terapi pasien diminta untuk kontrol rutin dan menjaga serta memelihara kesehatan mata sesuai tuntunan ajaran Islam.

SKENARIO 2

menyusul

SKENARIO 3

menyusul

SKENARIO 4

menyusul

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MINGGU KE 1:

HARI	SENIN	SELASA	RABU	KAMIS	JUMAT
PUKUL	14-Mar-22	15-Mar-22	16-Mar-22	17-Mar-22	18-Mar-22
07.00-07.50		Skill lab		Skill lab	PPD
07.55-08.45	PENDAHULUAN dr. Nur asiah, MS, SpGK	Skill lab	K.Fi.1 Cahaya (Irfan Syarif, SSi. MSi)	Skill lab	Metpen 3
08.50-09.40	K.A.1. Anatomi Organ Visual (Dr. Yenni Zulhamidah, MSc)	Skill lab	K.Fi.2 Mata & sistem penglihatan (DR. Dr. Eko Poerwanto, MKes)	Skill lab	Metpen 3
09.45-10.35		Skill lab	K.Fi.3 Penglihatan (DR. Dr. Eko Poerwanto, MKes)	Skill lab	Kewirausahaan
10.40-11.30		Skill lab	K.Fi.4. Gelombang Suara dan Resonansi (DR. Teguh Yuliadi, SSi, MSi)	Skill lab	Kewirausahaan
11.30 - 13.00					
13.00-13.50	PBL S1 (L1) A	Keselamatan Pasien PBL S1L1	PRAKTIKUM ANATOMI 1 MATA	PBL S1 (L3) A	Keselamatan Pasien PBL S1L3
13.55-14.45					
14.50-15.40	PBL S1 (L1) B	Histologi 1: Mata, kelopak	PRAKTIKUM FAAL 1	PBL S1 (L3) B	Bhs Inggris 6 (A)
15.45-16.35		dan kel. Lakrimalis (dr. Aan Royhan)			Bhs Inggris 6 (B)
16.40-17.30					

MINGGU KE 2:

HARI	SENIN	SELASA	RABU	KAMIS	JUMAT
PUKUL	21-Mar-22	22-Mar-22	23-Mar-22	24-Mar-22	25-Mar-22
07.00-07.50		Skill lab		Skill lab	PPD
07.55-08.45	K.A.2. Anatomi Vestibulocochlearis (Dr. Marisa Riliani, MBiomed)	Skill lab	K.H.3 Histologi kulit, rambut, kuku (Dr. Aan Royhan, MSc.)	Skill lab	Metpen 3
08.50-09.40		Skill lab	K.Fi.5 Pendengaran (Dr. Sony Pamuji Laksono, MKes)	Skill lab	Metpen 3
09.45-10.35	PRAKTIKUM HISTOLOGI 1	Skill lab	K.Fi.6. Keseimbangan (Dr. Sony Pamuji Laksono, MKes)	Skill lab	Kewirausahaan
10.40-11.30		Skill lab	K.Fi.9 Sensorik (DR. Dr. Indra Kusuma, M.Kes)	Skill lab	Kewirausahaan
11.30 - 13.00					
13.00-13.50	PBL S2 (L1) A	UTS Keselamatan Pasien	PRAKTIKUM ANATOMI 2 TELINGA	PBL S2 (L3) A	Keselamatan Pasien Dr. Syukrini, Sp.PK Peningkatan kualitas
13.55-14.45					
14.50-15.40	PBL S2 (L1) B	K.H.2 Histologi telinga (Dr. Aan Royhan, MSc)	PRAKTIKUM FAAL 2	PBL S2 (L3) B	Bhs Inggris 6 (A)
15.45-16.35		K.K.1 Lesi eritroskuamosa (Dr. Hadi Firmansyah S, SpKK, MKes)			Bhs Inggris 6 (B)
16.40-17.30		K.K.2 Gangguan kel sebasea & ekrin (Dr. Hadi Firmansyah S, SpKK, MKes)			

MINGGU KE 3:

HARI	SENIN	SELASA	RABU	KAMIS	JUMAT
PUKUL	28-Mar-22	29-Mar-22	30-Mar-22	31-Mar-22	01-Apr-22
07.00-07.50		Skill lab		Skill lab	PPD
07.55-08.45	K.Fi.7 Pengecap (DR. Dr. Diniwati Mukhtar, MKes)	Skill lab	K.Ma.1 External eye disease (Dr. Saskia Nassa Mokoginta, SpM)	Skill lab	Metpen 3
08.50-09.40	K.Fi.8 Penghidu (DR. Dr. Diniwati Mukhtar, MKes)	Skill lab	K.Ma.2 Refraksi (Dr. Saskia Nassa Mokoginta, SpM)	Skill lab	Metpen 3
09.45-10.35	PRAKTIKUM FAAL 3	Skill lab	K.Mi.2 Mikroorganisme penyebab infeksi kulit & telinga serta pemeriksaan mikrobiologi (Dian Widiyanti, SSi. MSi. PhD)	Skill lab	Kewirausahaan
10.40-11.30		Skill lab		Skill lab	Kewirausahaan
11.30 - 13.00					
13.00-13.50	PBL S3 (L1) A	PRAKTIKUM HISTOLOGI 2	PRAKTIKUM ANATOMI 3 PM	PBL S3 (L3) A	Keselamatan Pasien Dr. Maya Trisiswati, MKM Melibatkan pasien dan pelaku rawat
13.55-14.45					
14.50-15.40	PBL S3 (L1) B	Feedback Tugas Mandiri Faal DR.dr.Diniwati	K.T.2 OME, OMA, OMSK B (Dr. Arroyan Wardhana, SpTHT)	PBL S3 (L3) B	Bhs Inggris 6 (A)
15.45-16.35		K.Mi.1 Mikroorganisme penyebab infeksi mata & pemeriksaan mikrobiologi (Dr. Eri Dian Maharsi, MKes)			Bhs Inggris 6 (B)
16.40-17.30					

MINGGU KE 4 :

HARI	SENIN	SELASA	RABU	KAMIS	JUMAT
PUKUL	04-Apr-22	05-Apr-22	06-Apr-22	07-Apr-22	08-Apr-22
07.00-07.50	K.Ma.6 Katarak (Dr. Atiek Indriawati, SpM)	Skill lab		Skill lab	PPD
07.55-08.45	PRAKTIKUM HISTOLOGI 3	Skill lab	K.Ma.3 Strabismus (Dr. Saskia Nassa Mokoginta, SpM)	Skill lab	Metpen 3
08.50-09.40		Skill lab		Skill lab	Metpen 3
09.45-10.35	PRAKTIKUM FAAL 4	Skill lab	PRAKTIKUM MIKROBIOLOGI 1	Skill lab	Kewirausahaan
10.40-11.30		Skill lab		Skill lab	Kewirausahaan
11.30 - 13.00					
13.00-13.50	PBL S4 (L1) A	K.K.3 Kelainan rambut (Dr. Hadi Firmansyah S, SpKK, MKes)	PRAKTIKUM PARASITOLOGI 1	PBL S4 (L3) A	Keselamatan Pasien Dr. Riyani Wikaningrum,M.Sc Menekan infeksi melalui peningkatan pengendalian infeksi
13.55-14.45		K.K.4 Kelainan inflamasi non infeksius (Dr. Hadi Firmansyah S, SpKK, MKes)			
14.50-15.40	PBL S4 (L1) B	K.Ag.1 Panca Indera dalam sumber syariat Islam (Drs. Arsyad, MA)	K.P.1 Serangga penyebab penyakit mata, kulit, telinga (Dr. Rika Ferlianti, MBiomed)	PBL S4 (L3) B	Bhs Inggris 6 (A)
15.45-16.35		K.Ag.2 Panca Indera dalam perspektif fiqih (Drs. Arsyad, MA)	K.P.2 Gangguan yg disebabkan oleh serangga (Dr. Rika Ferlianti, MBiomed)		Bhs Inggris 6 (B)
16.40-17.30		K.Ag.3 Panca Indera dalam perspektif Akhlak / Etik (Drs. Arsyad, MA)			

MINGGU KE 5:

HARI	SENIN	SELASA	RABU	KAMIS	JUMAT
PUKUL	11-Apr-22	12-Apr-22	13-Apr-22	14-Apr-22	15-Apr-22
07.00-07.50	Oftalmologi Komunitas (Dr. Atiek Indriawati, SPM)	Skill lab		Skill lab	Wafat Isa Al Masih
07.55-08.45	UJIAN PRAKTIKUM ANATOMI	Skill lab	K.Ma.4 Glaukoma (Dr. Tri Agus Haryono, SpM)	Skill lab	
08.50-09.40		Skill lab	K.Ma.5 Retina (Dr. Tri Agus Haryono, SpM)	Skill lab	
09.45-10.35	K.G.1 Infeksi pada mulut & gigi (drg. Ardin Amir, DDS)	Skill lab	K.Fa.4 Dosis (DR. Dra. Risdawati Djohan, Apt. MKes)	Skill lab	
10.40-11.30		Skill lab		Skill lab	
11.30 - 13.00					
13.00-13.50	PRAKTIKUM FARMAKOLOGI 1	K.T.3 Otitis Media Kronis Maligna (OMSK M), Mastoiditis (Dr. Hastuti Rahmi, SpTHT)	K.T.1 Serumen, Otitis eksterna difusa	PRAKTIKUM FARMAKOLOGI 2	
13.55-14.45			Otomikosis (Dr. Arroyan wardhana, SpTHT)		
14.50-15.40	K.Fa.1 Obat alergi (DR. Dr. Wening Sari, M.Kes)	K.Fa.3 Resep	K.G.2 Gangguan pengecap & penyebabnya (drg. Audiawati Surachmin, SpPM)	K.T.4 Noise Induce Hearing Loss (NIHL), Presbiakusis (Dr. Hastuti Rahmi, SpTHT)	
15.45-16.35	K.Fa.2 Obat lepra & TBC kutis (Prof. dr. Rika Yuliwulandari, MHltSc. PhD. DiplDK)	(DR. Dra. Risdawati Djohan, Apt. MKes)			
16.40-17.30					

MINGGU KE 6:

HARI	SENIN	SELASA	RABU	KAMIS	JUMAT
PUKUL	18-Apr-22	19-Apr-22	20-Apr-22	21-Apr-22	22-Apr-22
07.00-07.50		Skill lab		Skill lab	PPD
07.55-08.45	PLENO SKENARIO 1-4	Skill lab	Ujian Praktikum Inegrasi	Skill lab	Metpen 3
08.50-09.40		Skill lab		Skill lab	Metpen 3
09.45-10.35		Skill lab		Skill lab	Kewirausahaan
10.40-11.30		Skill lab		Skill lab	Kewirausahaan
11.30 - 13.00					
13.00-13.50	HER PRAKTIKUM ANATOMI	UJIAN RESEP (DR. Dra. Risdawati)	Ujian Praktikum Inegrasi	UJIAN AKHIR BLOK	**Keselamatan Pasien** Dr. Kamal, Sp.B Keselamatan pasien dan prosedur invasif
13.55-14.45					
14.50-15.40	K.K.5 Zoonosis (Dr. Hadi Firmansyah S, SpKK, MKes)		K.K.7 Penyakit *Mycobacterium* (Dr. Hadi Firmansyah S, SpKK, MKes)		Bhs Inggris 6 (A)
15.45-16.35	K.K.6 Kelainan pigmen (Dr. Hadi Firmansyah S, SpKK, MKes)		K.K.8 Gigitan serangga (Dr. Hadi Firmansyah S, SpKK, MKes)		Bhs Inggris 6 (B)
16.40-17.30					

REVIEW

Sensory Profile of Adults with Reduced Food Intake and the Potential Roles of Nutrition and Physical Activity Interventions

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ABSTRACT

The sensory profile, referring to sight, smell, taste, hearing, and touch, plays an essential role in optimizing the habitual intake of energy and macronutrients. However, specific populations, such as older adults, are known to have impaired energy intake. In this paper, the relevance of sensory impairments in this older population is described, and the extent to which nutritional and physical activity interventions can modulate these sensory responses when food intake is insufficient is explored. With aging, all senses deteriorate, and in most cases, such deteriorations diminish the nutritional response. The only exception is sight, for which both positive and negative impacts on nutritional response have been reported. From a prevention perspective, nutritional interventions have been understudied, and to date, only hearing is known to be positively affected by a good nutritional profile. In comparison, physical activity has been more frequently studied in this context, and is linked to an improved preservation of 4 senses. Regarding treatment, very few studies have directly targeted sensory training, and the focus of research has tended to be on nutrition and physical activity intervention. Sensory training, and nutritional and physical activity treatments all have beneficial effects on the senses. In the future, researchers should focus on exploring gaps in the literature specifically concerning prevention, treatment, and sensory response to understand how to improve the efficacy of current approaches. In order to maintain sensory acuity and recover from sensory impairment, the current state of knowledge supports the importance of improving nutritional habits as well as physical activity early on in life. A combined approach, linking a detailed lifestyle profile with the assessment of numerous senses and one or more interventional approaches (nutrition, physical activity, sensory training, etc.), would be required to identify effective strategies to improve the nutritional state of older individuals. *Adv Nutr* 2019;10:1120–1125.

Keywords: lifestyle, aging, chemosensory, nutrition, exercise

Introduction

Aging is accompanied by a reduction in energy intake of up to 20% (1) and also affects carbohydrate and lipid intake (2). The consequences of this reduction in energy intake are important to consider, specifically since they can contribute to longer hospital stays (3) and increased health care costs (4). In older adults, reduced energy intake is also associated with body weight loss, which contributes to increased morbidity (5), hospitalization (5), and risk of mortality (6). One potential cause underlying the loss of appetite and inadequate energy intake in this population is the impairment of sensory performance (2). Such impairments are not only more common in older people, but are also characteristic of frail individuals (7), and are exacerbated by the diseases and medical treatments prevalent in this population (8–10). This situation of reduced energy intake will thus be the focus of the current review.

Current Status of Knowledge

Senses and nutrition in older adults

The sensory properties of solids and liquids greatly contribute to the ingestion process, before (e.g., directing towards the food source), during (e.g., portion selection), and after (e.g., fullness sensation) eating (11). Together, food properties inform palatability as well as the perceptual and physiologic responses to the nutrients chosen and ingested (11). Chemosensory (i.e., smell and taste) losses are prime examples of the sensory changes observed with aging. They include increased thresholds for taste and smell, reduced

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perceptions of intense stimuli, as well as diminished abilities to discriminate stimuli (12).

The following sections address sensory losses affecting sight, smell, taste, hearing, and touch, known for their impact on food choices, appetite, pleasure of eating, nutrient intake, and ultimately, nutritional and health status (12–15). Emerging nutritional strategies that seem to prevent and treat the deterioration of senses and improve nutritional response in older adults will be explored. Although nutritional interventions are an obvious choice when discussing the senses-nutrition relation, the relevance of interventions focused around physical activity will also be discussed. These findings are summarized in **Table 1**.

Sight

Apicius, a Roman gourmet, stated: "We eat first with our eyes" (16). Unfortunately, with natural aging, numerous changes occur that reduce visual acuity: *1*) lacrimation decreases and, consequently, so does the clarity of images; *2*) reduced transparency of the lens reduces light transmission to the retina (i.e., specifically blue and violet); and *3*) increased intraocular pressure adversely affects vision (15). Furthermore, numerous diseases, such as diabetic retinopathy, age-related macular degeneration, glaucoma, cancer, and stroke, as well as certain medical treatments, increase in the older adult population, reducing vision, with severe cases leading to blindness (15).

Visual cues are important before ingestion takes place (11), and the sight of food can trigger meal initiation (17). Visual characteristics such as bite size, dishware, and refills can also influence energy intake through expectations of the satiating effect of food (11). Although pictures of inviting food enhance ghrelin levels, which favors food intake (18), this response is potentially impeded with impaired vision.

Effective vision has been identified as an important factor pertaining to healthy nutrition for older adults living in the community (19–21). It has been reported that vision loss interferes with mobility, and with activities of daily living and food preparation (15, 22). Reduced vision can also interfere with the ability to monitor food quality and safety, to visually identify food, or to discriminate between eating utensils (15, 22). Loss of visual cues such as color reduces the enjoyment of the eating experience and the motivation to eat (15). It was recently reported that low visual attention is associated with lower food diversity in the diet (21), and that vision is important for nutrition literacy (i.e., the ability to obtain, process, and understand basic diet information and to make effective nutrition decisions) in older men (23). Visual deprivation from birth is associated with debilitated sensory taste detection, although such deprivation may be considered different to partial loss of vision or recently developed blindness in older adults. This may be potentially due to challenges in the act of feeding and being stimulated towards available food (22). A potential benefit of reduced vision could, however, exist, with visual deprivation being associated with a more intrinsic control of energy intake and higher importance given to satiety signals (22).

From a prevention perspective, a substantial cross-sectional study (n = 22,804) revealed that high physical activity levels are associated with fewer visual impairments (24). In addition, a 20-y longitudinal study (n = 4926) demonstrated that physical activity can help prevent vision deterioration (25). To date, it remains unknown if an optimized nutritional profile can help prevent vision loss.

From an intervention perspective, evidence supports the importance of nutritional strategies to improve nutritional habits. In nursing homes, a lot of variety on the plate or the presence of condiments on the table can increase food intake (26), supporting the potential of strategies that target visual stimulation to improve energy intake. Conversely, factors affecting the context of the meal, such as the name of dish or the decor of the room, have been shown to be ineffective at promoting intake (26). Moreover, there are other aspects of food that should be considered in a hospital setting: certain food-preparation techniques, such as freezing, can be detrimental to the appearance, flavor, smell, and mouth-feel of food—all of which are important components of the sensory response (27).

Smell

A decline in olfactory function is highly prevalent in the elderly population and becomes increasingly important with advancing age (28–30). Over 80 y of age, approximately two-thirds of individuals have an impaired ability to accurately identify odors (31). Smell deterioration is often more severe than taste deterioration and can also be affected by some medications, cancer and its treatments, neurodegenerative, and renal diseases (15, 32), all frequently encountered in older adults.

Smell's primary function is to monitor food and guide intake (33). Although it is suggested that smell has a short-term effect on the detection and selection of food (11), the smell of food is perceived even if the food is out of sight (34). Salivation, appetite, and prospective as well as actual food consumption can also be enhanced by very pleasant food odors (11, 35, 36).

An increase in the threshold for odor detection, lower perceived odor intensity, and a decreased ability to identify food-related odors occur in old age (2). Some association studies highlight that decreased smell is related to appetite suppression, weight loss, and malnutrition in older adults (37, 38). In order to overcome the limits of cross-sectional studies, a 5-y population-based longitudinal study confirmed that older adults, especially women, with moderate-to-severe olfactory impairments consumed lower-quality diets (39). Although this dysfunction in smell does not always interrupt the enjoyment of food, it can diminish interest in food-related activities (i.e., cooking). Preferences for many nutritious foods can also be diminished, increasing the intake of sweet and fatty foods (2, 40). This situation is concerning as reduced smell capacities are associated with body weight loss in older individuals with Parkinson's disease (41).

For older individuals, an active lifestyle was associated with better smell via odor detection (29). Interestingly, this effect was shown to be present with a low level of activity (i.e. $\geq$ 1 time/wk compared with $<$1 time/wk). To date, nutrition has not been recognized for its preventive effect on smell deterioration.

A protection from smell deterioration was observed in patients with Parkinson's disease following exercise training (e.g. 60-min cycling session, 3 times/wk for 8 wk) (42). On average, smell detection was not improved in the frail elderly after 17 wk of exercise; however, certain individual improvements were found in 43% of the participants (43). A fairly innovative sensory training, directly targeting smell, which uses daily olfactory stimulation over a 5-mo period (i.e. morning and evening exposure to 4 odors, and rating of odor intensities), has demonstrated olfactory improvements in older adults (44).

Taste

Taste, and its basic components (i.e., sweet, salty, bitter, sour, umami, and fat), is a proximal sense that affects eating (11, 45). Sensitivity to taste stimuli can decline with age. Older individuals require higher concentrations of a stimulus than younger individuals in order to perceive a difference in intensity. A 3-fold higher concentration of salt is required for an older person to sense the same intensity as a younger person, and even greater increases are required in cases of illness and with certain medications (15). This change is mainly due to reductions in the number of papillae and reduced regeneration can target specific areas of the tongue and involves neural damage (15). Numerous conditions observed with aging contribute to taste impairments, notably nervous and endocrine dysregulations, nutritional impairments, and cancer, renal, and liver diseases as well as their associated treatments (15).

Taste is, along with food quality, the main factor influencing food choice (46). People eat more food corresponding to their preferred concentration of taste; however, termination of a meal was reported to be enhanced by high taste intensity (11). A reduction in sensory perception is commonly noted in older adults, and is known to decrease appetite, and in turn may cause decreased dietary intake and undernutrition (27). A diminished perception of taste in the elderly can lead to an increased preference for specific tastes in some, but not in all, cases (2, 47). It has been hypothesized that a decline in the ability to taste can yield changes in food selection and preference (e.g., a reduced taste for salt enhances preference for salty foods), which can contribute to changes in food and nutrient intake (2).

Current research suggests that some nutritional deficiencies (e.g. zinc) are associated with taste disturbances in older individuals (48). In addition, high physical activity levels are associated with better sensitivity to tastes (49, 50), especially in an aging population (50).

Some treatment options are currently of interest. In free-living older adults, the addition of seasonings may increase food intake, which can increase energy, protein, and fat intakes (51). In this study, the addition of sauces had similar effects, and according to Tsikritzi et al. (52), sauces may be important, especially if they remain suitable for sensory appreciation (e.g. undesired flavors or texture). Confirmation of acute changes over a prolonged period of time is, however, needed to more permanently influence nutritional status. When seasoning changes were monitored over a 4-mo period in nursing homes, older adults did not increase energy intake or body weight (53). Regarding micronutrient supplementation, zinc supplementation was not reported to be effective in improving taste (i.e., acuity and discrimination) in a recent Cochrane review (54). Physical activity can also be included as part of a treatment approach. In an older population hospitalized with chronic obstructive pulmonary disease, of which a substantial proportion took medication that altered taste as a side effect, 4 wk of daily rehabilitation, including exercise training, was performed. After the program, both fitness and, importantly, taste recognition (i.e., salty, sweet, bitter) were improved (55).

Hearing

Hearing loss is the most prevalent sensory impairment in the aging population (56). Interestingly, individuals who report hearing loss also report olfactory disorders more frequently than those who do not (57).

Audition is a sensory factor identified as being important for healthy nutrition in older adults living in the community (21). Chewing sounds mainly influence perceived food textures (58), and consequently, hearing loss reduces sensory input from textural cues such as crispiness and crunchiness (15). Moreover, it has been shown that women with reduced hearing function may exhibit diminished nutrition literacy (23). Furthermore, hearing loss and deafness can lead to social isolation (59) and depression (60), both of which are associated with an increased risk of malnutrition in older individuals (15).

In terms of prevention, low intakes of fat and protein have been associated with hearing discomfort (61). Moreover, evidence suggests that meat and seafood consumption could potentially protect against hearing loss (62). In theory, this protection could be similar to what is observed through caloric restriction (63). Regarding physical activity level, fewer hearing problems have been associated with higher levels of physical activity, with every 60-min increase in physical activity linked to a 20% reduction in the risk of all-cause mortality in individuals with moderate or greater hearing loss (64).

To the best of our knowledge, only 1 study (currently ongoing) is investigating individuals with hearing loss following an exercise program (65), but the results have yet to be published.

Touch

Touch declines constantly with aging ($\sim$1%/y) but this change affects the mouth (i.e., lips) less than the extremities

TABLE 1 Summary of evidence for sensory changes with aging, their impact on nutrition as well as preventive and treatment strategies[1]

	Effect of aging	Impact of sensory alteration on nutritional response	Prevention of sensory alteration		Treatment to improve nutritional response		
			Nutrition	Physical activity	Sensory training	Nutrition	Physical activity
Sight	↓(15)	+(22) and −(15,19–23)	NA	+(24,25)	NA	+(26,27)	NA
Smell	↓(2,28–31)	−(2,37–40)	NA	+(29)	+(44)	NA	+(42,43)
Taste	↓(15)	−(2,27,47)	−(48)	+(49,50)	NA	+(51,52)	+(55)
Hearing	↓(56)	−(15,23,59,60)	+(61,62)	+(64)	NA	NA	NA
Touch	↓(15,66,67)	−(11,15,68)	NA	NA	NA	+(69)	NA

[1] ↓, deterioration; +, positive impact; −, negative impact; NA, not available.

(i.e., forearm) (66). The touch, temperature, pressure, and pain receptors of the skin are greatly affected by conditions frequently observed in older individuals, including peripheral neuropathies and vascular diseases, stroke, and surgery, and medications such as those used for cardiac health and chemotherapy (15).

Touch is important for feeding because it allows food and beverage temperature to be monitored, helps to avoid burning, and is essential for handling cooking and eating utensils (15). Along with vision, hearing, and the kinesthetic senses, touch contributes to texture evaluation, which influences energy intake (11). With aging, the mechanical functioning of the mouth declines, which reduces the recognition of textures (67) and the ability to chew hard food, potentially reducing food intake and favoring changes towards softer foods (68).

A preventive approach to touch loss appears to be virtually absent in the literature. In terms of intervention, a study conducted with community-based older adults found that hunger and prospective food consumption are improved following acute changes in texture, from solid to liquid, with a eucaloric intake (69). As recently reviewed, enhancing consumption by modifying food texture presents major challenges, however, with most interventions poorly effective at improving nutrition, including in residential aged care facilities (70).

Limitations and perspectives

One limitation that emerges from this current work is the lack of assessment of sensory impairment and related nutritional changes in the elderly. In addition, some common conditions, such as obesity, have not yet been assessed in the literature despite the importance of nutrition for energy balance. Thus, it is still unknown how obesity influences, or is affected by, the loss of senses with aging; as well as how obesity influences responses to preventive measures and treatment for conditions affecting the elderly. The current findings are also limited to the elderly, and responses might differ from those in adults and children. Other important factors to consider are that some senses are understudied with respect to important feeding activities (e.g., touch for opening containers) and that little information is available beyond the acute effects of preventive and treatment approaches. It seems necessary to assess the chronic effects of interventions in both laboratory and real-world settings. Finally, the specific nutritional, physical, or sensory prescription (e.g., frequency, intensity, timing) remains to be established, along with the possible interactions between these approaches.

Conclusion

This paper highlights how sensory impairments are present in older individuals and how these impairments can be detrimental to the nutritional state of these individuals. Moreover, current knowledge concerning nutrition and physical activity indicates that there may be promising approaches to improve nutrition through a preserved sensory response. In order to maintain sensory acuity and recover from sensory impairment, it is important that nutritional habits as well as physical activity be improved early on, and current interventional possibilities, despite being limited, are promising. In the future, a combined approach, linking a detailed lifestyle profile, the assessment of numerous senses, and one or more interventional strategies, will be required to better identify effective strategies to improve the nutritional state of older individuals.

Acknowledgments

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REVIEW ARTICLE

Taste Disorders and Their Diagnosis - A Basic Approach

Ravi Sehrawat,[1] Poonam Malik,[2] Manu Rathee[3]

ABSTRACT

Taste and smell disorders pose difficultly in diagnosing and treatment this occurs often because of a lesser knowledge and understanding of their senses and disease states. Also diseases related to them are often overlooked even though these disorders can have a substantial impact on quality of life. This paper describes in brief about the various taste disorders and their evaluation in patient as the improvement in the food flavour and appearance can improve quality of life in patients with irreversible dysfunction.

Key words: Taste perception, Taste buds, Salivary hypofunction

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INTRODUCTION

Taste is mainly a function of the taste buds in the mouth, but it is common experience that one's sense of smell contributes strongly to taste perception, as persons with cold or allergies sometime complain that they cannot taste their food although their taste sensation may be operating normally, but the olfactory sensations are not. This shows that much of what we think of a taste is actually smell. Odors from foods pass upward into the nasopharynx and nasal cavity to stimulate olfactory receptor. Thus, a given concentration of odors stimulates the olfactory system thousands of times more strongly than it stimulates the gustatory system.

Taste buds appear very early in the tongue of human as it features at 7 to 8 weeks of gestation and mature appearing taste buds are not observed until later in gestation. Development is not complete at birth and taste bud numbers continue to increase. Aging has very little effect on the taste system. Counts of taste buds in carefully controlled experiments have revealed little or no reduction in taste bud numbers.[1] Behavioral studies have also shown that in a healthy population of individuals, decline in taste[2] sensitivity is small and relatively insignificant. So thus the peripheral taste system is maintained structurally and functionally across the life span. This paper describes in brief about the various taste disorders and their evaluation in patient.

CLASSIFICATION OF TASTE DISORDERS

They are mainly classified into[1]

1. Gustatory – olfactory confusion in patients with hyposmia.
2. Secondary dysgensia and paragensia.
3. Transport disorders.
4. Idiopathic taste abnormality.

Gustatory – olfactory confusion in patients with hyposmia: Following upper respiratory tract infection or any multiple causes of olfactory loss, individual experience smell and taste loss on report that particular food no longer tastes the same.

Most of such problems are due to decreased transport of volatile substances to olfactory receptors on a result of heavy nasal mucous or sneezing of the sinus mucosa. So in either, examination of patients reveal abnormal or loss or altered olfactory function rather than taste.

Secondary dysgensia and paragensia: The causes include, retained food in and around maxillary and mandibular arches, heavy dental plaque and calculus across the gingivaland proximal surfaces, , carious tooth , defective dental restorations, acute and chronic gingivitis and periodontitis and also poorly cleaned bridges or dentures.

Some are eliminated by standard dental treatments like restorative periodontal therapy. But chronic dysgensia due to metallic cations released from corrosion of dissimilar metallic dental restorations and prosthesis remains in question.

Transport disorders: It includes

a. Salivary hypofunction and xerostomia: Taste bud cell function is dependent on specific soluble molecules access to the cell membrane followed by transport of the molecule across the membrane. In patients with reduced salivary flow the concentration of taste stimuli and salivary electrolytes of sodium, calcium and bicarbonates may be greatly reduced unless the stimulus is provided in liquid form.

b. Blocking of taste buds by micro organism or dentures: Salivary hypofunction and radiotherapy to the head and neck also are after accompanied by overgrowth of oral bacteria and yeasts. The upper denture also blocks the palatal taste buds. Though the posterior part is not covered by denture because of gag reflex but covering by upper denture significantly reduces the taste sensation. This is because diminished touch and pressure sensation and retention of food particle and bacterial plaque on the surface of denture. More than 10 percent of edentulous patients complaints of taste loss initially after wearing denture.[4]

1. Idiopathic taste abnormality: It Includes

a. **Inherited disorders:** Several inherited disorders have been associated with abnormal taste sensation. Abnormalities of taste receptors can be congenital or acquired. Common disorders inherited includes: Familial dysantonouria, Terner's syndrome. Pseudohyperparathyroidism, facial hypoplasia syndrome and cleft palate.

b. **Loss of taste bud or taste bud functions:** Any damage to the taste bud field lingual palatal or pharyngeal fields are caused by variety of lesions and neuropathic disorders affecting the taste nerves. The dorsum of tongue is affected by wide range of inherited developmental and atrophic lesions that conceivably reduce the number of taste buds. E.g.: Glossitis (Vit B, iron, medication), White lesions of tongue (Lichen planus and leukoplakia), Salivary hypofunction (xerostomia), Fissured tongue and benign migratory Glossitis. Hairy tongue causes blocking of taste pores by desquamated epithelial cells.

Stomatitis secondary to radiation. The condition will get improved after the subside of stomatitis provided the taste sensory nerves are not damaged. The traditional method of treating radiation stomatitis is coating the mucosa with glycerine, frequent rinsing with topical analysis and using artificial saliva. [5-7]

Many antimicrobial medication like captopril, Amphotericin B, chlorehexidine, metrainidazole, pencillamine, sodium lauryl sulfate have associated with taste dysfunction. Burning mouth syndrome, is an intraoral pain condition occurring primarily in postmenopausal females. Although oral cavity appears normal, there is an apparent change in sensory perception. Malignancy, the patient become anorexic and their food intake declines, so that they lose weight, this results increased mortality. The hypothesis is that this anorexia is possibly caused by alterations in taste sensation because taste is important in guiding food intake.[8]

Vitamin A deficiency increases keratinization of the tongue, including the pore area of the taste buds, and adjacent epithelial and glandular tissue,

loss of gustatory sensitivity from vitamin A deficiency is due to blocking of the taste pore with keratin plugs, which prevents access of stimuli to the receptor membrane.

Damage to taste nerves: It includes Lingual nerve, Chordatympani nerve and Glossopharyngeal nerve.

a. **Lingual nerve:** Usually results from surgical trauma like extraction of molar (mandibular), jaw fractures, accidental laceration of tongue during dental treatment, orthognathic surgery as these fibres carry general sensory and gustatory fibres to the anterior 2/3 of tongue, the pain and burning sensation caused by damage to the general sensory fibres overshadow any dysguesia symptom. The patient complaints of unilateral number and altered gustatory sensation. Such damage to the nerve is resolved within 6 months to 1year. [9-11]
b. **Chordatympani nerve damage:** Chronic inflammation, tumors of the middle car, damage to petrous temporal bone, Bell's palsy of facial nerves and parotid grand may also impinge on the chordatympani and produce unilateral anterior dysguesia. Dysfunction of salivation and lacrimation may also accompany the damage to the 7th cranial nerve.
c. **Glossopharyngeal nerve damage:** Usually results from pharyngeal tumours and repeated tonsillectomy or cauterization of the tonsillar bed. Dysgensia to one side of the posterior 2/3 of tongue is unusual but not impossible.

The lesions of the nerve near its point of origin in the facial canal or in the region of geniculate ganglion are accompanied by a paralysis of motor, gustatory and autonomic functions of the nerve. In case of any lesions present between geniculate ganglion and the point of separation of chordatympani it produces the same dysfunction as produced that of injury in the geniculate ganglion, without dysgnesia. [12]

LESIONS AFFECTING CENTRAL TASTE PATHWAY

The common CNS lesions affecting the taste abnormality are Head trauma, vascular disease, brain tumors, cerebrovascular lesions and neuro degenerative diseases. There is simultaneous loss of gustatory and olfactory sensations in patients with head trauma due to damage to temporal lobe, which may damage the greater wing of sphenoid bone. The tumors, vascular lesions and other destructive lesions of pons, thalamus and cerebrium may cause focal neurological abnormality in orofacial region. These lesions are rarely associated with isolated sensory or motor deficit and dysgensia symptoms are usually accompanied by pain of other sensory loss.

Gustatory hallucination is sensory perception in absence of stimulus are sometimes reported by patient with epilepsy. The hallucination is reported as 'The taste was bitter and dry.' – '1 tasted something in my throat; The taste starts in stomach, it rises and falls. The taste is usually not described in detail but rather in more general terms, such as bitter, Unpleasant, or a taste. [3-15]

EVALUATION OF TASTE ABNORMALITY

This includes thorough evaluation of: Presenting complaint, General medical history, Physical examination, Taste testing, Laboratory tests and Craniofacial imaging.[16-20]

a. **Presenting complaint:** This should include the recording: does the patient have complete loss of taste, diminished perception for one or more of the four standard taste quantities or a persistent abnormal taste. Distinction made whether abnormal taste is only for some time, or is if severe enough to prevent normal tasting or is it continuous. History should also include the past and present experience of olfactory sense. The change in olfaction is measured by the ability of the patient to distinguish between a hot chocolate from hot sweetened coffee. The response of patient to strongly visiting volatile compounds like onion

etc., are also measured. The loss of lacrimation and loss of sneezing and nasal irritability for stimulus suggests diminished trigeminal function which may cause abnormality of taste perception. In patients with Bells palsy the taste abnormality (unilateral) is accompanied by paralysis of facial muscles on the same side.

b. **General medical history:** It should include: Radiation to head and neck. Industrial metal poisoning. Other symptoms like altered cranial nerve function. E.g.: Headache, diplopia, seizures, dizziness, deafness, muscle weakness should be covered in the history, because taste abnormality may also occur as a results of neoplasia or other lesions of CNS.

c. **Physical examination:** This include careful examination of cranial nerves particularly I, V, VII and IX. Especially for taste abnormality one should examine for nerves V and VII function. The confirmation should be done regarding gustatory and olfactory confusion or a trigeminal or a olfactory dysfunciton. The oral examination should include the careful examination for retained food, heavy dental plaque, postnasal discharge, sinusitis, sinusitis with retention of nasal secretion. The dorsum of tongue should be examined for lesions, presence of normal papilla's damage to the lingual branch of V nerve. A pharyngeal surface of the tongue is inspected for the masses that may affect the lingual branch of IX cranial nerve. Salivary function estimation should be done in order to rule out the xerostomia.

Taste testing

Testing at a single concentration for each stimulus may fail to detect an abnormality. So a concentration of high, medium and low are used. The test is done by asking the individual to have sucrose (sweet), sodium chloride (Salty) hydrochloric acid (Sour) and quinine (bitter), for detection of loss of taste. [20]

Regional or spatial taste testing

The four quadrants on dorsum of the tongue provide an accessible are for testing the right and left 5^{th} and 7^{th} nerve responses. This approach considerably helps where damage to a branch of a peripheral nerve or central taste pathway is suspected and can be achieved by application of individual taste solutions or electrogustatory.
According to recent investigation this approach has got limitation by concentration of fractional taste bud and in the area being tested. Many times there are not complaints from the patient even though there is fractional loss.[21]
E.g., in bells palsy there is unilateral loss of function of chordatympani but patient is unaware of it.

Electrogustatory

The taste bud fields can be stimulated by low voltage anodal and cathodal currents applied by means of a battery or operated hand-held instrument referred to as Electrogutometer.
Anodal currents produce a sour metallic sensation and cathodal current produce indistinct bitter, sweet sensation. Full range basic taste experience cannot be achieved by this means.[22-23]
The advantages of Electrogustometis are: Portability, Lack of taste solutions or rinsing of tongue in between, Ability to stimulate defined areas of the tongue dorsum, palate, oropharynx precisely, Detection of localized taste loss.

Laboratory tests

The lab tests that may indicate the presence of problems associated with dysguesia, that includes post prandial blood glucose level and glucose tolerance test, Serum triglycerides, Blood urea nitrogen and thyroid function test.

Craniofacial imaging

This includes imaging of hard and soft tissues in a standard radiographic view. Like CT and MRI.

Occasionally it is found that there are suspected intracranial pathology in patients with only gustatory abnormality. This emphasizes the potential value of and need of craniofacial imaging in patients with unexplained electronic taste abnormality. Olfactory and gustatory complaints CT plays an excellent sole in evaluation of nasal obstruction mucosal thickening, polyposis, nasal and intracranial neoplasms.

DISCUSSION

According to study conducted by Bromley SM[3] smell and taste disorders are commonly observed in the population and with smell loss more common. Although these disorders can have a substantial affect life but may also represent significant underlying diseases which are commonly overlooked by the clinicians medical community. And progress made ravelling the nutrient-sensing mechanisms of the tongue has triggered studies on the existence and role of chemosensory cells in the gut. Depoortere et al. [6]summarised that targeting the receptors involved in the sensing of nutrients by taste receptors along the gut which in turn plays a key role in the process of digestion should be used as first line of treatment of diseases of taste receptors Later Feng P et al.[5] further also concluded in their review study that, some regulatory factors of taste cell differentiation and degeneration have been identified, but their study had the limitation that in understanding of different aspects of taste bud homoeostasis remains limited.

CONCLUSION

In conclusion the taste disorders are not uncommon and can be very debilitating. Individuals with abnormalities of taste and smell are unable to appreciate food and lose the ability to detect spoiled food, fumes, and gas leaks. Moreover, persons with certain occupation that uses the chemical senses such as perfumes, fire-fighters may be unable to continue their profession. So it is important to recognize that these patients do have disorder that once accurately diagnosed may be treatable.

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RE VIE W AR TICLE

Investigations for diseases of the tongue: A review

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Abstract

Tongue is a vital organ within the oral cavity that has varied function, and it may act as an index for underlying systemic diseases. The investigation of tongue disease may begin with mere clinical examination and extend to the use of few specialized tests. This article is an attempt to highlight the special investigations of tongue lesions with emphasis on clinical examination.

Introduction

Oral cavity is the most important structure of the orofacial complex and has hard and soft tissues, each of which has a varied anatomy and function. It mainly acts as a source for communication of the internal body with the outside environment. Among these tissues, tongue is a mobile muscular organ situated in the floor of the mouth which can assume a variety of shapes and positions in the oral cavity. A thorough examination of the tongue is an integral part of the physical examination and may provide clues to the systemic conditions; nevertheless, it has been the most neglected organ with in the zone of interest. This article emphasizes on the importance of clinical examination of the tongue and the available special investigations for early diagnosis and management of tongue disorders. Routine hematological investigations are mandatory for the initial assessments of any diseases of the tongue which helps in the identification of underlying health status. However, describing them in detail is beyond the scope of this article.

Tongue develops from the first branchial arch in the 4th week of intrauterine life and has various functions such as speech, mastication, deglutition, and taste. There are various disorders that may be manifested on the tongue, and among them, the common disorders can be broadly grouped into various categories.

Working classification of common disorders of tongue is shown in Table 1.

The examination of the tongue is an integral part in oral screening of diseases, and the steps of clinical examination of tongue are discussed below.

Clinical Examination of the Tongue

A good illuminating light and mouth mirror are the main requirements for the examination of the intraoral structures. Initially, an overall assessment should be made of entire oral mucosa, then begin with examination of dorsum and lateral margins of the tongue followed by the ventral surface, ask the patient to protrude the tongue, and move sideways and then examine. Tongue is to be stabilized with the cotton/gauze and should be examined for changes of color, shape, size, and surface of tongue using both direct and indirect vision [Figures 1 and 2]. Depress the tongue using the tongue depressor to observe similar changes in the base of the tongue and the circumvallate papillae.

Other changes like swellings , ulcers, fissures, atrophy or hypertrophy of papillae should be noted. Ulceration of the mucosa of the tongue may be due to trauma, infection, immune-related disease, or neoplastic. Vesiculobullous blistering disorders frequently also present as ulceration due to rupture of initial lesions. Any physiological or pathological changes should be noted. Using a gloved hand palpation should be done, hold the tongue with gauze in one hand, and palpate the tongue

Table 1: Working classification of common disorders of tongue

Developmental disturbances	**Traumatic lesions of tongue**	**Infections of tongue**
Aglossia	*Physical*	*Bacterial*
Microglossia	Tongue piercing	Tuberculosis
Macroglossia	Linea alba	Syphilis
Ankyloglossia	Scalloped tongue	Scarlet fever
Fissured tongue	Traumatic ulcer	*Fungal*
Bifid tongue	*Chemical*	Candidiasis
Median rhomboid glossitis	*Thermal*	*Viral*
Benign migratory glossitis		
Hairy tongue		
Lingual thyroid nodule		
Lingual varices		

Immunological conditions of tongue	**Cysts of tongue**	**Potentially malignant disorders of tongue**
Recurrent aphthous stomatitis	Dermoid/ Epidermoid	Leukoplakia
Lichen planus	Lymphoepithelial	Erythroplakia
Pemphigus vulgaris	Gastric mucosal cyst	Lupus erythematous
	Mucous cyst	Syphilitic glossitis

Neoplastic

Benign	**Malignant**	**Systemic conditions associated with glossitis**
Fibroma	Squamous cell carcinoma	Iron deficiency anemia
Giant cell fibroma	Verrucous carcinoma	Pernicious anemia
Glomus tumor	Kaposi's sarcoma	Niacin deficiency
Leiomyoma	Angiosarcoma	Folic acid deficiency
Rhabdomyoma	Mucoepidermoid carcinoma	
Plasmacytoma	Malignant lymphoma	
Neurofibroma	Malignant melanoma	
Keratoacanthoma		
Papilloma		
Adenoma		
Hemangioma		
Lymphangioma		

Syndrome associated with tongue	**Taste disorders**	**Miscellaneous lesion**
Aglosia–adactylia syndrome Beckwith–Wiedemann syndrome	Ageusia	Lichenoid reaction
Burning Mouth syndrome	Hypogeusia	Pyogenic granuloma
Down syndrome	Hypergeusia	Dyskeratosis
Eagles syndrome	Dysguesia	
Melkersson–Rosenthal syndrome		
Orofacial digital syndrome		
Parry–Romberg syndrome		
Riley–Day syndrome		

between the thumb and index finger of the other hand (bidigital palpation technique). The tissues of the tongue should feel soft and resilient with no palpable indurations or masses.

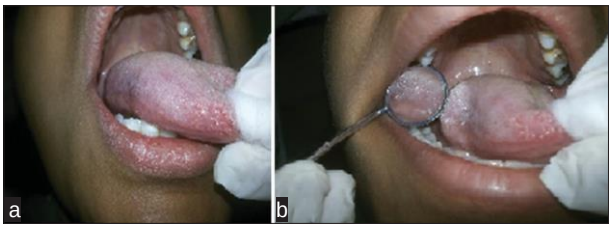


Figure 1: Clinical examination: (a) Direct vision method, (b) Indirect vision method

Evaluation of Nerve Supply

Tongue is supplied by motor and sensory components of 5th, 7th, 9th, 10th, and 12th cranial nerves. Taste sensation and the other functions of the facial nerve are not routinely tested, but altered taste, lacrimation, and salivation history are taken while recording the case details. For formal taste testing, measurement of detection or recognition thresholds is done. The detection threshold is the lowest concentration at which a taste can just be detected while the recognition threshold is the lowest concentration at which the quality of a taste stimulus can be recognized and few other tests can be carried out to assess the taste function.[1]

Magnitude matching

It is an psychophysical procedure where assessment is done based on the patient's perceptions of various concentration of taste intensities above threshold level (concentrations of sodium chloride, sucrose, quinine hydrochloric acid, and citric acid) along with various loudness levels (up to 1000 Hz) tone which are provided for the magnitude matching task. The patient sips each solution and expectorates, and the tones are presented through headphones. The patient estimates and gives a value for perceived magnitude for each stimulus. The results are scaled in relation to loudness functions to reveal abnormalities of taste as depressed psychophysical functions.[2] Patients with hypogeusia associate stronger taste concentrations with weaker tones than normal patients. The limitation of this test is its dependence on normal hearing and its complicated design.

Spatial test

The gustatory system has multiple nerve innervation, and damage to one of the three major nerves or their ganglia may cause a disturbance of taste that can be evaluated only by testing the anatomic areas supplied by those nerves. To test these areas, filter paper (4 standardized sizes) are soaked with strong concentrations of the four basic tastes. The papers are randomly placed on the all quadrants of the tongue and on both sides of the soft palate. Patients then identify the quality of the taste and rate its intensity from 1 to 10 (10 being the strongest).[3]

Labeled magnitude scale

"Three drop test" given by Henkin[4]

In this test, three drops of liquid are presented to the patient. One of the drops is the taste stimulus, and the other two drops

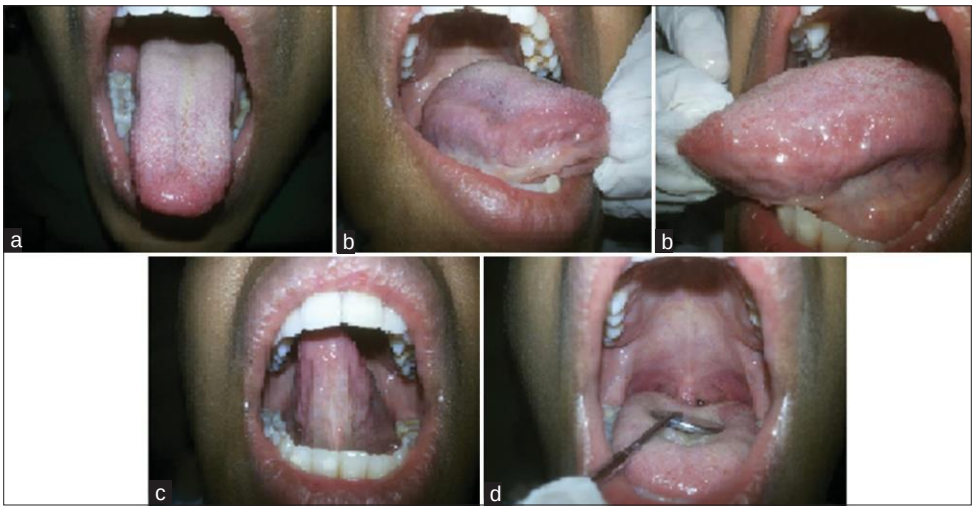


Figure 2: Surfaces of the tongue: (a) Dorsal, (b) right and left lateral surfaces, (c) ventral (d) base

are of pure water. The threshold is noted at the concentration where the patient identifies the taste correctly 3 times in a row.

Motor nerve examination

The hypoglossal nerve provides motor innervation to the intrinsic and extrinsic muscles of the tongue. The examiner begins to assess the tongue movements by asking the patient to open their mouth and inspecting the tongue for wasting and fasciculations (rippling, involuntary movements of a muscle at rest) while it is at rest in the floor of the mouth. Then, the patient is asked to protrude the tongue and should note any deviation of the tongue from the midline. The patient is instructed to move the tongue sideways. If any abnormalities are found, resistance is tested by applying pressure on the external surface of the cheek and asking the patient to push their tongue against the cheek.

Chairside Investigations

Toluidine blue (TB) staining

TB, tolonium chloride, which is a vital dye is believed to stain nucleic acids. It is used as an aid to the identification of clinically occult mucosal abnormalities and as a useful way of demarcating the extent of a potentially malignant lesion before excision of suspected lesion.[5]

Cytopathology

Smear

This is the method of collecting superficial epithelial cells by scraping the surface using tongue blade or spatula and then transferred on to the slide and fixed with the alcohol. Then, staining is done and examined under microscope for visualizing cell morphology and structure.

Brush biopsy

This is a method of collecting a transepithelial sample of cells from a mucosal lesion with the representation of the layers of the epithelium (superficial, intermediate, and parabasal/basal). A specially designed brush is used for epithelial cell collection and samples are eventually fixed onto a glass slide, stained with a modified Papanicolaou test, and analyzed microscopically through a computer-based imaging system. Results are reported as "positive" or "atypical" when cellular morphology is highly suspicious for epithelial dysplasia or carcinoma or when abnormal epithelial changes are of uncertain diagnostic significance, respectively. Results are defined as negative when no abnormalities can be found. The test is an intermediate diagnostic step where a scalpel biopsy must follow when an abnormal result is reported (atypical or positive).[6]

Incisional/excisional biopsy

This is the procedure of collection of samples from the lesion for cytopathological studies.

Chemiluminescence

This is a procedure where examination of oral mucosa is done with the help of chemiluminescent (blue/white) light which was recently implemented to improve the identification of mucosal abnormalities. Vizilite is the technology which involves the use of an oral rinse with a 1% acetic acid solution for 1 min followed by the examination of the oral mucosa under diffuse chemiluminescent blue/white light (wavelength of 490–510 nm). The theory behind this technique is that the acetic acid removes the glycoprotein barrier and slightly desiccates the oral mucosa and the abnormal cells of the mucosa then absorbing and reflecting the blue/white light in a different way with respect to normal cells. Hence, normal mucosa appears blue, whereas abnormal mucosal areas reflect the light (due to higher nuclear/cytoplasmic ratio of epithelial cells) and appear more acetowhite with brighter, sharper, and more distinct margins.[7]

Tissue fluorescence imaging

Tissue autofluorescence has been used in the screening and diagnosis of pre-cancer stages. Autofluorescence is a process

when the epithelial and stromal changes alter the distribution of tissue fluorophores and emit fluorescence after stimulation with intense blue excitation (400–460 nm) light. The autofluorescence signal is finally visualized directly by a human observer. With regard to the oral cavity, normal oral mucosa emits a pale green autofluorescence when viewed through the instrument handpiece while abnormal tissue exhibits decreased autofluorescence and appears darker with respect to the surrounding healthy tissue. Autofluorescence technology for inspection of the oral mucosa has been developed by LED Medical Diagnostics Inc. in partnership with the British Columbia Cancer Agency and is marketed as VELscope system.[8]

Several studies have investigated the effectiveness of the VELscope system as an adjunct to visual examination for (i) differentiating between benign and dysplastic/malignant changes and (ii) identifying dysplastic/malignant lesions (or lesion's margins) that are not visible to the naked eye under white light.[9]

Specialized Examination Procedures

Ultrasonography/pulsed (Doppler) ultrasound

Ultrasound is a technique using acoustic pressure wave, and the frequency of the wave is above the limit of human hearing which gets transmitted through tissues and produces biological effects.[10] This has been used for imaging purpose as it is non-invasive, reliable, and relatively simple technique. Recent advancements in this technique have given a 4th dimension in the form of color. Doppler to assess vascular changes. In addition, it is also being used to study tongue movements.[11]

Method - Ultrasound pulses are passed from a transducer positioned below the chin, through the skin and the muscular tissue of the tongue, and are reflected in proportion to changes in acoustic impedance, at transitions in tissue density in the tongue body, at the interface between the tongue dorsum and the ambient air, and at the oral cavity walls. It is used based on the frequency [Table 2].

It helps in studying the characteristics of arterial blood flow in the tongue, and usually abnormal pulse waves have been noted in the lingual arteries of individuals with evidence of compromised flow in other branches of the carotid arterial tree.[12]

Karen *et al*., 2003, assessed the tongue moments in feeding and speech through ultrasound and found that ultrasound has a potential to be a diagnostic tool in assessing the tongue movements, and furthermore, 3D reconstruction of tongue models can be done for documentation purpose.[13] Geddes *et al*., 2008, described the tongue movement and intraoral vacuum in 20 breastfeeding infants through ultrasound and stated that ultrasound imaging demonstrated that milk flow from the nipple into the infant's oral cavity coincided with both the lowering of the infants tongue and peak vacuum. And also, they said that recording tongue movements with ultrasound is noninvasive and has not been shown to have any biologic effects in humans at diagnostic intensities. This modality enables automated measurements of tongue movements and helps in assessing the diseases of the tongue of neuromuscular origin.[14]

Table 2: Applications of USG based on frequency

Applications in medicine	Frequency
Operative	Ranges between 2 and 8 KHz
Therapeutic	Ranges between 20 KHz and 3 MHz continuous or pulsed modes
Diagnostic	Ranges between 1.6 and 12 MHz

USG: Ultrasonography

Electromyography

Electromyography is a test to study the muscle functions. It is a non-invasive technique that measures the electrical activity of several muscles in the body to diagnose movement disorders and can also contribute to the assessment of prognosis in motor alterations. The use of surface electrodes has been introduced with considerable success.[15]

Cheng *et al.* done a study to assess the movement of the tongue during normal breathing in awake healthy patients using electromyography and suggested that the local movement of tongue varies between each individual. He found that, during inspiration, anterior movement of the genioglossus muscle can occur, and hence, he has stated that the tongue can act as a muscular hydrostat.[16]

Magnetic resonance imaging (MRI)

MRI was used as an alternative to imaging modalities involving radiation. It has been proven that it provides a greater details of soft-tissue structures, such as the tongue and oropharynx. MRI has the ability to provide multiple sections, which allows accurate delineation of the lingual musculature and the extent of tumor infiltration. The supine position of the patient is the major limitations of MRI as a research tool in the field of speech or deglutition because it causes difficulty in feeding and also MRI data acquisition is slow when compared with normal feeding and deglutition.[13]

Stone *et al*. stated that MRI imaging can explain normal as well as glossectomy movements of the tongue and there is a great need for understanding the biomechanical and muscular mechanisms of the tongue motion which provides data to help surgeons in planning and evaluating reconstructive surgery.

Computer-assisted tomography

These thin multiple axial sections are obtained using an X-ray source which rotates around the object and sensors are positioned on the opposite side of the circle from the X-ray source. Then, the data are reformatted with special software packages to produce multiplanar reformatted images and also images in all the three orthogonal planes (coronal, sagittal, and axial) which enable the accurate measurements for the evaluation.

It can be used to identify muscular atrophy which is caused due to hypoglossal nerve damage and large lesions, in cases

where the lesion is deep in the base of the tongue and cannot be detected by other approaches. This also be used for the detection of extension of head-and-neck carcinomas involving tongue and other parts.[17]

Murakami R *etal.*, in 1997, did a computed tomography (CT) and MR study of denervated tongue after radical neck dissection, found that the side of the tongue operated showed low density on CT scans, and concluded that, in patients who have undergone a neck dissection for a malignant process, abnormal imaging findings in the tongue not only might indicate a recurrence of tumor involving the hypoglossal nerve but also suggest the possibility of postoperative change and emphasize the importance of the denervated tongue in differentiating inflammatory from neoplastic diseases of the tongue.

Isotopic scanning techniques

The principle of this scanning is based on the visual image which shows the uptake of an isotope by abnormal tissue which often differs from healthy tissue and its distribution.

The images obtained are two dimensional which are similar to the appearance of contrast radiography. It can be used when a mass in the tongue is composed of specialized secretory tissue or other tissue, such as thyroid, which selectively concentrates intravenously administered radioactive 131I or 99Tc-pertechnetate. To outline the extent of oral tumors Gallium scanning, tumor labeling with radioactive indium and cobalt–bleomycin chelates are used. Bathi *etal.* reported a case where they have used 99mTc04 isotopic scanning to evaluate the type of tissue mass on dorsal surface of the tongue.[18]

Cineradiography

Cineradiography is a procedure of capturing radiographs of moving objects in rapid sequence so that the radiographs made are projected as motion pictures which helps us to understand the position and shape of the tongue in motion and also help us to diagnose abnormalities of swallowing, phonation, and other functions associated with congenital and surgically induced defects.[19]

A study was conducted on 20 post-polio syndrome patients using cineradiography to evaluate their swallowing defects, and author has found that the abnormalities were seen in the pharynx in varying degree in all. However, in one of the patients, they observed that dysphasia can occur as a late complication to poliomyelitis and concluded the cineradiography and flow radiography are useful technique to assess the severity of the disease and degree of decomposition.[20]

Scanning electron microscope (SEM)

The SEM uses a focused beam of high energy electrons to generate a variety of signals at the surface of solid specimens. SEM is a diagnostic tool used to study the surface topography of dorsum of tongue, the character and morphology of the different types of tongue papillae, and distribution and morphology of bacteria on the papillated areas of the dorsum. Many studies have been done on different animals, but in human still, it requires more studies to know the efficacy of SEM on the tongue. This can be of two types - video microscopy which is used for observation of the papillary surface of tongue and stereo microscopy which results a three-dimensional image. Both are used to study the tongue papillae, their capillary network, and taste pores.[10]

Conclusion

As diagnosis of tongue diseases plays an eminent role in the treatment of the disease, it has attracted an increasing amount of attention on various investigatory methods followed by examination such as shape, size, motion, and any disability which are very well recorded by advanced investigative techniques and also different microscopic techniques to study anatomy and other abnormalities can be very well appreciated. Such, updated techniques are very helpful in accurate diagnosis which leads to a good successful treatment.

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