

INFEKSION MATERIALLAR BILAN ISHLAGANDA TEXNIKA XAVFSIZLIGI QOIDALARIGA RIOYA QILISH

Ilmiy rahbar: **Xolmurodov Inoyatullo Ismatullayevich**

Tibbiy profilaktik fanlar kafedrası mudiri

E-mail: inoyatulloxolmurodov@gmail.com

Eshqobilova Dilrabo

Termiz Iqdisodiyot va servis universiteti

Tibbiyot fakulteti Davolash ishi ta'lim yo'nalishi talabasi:

E-mail: dilraboeshqobilova2006@gmail.com

ANNOTATSIYA. Ushbu maqolada mikrobiologik laboratoriyalarda infeksiyon materiallar bilan xavfsiz ishlash qoidalari, zamonaviy biosafety talablari va personal himoyasining muhim jihatlari ko'rib chiqilgan. Tadqiqotda xalqaro standartlar asosida ishlab chiqilgan texnika xavfsizligi choralari tahlil qilingan hamda amaliy tavsiyalar berilgan. Maqola mikrobiologiya sohasidagi mutaxassislar, laboratoriya xodimlari va talabalar uchun mo'ljallangan. Infeksiyon materiallar bilan ishlash jarayonida yuzaga kelishi mumkin bo'lgan xavflar va ularning oldini olish usullari batafsil yoritilgan.

Kalit so'zlar: infeksiyon materiallar, biosafety, texnika xavfsizligi, laboratoriya xavfsizligi, personal himoya vositalari, mikrobiologik tadqiqotlar, risk-menejment, laboratoriya avariyalari.

KIRISH Mikrobiologik tadqiqotlarda infeksiyon materiallar bilan ishlash jarayonida texnika xavfsizligi qoidalariga qat'iy rioya qilish zaruriyati kundan-kunga ortib bormoqda. Zamonaviy mikrobiologiya laboratoriyalarida patogen mikroorganizmlar bilan ish olib borish jarayonida xodimlar va atrof-muhit uchun xavfni minimallashtirish asosiy vazifalardan biri hisoblanadi. Bu masala ayniqsa global pandemiya davrida yanada dolzarb bo'lib qoldi va laboratoriya xavfsizligiga bo'lgan talablarni yangi darajaga ko'tardi.



Jahon sog'liqni saqlash tashkiloti (JSST) ma'lumotlariga ko'ra, laboratoriya xavfsizligi buzilishi natijasida yuzaga kelgan infeksiyon kasalliklar holatlari haqida ko'plab xabarlar mavjud. Bu holatlar laboratoriya xodimlarining sog'ligi va hayotini xavf ostiga qo'yadi, shuningdek, jamoat sog'lig'iga ham tahdid soladi. Masalan, 1978-1982 yillarda Buyuk Britaniyada laboratoriya xavfsizligi qoidalari buzilishi natijasida 459 ta laboratoriya xodimi turli infeksiyon kasalliklarga chalingan va bu holatlar laboratoriya-acquired infections (LAI) sifatida ro'yxatga olingan.

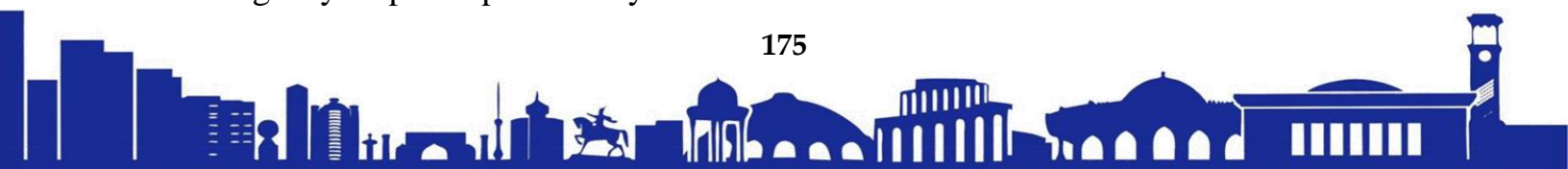
Mikrobiologik laboratoriyalarda xavfsizlik muammolari kompleks yondashuv talab qiladi. Bu yerda nafaqat individual himoya choralari, balki laboratoriya infratuzilmasi, havo almashish tizimi, chiqindilarni utilizatsiya qilish, personal ta'limi va doimiy monitoring kabi ko'plab omillar hisobga olinishi zarur. Har bir element butun tizimning ishonchligini ta'minlashda muhim rol o'ynaydi va birining ishlamay qolishi butun xavfsizlik tizimini buzishi mumkin.

Zamonaviy biotexnologiya va genetik muhandislik sohasidagi yutuqlar yangi xavflar va risklarni keltirib chiqarmoqda. Rekombinant DNK texnologiyasi, genni o'zgartirish usullari va sintetik biologiya kabi sohalarda yangi biosafety tamoyillariga ehtiyoj paydo bo'lmoqda. Dual-use research of concern (DURC) kabi tadqiqotlar maxsus nazorat va xavfsizlik choralari talab qiladi.

Tadqiqotning maqsadi va vazifalari

Tadqiqotning asosiy maqsadi - infeksiyon materiallar bilan ishlash jarayonida texnika xavfsizligi qoidalarini takomillashtirish va zamonaviy biosafety talablariga mos keluvchi tavsiyalar ishlab chiqishdir. Bu maqsadga erishish uchun xalqaro tajriba va O'zbekiston laboratoriyalarining amaliy ehtiyojlari hisobga olinadi.

Asosiy vazifalar quyidagilarni o'z ichiga oladi: biosafety darajalarini tasniflash va ularga mos xavfsizlik choralari aniqlash, personal himoya vositalarining to'g'ri tanlanishi va qo'llanilishi bo'yicha ko'rsatmalar berish, laboratoriya jihozlarining xavfsiz ekspluatatsiya qoidalarini ishlab chiqish, infeksiyon chiqindilarni saralash va utilizatsiya qilish usullarini takomillashtirish, favqulodda vaziyatlarda harakat algoritmi va emergency response planlarini yaratish.





Biosafety darajalari (BSL) tasnifi

Xalqaro amaliyotda biosafety darajalari to'rtta asosiy kategoriyaga bo'linadi. Har bir daraja muayyan xil patogen mikroorganizmlar bilan ishlashda qo'llaniladigan xavfsizlik choralarini belgilaydi. Bu tizim 1970-yillarda CDC (Centers for Disease Control and Prevention) tomonidan ishlab chiqilgan va keyinchalik butun dunyo bo'ylab qabul qilingan. Biosafety darajalarining to'g'ri talqin qilinishi va qo'llanilishi laboratoriya xavfsizligining asosini tashkil etadi.

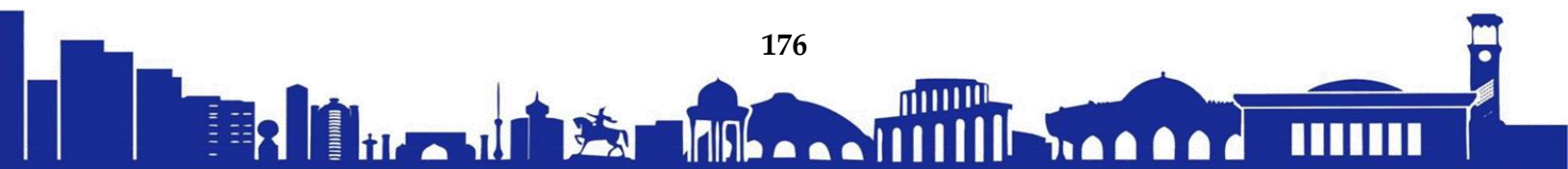
Personal himoya vositalari (PPE)

Personal himoya vositalari mikrobiologik tadqiqotlarda xodimlarning sog'ligini himoya qilishning eng muhim elementi hisoblanadi. To'g'ri tanlangan va qo'llaniladigan PPE infeksiyon kasalliklarning laboratoriya ichida tarqalishini oldini oladi. PPE tanlash jarayonida risk assessment natijalari, patogenlarning xususiyatlari va ishning xarakteri hisobga olinadi. Hierarchical approach bo'yicha PPE - eng oxirgi himoya qatlami bo'lib, boshqa barcha choralar samarasiz bo'lganda ishlatiladi.

Laboratoriya jihozlari bilan xavfsiz ishlash

Mikrobiologik laboratoriyalarda ishlatiladigan jihozlarning xavfsiz ekspluatatsiyasi alohida e'tiborni talab qiladi. Biosafety cabinet, laminar flow hood, avtoklavlar, santrifugalar va mikroskoplar kabi asosiy jihozlarning to'g'ri ishlatilishi laboratoriya xavfsizligining muhim komponentidir. Har bir jihozning o'z xususiyatlari, ekspluatatsiya qoidalari va texnik xizmat ko'rsatish talablari mavjud.

Biosafety cabinet (BSC) - mikrobiologik laboratoriyalarning eng muhim jihozi bo'lib, u nafaqat namunalarni kontaminatsiyadan himoya qiladi, balki laboratoriya xodimlarini ham patogen mikroorganizmlarning ta'siridan saqlaydi. BSC turli sinflarga bo'linadi: Class I - shaxsiy himoya (personnel protection), Class II - shaxsiy va mahsulot himoyasi (personnel and product protection), Class III - maksimal himoya darajasi (maximum containment). Har bir sinfnig o'z airflow pattern va ishlatish doirasi mavjud.





ISSN (E): 2181-4570 ResearchBib Impact Factor: 6,4 / 2024 SJIF 2024 - 5.073 Volume-4, Issue-3

Avtoklavlash jarayoni mikrobiologik chiqindilarni zararsizlantirish uchun eng ishonchli usul hisoblanadi. To'g'ri avtoklavlash rejimi: 121°C haroratda 15-20 daqiqa yoki 134°C haroratda 3-4 daqiqa davomida moist heat sterilization. Avtoklavdan foydalanishdan oldin barcha materiallar tegishli tarzda tayyorlanishi (packaging), biological va chemical indicators o'rnatilishi va load configuration to'g'ri amalga oshirilishi zarur.

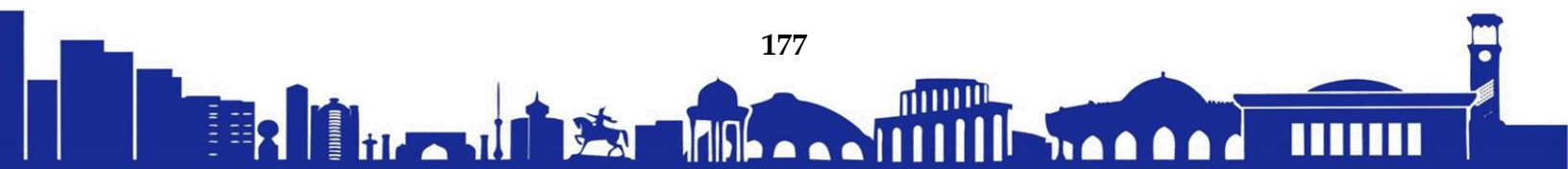
Santrifugalash jarayonida xavfsizlik choralari alohida ahamiyatga ega. Safety-sealed rotors va buckets dan foydalanish, load balancing ta'minlash, to'g'ri speed va time rejimini tanlash va emergency stop mexanizmlarini bilish muhim talablardir. Pre-centrifugation inspection, proper tube sealing va post-centrifugation safety procedures qat'iy rioya qilinishi lozim.

Laboratoriyada xavfsizlik madaniyatini rivojlantirish

Xavfsizlik madaniyati (safety culture) - bu barcha laboratoriya xodimlarining xavfsizlik qoidalariga nisbatan ijobiy munosabati va ularni kundalik faoliyatda qat'iy bajarishga bo'lgan irodasidir. Bu madaniyatni shakllantirish uchun doimiy ta'lim, amaliy mashg'ulotlar, safety awareness campaigns va xavfsizlik qoidalarining ahamiyatini tushuntirish zarur. Leadership commitment va employee engagement bu jarayonning muhim qismlaridir.

Yangi xodimlarni ishga qabul qilish jarayonida (onboarding process) majburiy ravishda biosafety bo'yicha asosiy ta'lim berish va hands-on training o'tkazish lozim. Har bir xodim o'z ish joyidagi xavflarni hazard identification, risk assessment va appropriate control measures qo'llash bo'yicha bilim va ko'nikmalarga ega bo'lishi kerak. Mentorship programmes va buddy systems yangi xodimlarni tez adaptatsiya qilishda yordam beradi.

Xavfsizlik qoidalarini buzishning oldini olish uchun regulyar safety audits va behavioral observations o'tkazish muhimdir. Bu jarayonlarda xodimlarning work practices kuzatilib, compliance darajasi baholanadi. Near-miss reporting systems va incident investigation procedures xavfsizlik tizimini doimiy takomillashtirish imkonini beradi. Corrective va preventive actions (CAPA) tizimi zarur.



Xavflarni baholash va risk-menejment

Har bir mikrobiologik tadqiqotni boshlashdan oldin comprehensive risk assessment o'tkazish majburiydir. Bu jarayonning maqsadi potential hazards ni aniqlash, ularning likelihood va impact ini baholash, hamda appropriate control measures belgilashdir. Risk matrix yoki quantitative risk assessment methods qo'llanilishi mumkin. Documented risk assessment protocol va regular review processes zarur.

Risk assessment jarayoni quyidagi bosqichlarni o'z ichiga oladi: hazard identification (biological, chemical, physical hazards), exposure pathway analysis, dose-response assessment, exposed population characterization va risk characterization. Har bir bosqich asosida appropriate risk mitigation strategies ishlab chiqiladi va implemented qilinadi.

Xavflarni boshqarish uchun hierarchy of controls qo'llaniladi: elimination (hazard ni to'liq yo'q qilish), substitution (kam xavfli alternativa), engineering controls (ventilation, containment), administrative controls (procedures, training) va personal protective equipment (PPE). Eng samarali himoya - combined approach bo'lib, bir nechta control levels ni birga ishlatishdir.

Laboratoriya xavfsizligini ta'minlash bo'yicha tavsiyalar

Mikrobiologik laboratoriyalarda comprehensive safety management system joriy etish uchun quyidagi asosiy tamoyillarga rioya qilish zarur:

1. Ish joyini tashkil etish va muhit nazorati:

- Laboratoriya yuzasini kundalik disinfection protocol bo'yicha tozalash
- Biosafety cabinet ichida aseptic technique bilan ishlash
- Environmental monitoring (air quality, surface contamination) o'tkazish
- HVAC systems va air filtration regular maintenance

2. Namunalar bilan ishlash va specimen management:

- Namunalarni chain of custody va proper labeling bilan saqlash



- Transport vaqtida UN regulations ga mos keluvchi packaging
- Infectious waste segregation va color-coded containers
- Decontamination va disposal protocols qat'iy bajarish

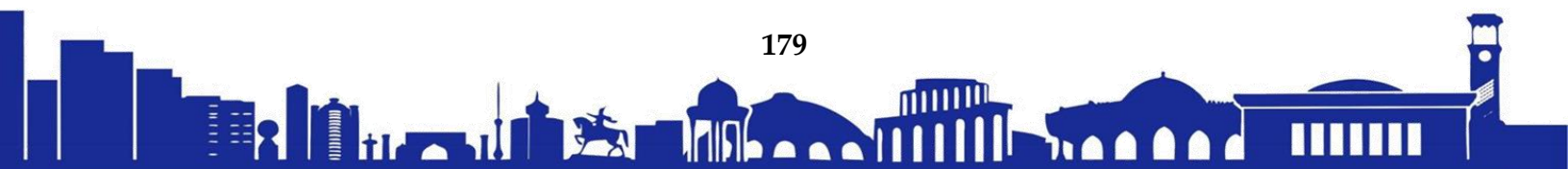
3. Favqulodda vaziyatlarga tayyor bo'lish va emergency response:

- Emergency action plans ishlab chiqish va xodimlarga o'rgatish
- First aid supplies, eye wash stations va emergency shower
- Spill kits va decontamination materials tayyorlab qo'yish
- Regular emergency drills va post-incident review

XULOSA Infekcion materiallar bilan ishlash jarayonida texnika xavfsizligi qoidalariga qat'iy rioya qilish zamonaviy mikrobiologik tadqiqotlarning ajralmas qismidir. Biosafety darajalariga mos ravishda tashkil etilgan laboratoriya sharoitlari, to'g'ri tanlangan personal himoya vositalari va xodimlarning yuqori malakasi xavfsiz ish muhitini ta'minlaydi. Ushbu tadqiqotda tahlil qilingan ma'lumotlar shuni ko'rsatadiki, integrated approach - ya'ni technical controls, administrative measures va personal protective equipment ni birgalikda qo'llash eng yuqori xavfsizlik darajasini ta'minlaydi.

Tadqiqot natijalari shuni ko'rsatadiki, international standards ga mos keluvchi biosafety protocols qo'llash laboratory-acquired infections (LAI) ni sezilarli darajada kamaytiradi va occupational health risks ni minimallashtiradi. Evidence-based approach va best practices ni qo'llash orqali risk management systems ni takomillashtirish mumkin. Quality assurance va continuous improvement principles laboratoriya xavfsizligini doimiy rivojlantirishda muhim rol o'ynaydi.

Xavfsizlik madaniyatini rivojlantirish va comprehensive training programs xodimlarning professional competency sini oshirishda muhim rol o'ynaydi. Behavioral-based safety approaches, peer-to-peer learning va leadership commitment safety culture ni mustahkamlashda zarurdir. Regular training updates, competency assessments va certification programs xodimlarni zamonaviy biosafety requirements ga mos ravishda tayyorlaydi.



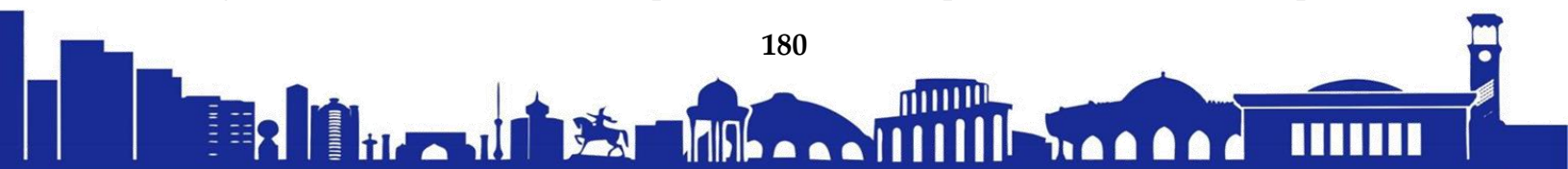
Mikrobiologik laboratoriyalarda proactive risk management systems ni joriy etish preventive approach ni ta'minlaydi. Systematic hazard identification, quantitative risk assessment va evidence-based control measures orqali potential incidents ni prevention qilish mumkin. Emergency preparedness planning, incident response protocols va business continuity plans laboratoriya resilience ni oshiradi.

Kelajakda mikrobiologik laboratoriyalarda digital transformation va smart technologies ning joriy etilishi biosafety management ni yanada takomillashtirish imkoniyatlarini yaratadi. Internet of Things (IoT) sensors, artificial intelligence algorithms va real-time monitoring systems orqali hazard detection va automated response capabilities ni rivojlantirish mumkin. Predictive analytics va machine learning approaches laboratory incidents ni proactive prevention qilishda yordam beradi.

Shu bilan birga, global harmonization efforts, international collaboration va knowledge sharing platforms orqali biosafety standards ni unifikatsiya qilish global health security ni mustahkamlashga yordam beradi. Public-private partnerships, academic-industry collaborations va regulatory alignment bu sohadagi innovation va best practices ni tarqatishda muhim rol o'ynaydi. Sustainable development goals va One Health approach mikrobiologiya sohasida comprehensive safety framework yaratishda yo'l-yo'riq beradi.

ADABIYOTLAR

1. WHO Laboratory Biosafety Manual, 4th edition. World Health Organization, Geneva, 2020. - 204 p.
2. CDC/NIH. Biosafety in Microbiological and Biomedical Laboratories, 6th edition. US Government Printing Office, Washington, 2021. - 438 p.
3. Richmond J.Y., McKinney R.W. Primary containment for biohazards: selection, installation and use of biological safety cabinets. 3rd edition. US Department of Health and Human Services, 2021. - 125 p.
4. OECD Guidelines for the Licensing of Genetic Engineering Facilities. Organisation for Economic Co-operation and Development, Paris, 2020. - 89 p.





ISSN (E): 2181-4570 ResearchBib Impact Factor: 6,4 / 2024 SJIF 2024 - 5.073 Volume-4, Issue-3

5. Yusupova M.K., Rahmonov A.B. Mikrobiologik laboratoriyalarda xavfsizlik choralari. O'zbekiston tibbiyot jurnali, 2023, №2, 45-52.
6. Fleming D.O., Hunt D.L. Biological safety: principles and practices. 5th edition. ASM Press, Washington, 2022. - 654 p.
7. Singh B., Sharma M.K. Laboratory acquired infections: prevention and management strategies. International Journal of Infection Control, 2021, Vol. 17, No. 3, pp. 1-15.
8. European Committee for Standardization. Laboratory biorisk management standard (CWA 15793:2021). Brussels, 2021. - 76 p.
9. Abdullayev T.M., Karimov N.S. Personal himoya vositalarining samaradorligi. Mikrobiologiya va epidemiologiya jurnali, 2022, №4, 78-85.
10. WHO. Laboratory Quality Management System Handbook. World Health Organization, Geneva, 2021. - 178 p.
11. International Organization for Standardization. ISO 35001:2019 Biorisk management for laboratories and other related organizations. Geneva, 2019. - 45 p.
12. Burnett L.C., Lunn G., Coico R. Biosafety: Guidelines for working with pathogenic microorganisms. Current Protocols in Microbiology, 2021, Vol. 60, pp. 1A.1.1-1A.1.14.

