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Department of Pathology and
Laboratory Medicine
Aga Khan University Hospital
Stadium Road, P. O. Box 3500
Karachi 74800, Pakistan

Tel: 92 21 3486 1551
Fax: 92 21 3493 4294, 3493 2095

hospitals.aku.edu/Karachi/clinical-laboratories

EDITORIAL

Welcome to this special issue of LabRad, themed "Green Parade." As we celebrate World Environment Day, observed on June 5th, we are reminded of our collective responsibility to safeguard our planet and change to green laboratory practices. This issue is dedicated to exploring the environmental impact of clinical laboratories and advocating for sustainable practices within our field.

Clinical laboratories play a crucial role in healthcare, but their environmental footprint cannot be ignored. From high energy consumption to significant waste generation, our laboratories contribute to greenhouse gas emissions and resource depletion. This issue highlights various strategies and innovations adopted to reduce our environmental impact, emphasizing the importance of green laboratory practices.

In "Empowering Donors Through Technology," we discuss how digitalization can streamline laboratory reporting, reducing paper waste and improving efficiency. Articles on eco-friendly molecular pathology practices and sustainable histopathology lab development provide practical insights into minimizing our ecological footprint. Additionally, we explore the role of behavioral changes and technology, such as speech recognition and artificial intelligence, in enhancing productivity while promoting sustainability.

The "Green Assembly" section celebrates our commitment to eco-conscious initiatives, showcasing efforts taken by the laboratory team to implement green laboratory practices and recognize our green guardians. As we navigate the challenges and opportunities of creating environmentally friendly laboratories, let us work together to make a meaningful impact.

Join us in this Green Parade, and let's pave the way for a healthier planet and a brighter future for all.

Dr Hafsa Majid
Associate Editor LabRad

Empowering Donors Through Technology

Shehnila Kanwal, Sana Brohi and Dr Hasan Hayat
Hematology & Transfusion Medicine

Our Blood Bank's journey at The Aga Khan Hospital towards sustainability, is not just an initiative; it's a transformation. We are pioneering a path where technology meets ecology, crafting a system that not only serves our immediate needs but also preserves our planet for future generations.

Every donated blood unit in our Blood Bank is screened for infectious markers i.e. Hepatitis B, C, HIV, Malaria and Syphilis. The blood donors come to hospital to collect their report (screening positive or negative) as hard copy. The blood donors that are positive for infectious markers are invited for a session of confidential counselling by the on-call doctor.

To bring an environmental change in this process, it is suggested that the blood donors that hold negative screening for infectious markers (who, are in majority) shall be given an online specific identification / donation number from where they can download their report. This meticulous approach will not only save time of Blood donors so they will not have to visit hospital for collecting their screening negative report but also minimizes wastage of paper and maximizes resource utilization, reflecting our dedication to excellence in every aspect of our operations.

We believe that caring for the environment and humanity go hand in hand. The online system shall be designed to reflect this ethos, creating a culture where every action is taken with consideration for the well-being of both individuals and the environment.

Our goal is to develop a secure online system which

is more than a tool; it's a portal that empowers donors to become agents of change. By streamlining the screening process, we focus to provide a seamless experience that respects both, their time, and their commitment to saving lives.

Thus, as we look to the future, we remain committed to continuous improvement. We will keep abreast of technological advancements and environmental best practices, ensuring that our system evolves to meet the challenges of tomorrow.

We extend an invitation to technology experts, environmental advocates, and the global community to collaborate with us. Together, we can explore new frontiers in healthcare sustainability and make a lasting impact on the world.

Impact of Clinical Laboratories on Greenhouse Gas Emissions

Zubair Ahmed Rahojo
Clinical Chemistry

In the global fight against climate change, every sector face scrutiny, including healthcare. Clinical chemistry laboratories, are spotlighted for their significant environmental footprint. At the forefront of this movement is the clinical chemistry team at Aga Khan Laboratory Pakistan. Their pioneering efforts to assess and mitigate the environmental impact of clinical laboratories promise a greener future for healthcare. This article delves into the pivotal role of clinical and research laboratories in climate change and presents actionable strategies for a more sustainable healthcare sector.

Environmental Impact:

Clinical and research laboratories are notorious for their high energy consumption, driven primarily by the continuous operation of equipment like spectrophotometers, centrifuges, and refrigeration units. This heavy reliance on electricity leads to significant greenhouse gas emissions. One strategy to control this effect was recommended by D'Souza and Samuel (2023), they suggested that Institutional Review Boards or Ethics committees should make evaluation of the carbon footprint of equipment for clinical research. This is also an essential ethical principle of World Medical Association (2023). Similarly, this can be made part of the environmental checklist for clinical laboratories. This approach ensures environmental responsibility while maintaining research integrity.

Chemical Usage and Waste Management:

Clinical and research laboratories utilize a variety of chemicals crucial for diagnosing illnesses. However, improper handling and disposal of these chemicals pose environmental risks. Implementing solutions such as safe disposal methods and recycling programs can significantly mitigate the environmental impact of clinical chemistry waste (D'Souza & Samuel, 2023). Moreover, the excessive use of single-use plastics exacerbates the waste problem. To protect the environment, labs must adopt better waste management practices and minimize the use of single-use plastics.

Energy consumption:

Energy consumption in clinical and research laboratories across Pakistan varies significantly, with some facilities consuming up to three times more energy than equivalent-sized offices. Energy-intensive equipment like fume hoods and ultra-low temperature freezers contribute substantially to this consumption. Implementing simple measures such as adjusting settings can yield significant energy savings.

Efforts to reduce environmental impact include phasing out harmful gases and adopting innovations like heat recovery systems. Additionally, there's a growing emphasis on reducing water consumption and minimizing single-use plastics to mitigate environmental impact.

Embracing Digitalization and Sustainability: Streamlining Laboratory Reporting

Akhtar Shah
Clinical Chemistry

A significant advancement in the digital age has been the shift of clinical laboratory reporting to online platforms, enhancing efficiency and sustainability and reducing paper consumption. At the Aga Khan University Hospital (AKUH) Clinical laboratories, most test reports are available for viewing and printing online through e-reporting from many years. This digital transformation has simplified access for patients and healthcare providers, eliminating the need for physical copies in many cases. However, for certain specialized tests (n=19) that required special attachments or pathologist comments, hard copy reports were generated at Clinical Chemistry section. These hard copy reports have to be collected by patients from their respective collection centers/labs, where the sample were given. This results in several challenges, few of which are as follows:

- High paper consumption and increased carbon footprint
- Manual review and signature of hard copy reports
- Increased staff engagement in the collection and transportation of reports
- Delays in transporting reports across the country, compromising TAT.
- Loss of original reports during transportation
- Time-consuming retrieval process for patients
- Reports can only be collected from the location where samples were given.

To address these issues, Clinical Chemistry laboratory had undertaken a process improvement initiative aimed at digitalizing and enhancing online accessibility for companion reports and reducing environmental impact. We initiated online Sign-Out by Technologists and Pathologists. Initially reports were reviewed on hard copies and results were manually entered in laboratory software (ILMS) by technologist followed by sig-out by faculty. In new process, reports are reviewed and signed-out digitally by technologists and pathologists both, ensuring a seamless transition from review to availability. This has led to some key improvements as listed below:

- **Online Availability for Customers:** Patients and healthcare providers can access the final reports online, significantly reducing the need for physical copies.
- This initiative has led to several benefits:
- **Faster Availability of Reports:** The laboratory can now provide quick and efficient access to specific test reports. Patients can now access 14 different test reports online, significantly reducing the waiting time, eliminating the need for physical collection, and resulting in improved TAT.
- **Elimination of Transportation Hassles:** The need for physical transport of reports is minimized, saving time and reducing logistical complexities.
- **Elimination of Record Keeping:** The online availability of reports eliminates the need for acknowledgment receipts, maintaining and tracking records.
- **Cost Savings:** Reduced staffing requirements and lower paper consumption translate into significant cost savings.
- **Environmental Impact:** The initiative has saved the printing of 80,000 A4-size paper sheets annually, contributing to sustainability efforts.

This initiative allows patients and healthcare providers to view and print test reports online, greatly enhancing accessibility and convenience. Furthermore, underscore AKUH laboratory's commitment to sustainability, reducing carbon footprints, and optimizing operational efficiency. By leveraging digital solutions, the laboratory not only enhances service delivery but also makes a positive impact on the environment. This forward-thinking approach sets a benchmark for other laboratories to

follow eco-friendly practices, demonstrating that technological advancements can go hand in hand with environmental stewardship. Moreover, the time and cost savings realized from these initiatives are being reinvested into further improving laboratory services and patient care.

Accelerating Productivity and Performance: Transition from Transcribers to Working with Speech Recognition.

Fatima Safdar, Riaz Sirzameen and Dr Madiha Bilal Qureshi
Histopathology

Recent advances in technology and growing demand for pathologists' services require shortened turnaround time of reporting without compromising quality work. Solutions that assist the pathology workflow without compromising efficiency and quality are vital in supporting the service and improving patient care. Transcribing has long been a secretarial function, time consuming and more human dependent. This makes it less efficient in delivering output. To overcome this problem, speech recognition systems have emerged as a key technology that enables achieve efficiency and patient care goals.

One such speech recognition system is the Dragon Medical One (Cloud based) software package. Dragon Medical One uses artificial intelligence to accurately capture voice-generated content directly into clinical systems (ILMS). Advanced speech recognition delivers faster, simpler, and more complete clinical documentation. Dragon Medical One requires no voice profile training, a single cloud-based profile is auto established at first use powered by AI algorithms and a first-class professional medical vocabulary. Accent adjustments and microphone calibration are automatic, providing even greater accuracy, and an optimal clinician experience from the start.

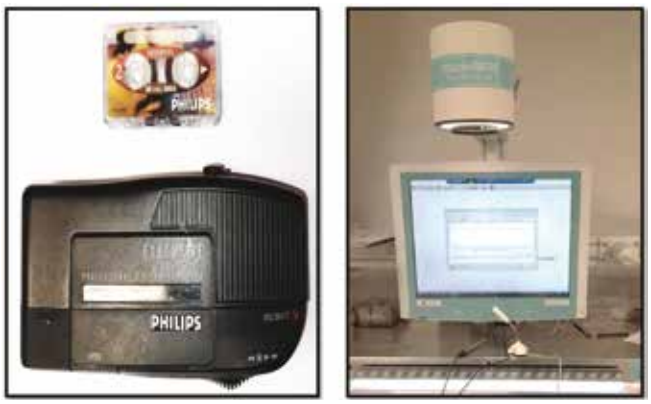


Figure 1: The picture on left side shows dicta system previously used and on right is the Dragon system currently being used for small gross specimens.

It is currently being used in the Section of Histopathology for dictation of small gross specimens. The grosser speaks up in the mic while grossing the specimen and the words are automatically transcribed on a word file to be viewed on laptop. The translated document becomes visible in the hospital system, is easily printed and ready for further assignment. This process was previously done in such a way that the dictator (grosser) used to dictate gross on a recorder and the data was saved in a cassette. The cassettes were run by the transcribers in their computer systems and gross was typed by them listening to the saved data files. In contrast to this method, Dragon System has the following advantages:

- **Improves staff satisfaction:** Speech recognition allows residents to effectively utilize their time for clinical analysis and interpretation and minimizes repetitive, time-consuming grammatical correction.
- **Optimizes documentation workflow:** Voice commands cut out the need for multiple clicks to move data between Laboratory Information Management System (LIMS) screens and pathology systems.
- **Delivers reports faster:** Speech is at least 3x faster than typing and notes are completed in real-time - you can dictate while viewing a specimen. This helps remove admin backlogs and accelerates report turnaround times.
- **Reduces administrative costs:** Speech recognition also helps pathology labs to significantly reduce administrative costs and reduces the need for transcription services.
- **Typographical errors reduction:** The assigned resident and medical officer can correct the dictation at the same time on screen, saving time of waiting till printing of reports and correct mistakes and typographical errors.

The disadvantage of the Dragon system in our setup

is the lack of number of such systems owing to a huge number of grossing specimens per day. Hence, it is currently employed in the grossing of small specimens only. Another frequent issue that occurs due to a limited number of dragon systems is voice recognition by the system since multiple residents and medical officers use the same system. To cope with the demand in near future, grossing will have to be entirely shifted to these systems. It is high time to take adequate measures to bring in more such systems and accommodate them accordingly in the best interest of saving time, energy and improving patient care.

ECO-Friendly Molecular Pathology Laboratory Practices

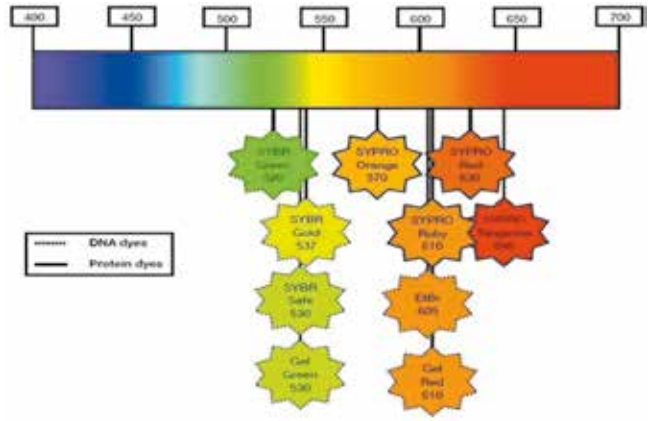
Samina Ghani, Shafaq Khan and Dr. Tariq Moatter
Molecular Pathology

As we are all very aware, laboratory sciences can require a lot of resources and generate billions of pounds of waste, nearly all of it considered hazardous. Through simple, easy changes, lab staff can make reduction in each of four key areas; energy, water, waste and hazardous chemicals that will result in a safe and environment friendly lab. As a diagnostic lab we look at our lab practices and optimize procedure to switch our Lab Green.

Green Molecular Laboratory By Using Safe Chemical

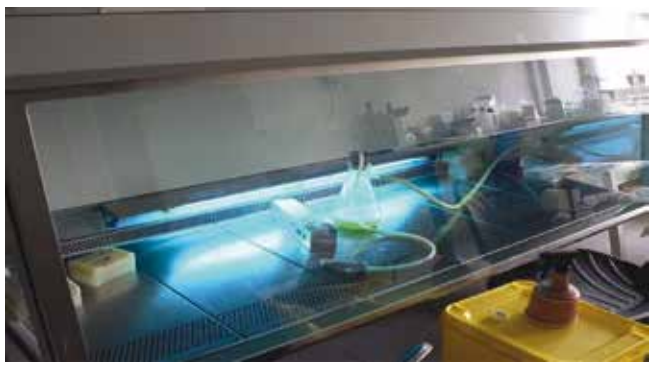
Different types of dyes are used to stain nucleic acids in the preparation and use of electrophoresis gels. The hazard properties of various products, and hence the disposal requirements, are very different. While some products are completely safe or less toxic, others are mutagenic and require special handling and disposal procedures.

SYBR Safe
SYBR Safe is a commercial DNA stain manufactured by Invitrogen. It is marketed as being less harmful than Ethidium bromide. Its major advantage is that it is as sensitive as Ethidium bromide and not require UV light for visualization.



GelRed
GelRed is a commercial DNA stain manufactured by Biotium. It is marketed as being the most safe, sensitive and robust nucleic acid gel stain- less mutagenic than ethidium bromide, but more stable in storage than SYBR Safe. Like ethidium bromide, GelRed is visualized using UV light.

UV Light Disinfection
In diagnostic laboratories UV light is routinely used as disinfection. UV can be associated with adverse health effects depending on duration of exposure and the wavelength. The adverse health effects that may occur are erythema (sunburn), photokeratitis (a feeling

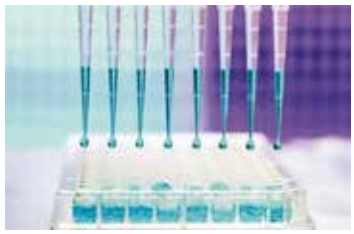


of sand in the eyes), skin cancer, increased skin pigmentation (tanning), cataracts, and retinal burns. Some alternate like hydrogen-peroxide vapor system and Mercury UV-C light sources are long known to be efficient for microbial disinfection.

Best Practices for Laboratory Plastics

Plastic test tube comes wrapped in plastic; held in a plastic bag. Most of the plastic material waste ends up in biohazard disposal Which is autoclaved and incinerated at high temperatures. Labs use 5-10x the energy of an office and lab work generates 5.4 billion kg of plastic waste per year. Before initiating use of laboratory plastics consumables for a new assay, review the chemical resistance chart to verify the compatibility.

Importance of Buying Best Pipette Tips



Pipette tips are in integral part of your liquid handling procedure. Waste that is composed of hard plastic pipettes or other sharps that could puncture the bag should be discarded into yellow lidded sharps boxes. Choosing tips made from recycled plastics or switching to glass may also be options. And there are pipette tip washers on the market for those who want to go the extra mile. Plastic pipette tips can absolutely be recycled, but not each waste hauler has the facilities or the confidence to do so.

Recycled Laboratory Consumables

Packaging which uses less plastic, or a greater proportion of recycled plastic (e.g. Anachem, Gilson). New England Biolabs (NEB) and BioEcho both purposely use minimal packaging materials for many of their products, like DNA and RNA kits. Some large wholesalers provide an indicator on their website/catalogue of greener options.). Purchase autoclavable tip boxes required loose refill tips.

Summary

Green laboratory practices provide numerous advantages, such as minimizing the use of hazardous chemical, limiting waste generation, reducing harmful environment impacts, cost savings and accelerating innovation processes. Setting quality targets of green laboratory is critical to ensure greenness and sustainability without compromising the quality of daily actions. This provides a more habitable world for future generations. In addition to using less hazardous chemicals whenever possible, labs should eliminate the use of such chemicals which harms ourselves as well as laboratory systems.

Let's Work to Build A Sustainable Histopathology Lab

Dr Sahar Suleman and Dr Tamana Asghari
Histopathology

With climate change and sustainability becoming an essential focal point for any work sector, it's hard to ignore healthcare's need for transformation. Pathology laboratories are known to contribute towards a substantial portion of carbon emissions due to their high energy demand.

Implementation of green initiatives will require a long term focus on sustainability, financial investment, effective training and support of senior management. The basic fundamental ways to approach this goal is by decreasing the cost of waste management in the laboratory, and discovering new processes affecting our daily work. Recycling, water conservation, using renewable or energy-efficient products for potential resource savings, such as installing low-energy

LED lights, or optimizing air conditioning are few examples. Mentioned below are few practices that a Pathology laboratory based in Northwest United States carried out when they went GREEN:

1) Recycling 1,800 gallons of 10 percent buffered formalin a year with influx of more than 87,000 specimens annually.
2) Partnering with a company, that specializes in purifying mixed products, the company turned the lab's paraffin waste into 7,800 pounds of fire-starting logs.
3) A program was started to recycle plastic containers with a company that specializes in recycling and reusing biodegradable plastic that decomposes in one-ten years as opposed to traditional 100+ years of decomposition.
4) They also buy formalin, alcohol and xylene in bulk 55 gallon drums. Which decreases the use of plastic and reduces the number of shipment, thereby reducing single use containers, hence carbon footprint.

Here are some ways that we can implement in our laboratory, effortlessly:
1) Maximize use of recyclable gloves that last longer.
2) Reusable blades.
3) Use cassettes with metal lids , or recycle cassettes.
4) Recycle paraffin/wax.
5) Minimize cutting unstained slides.
6) Share surplus chemicals/ staining reagents.
7) Finding alternatives to filing systems.
8) Electronic archiving , eliminate paper.
9) Turn off lights, keep machines/cryostat/printers on standby when not in use.

Together we can make a difference in saving our environment, just as we do in making human life better.

Laboratory Sustainability -Things to Promote Eco-Conscious Laboratory Environment

Nazneen Islam and Dr Zeeshan Ansar
Molecular Pathology

Climate change has become the greatest global health problem. It affects public health, and its impact is increasing day by day. Studies indicated that the healthcare sectors contribute four-five percent to the emission of green house gas.

Thus, immediate action is required at all levels—individual, organizational, and governmental—to achieve the necessary transformative change.

Sustainability in laboratory achieve by taking minor measures. Such measures accumulate over the time, leading to significant energy savings and a reduced environmental impact.

Promoting sustainability in laboratory management involves a combination of practices aimed at reducing waste, conserving resources, and minimizing environmental impact. Improving lab sustainability is important to lab managers, lab scientists, and the organizations they work for, here are few key steps for the lab management & improvement.

- **Laboratory Design**

The main goal of sustainable lab design is to balance sustainability with the health and safety of the people who work in the lab. All stakeholders, the user, healthcare safety professional, EHS professionals and architects to ensure that the desired lab will function properly.

- **Supplier Selection**

A lab contains variety of instruments and consumables that makes supplier selection a critical element. Many sustainability -minded suppliers provide greener products that use less energy, produce less waste, or recyclable materials. They also adhere environmental standards to minimize pollution and waste during manufacturing.
When choosing suppliers, labs can prioritize those that share their commitment to sustainability.

- **Instrument Choice and Care**

The choice of instruments in the laboratory has significantly influences in the sustainability. The less efficient instrument consumes more consumables and reagents, contributing to higher energy consumption and more waste. The durable and efficient instrument is the best choice for labs aiming for sustainability.

- **Product Lifespan**

labs should prioritize reliable products with extended lifespans, which reduces the frequency of replacement and keeps items out of landfills for longer. This will also help to improve the sustainability and reduce waste. Autoclavable glass products can be a sustainable alternative enabling sterilization and reuse while reducing the need for disposable plastic.

- **Digitization**

In many labs, data is still recorded on the paper manually. Paper-based processes contributing negatively to the environment. Implementation of digitize process can optimize the work process by reducing wastage of papers, it also reduces the risk of error in the data. Some software that notifies the lab user when the system needs maintenance, or pipettes are due for calibration.

- **Automation & POCT**

Manual experiment processes are still a significant part of many laboratories. They are sensitive to operator error and have a risk of contamination as well. A repeat run is required to mitigate the error /contamination, which contributes to waste of resources and energy.

Implementing automated instruments and POCT leads to more robust protocols and standardized procedures, significantly reducing errors and improving consistency.

- **Chemical Management**

Properly manage and dispose of hazardous chemicals according to regulations. Implement green chemistry principles by using safer alternatives and minimizing the use of toxic substances.

- **Equipment Maintenance**

Regularly maintain laboratory equipment to ensure optimal performance and longevity. Proper maintenance can extend the lifespan of equipment, reducing the need for replacements and conserving resources.

- **Procurement Practices**

Choose environmentally friendly products and materials whenever possible. Consider factors such as recyclability, energy efficiency, and eco-friendly packaging when making purchasing decisions.

- **Green Lab Certification**

Pursue certification programs such as LEED (Leadership in Energy and Environmental Design) or Green Lab Certification to demonstrate commitment to sustainability.

- **Collaboration and Networking**

Share best practices and collaborate with other labs or institutions to exchange ideas and resources for improving sustainability. Participate in industry networks and initiatives focused on laboratory sustainability.

- **Sustainability standards**

My green Lab" certification is considered as gold standards for laboratory sustainability best practice. This is non-profitable environmental organization with mission to build a global culture of sustainability in the laboratory.

It is more important than ever that labs do their part in reducing their environmental impact to support the ongoing global focus on environmental conservation. By implementing these measures, laboratories can reduce their environmental footprint while promoting responsible stewardship of resources for future generations.

A Guide to Develop the current and future Eco-Friendly Molecular Lab practices

Sony Siddiqui and Dr Zeeshan Ansar
Molecular Pathology

Introduction

Many healthcare facilities are adopting eco-friendly practices like energy-efficient infrastructure, waste reduction and recycling programs, and promoting telemedicine to reduce the need for patient travel. These initiatives aim to minimize the carbon footprint of healthcare services while maintaining high-quality

patient care.

An estimate of four-five percent of the world's greenhouse gas emissions come from healthcare. The benefits of tackling this issue aren't just global though, as researchers can also save money at both a lab and a university level.

Making more environmentally friendly choices at the outset is perhaps more effective than trying to deal with the impact. For example, replacing hazardous chemicals such as ethidium bromide with an equivalent but non-mutagenic product such as SYBR Safe. Furthermore, It is surprisingly simple to lose track of supplies and wind up duplicating across labs, thus centralising helps cut down on unnecessary ordering or you could even try combining orders to reduce shipping costs and waste.

Green Lab Guide: Current Practices

1. Cut energy usage in the laboratory

According to estimates, a single institute can use as much energy in a weekend as a typical house does in a year, and the average life science lab uses three times as much energy as an office building It seems obvious but reducing energy consumption from electrical equipment in the lab is a very effective way of reducing the lab's carbon footprint.

1.1. Switch off lights and appliances

We take more care to turn off the lights and appliances at home, but in the lab, we usually take less care. Switching off large lab equipment, such as computers may have a significant impact because they frequently operate all night without need. Try placing "turn off" stickers next to the light switches.

1.2. Altering equipment settings

Automation and IT provide results with speed, accuracy and volume, but use vast amounts of energy and water. Water baths, film developers, and other equipment can be set to turn on automatically during regular business hours while conserving energy at other times by installing timers on their plug connections. If your PCR machine needs to run overnight, try altering the settings so it holds at 10oC rather than 4oC.

1.3. Check freezers.

Freezers are essential for long-term storage, but they require a huge amount of energy to power. To keep them efficient check the rubber seals are working and defrost regularly. Reduce the total number of freezers needed by combining into smaller storage to lessen the overall impact.

1.4. Close the fume hood

One of the most significant drains on energy is an open fume hood, as when the sash is up it pulls room air into the hood while simultaneously pumping in reconditioned outside air, shutting the fume hood sash is an easy fix with a big effect.
Harvard University initiated a programme in 2005 that, with only a 30 percent decrease in fume hood usage, has resulted in an annual savings of $240,000 and a reduction of 300 metric tonnes of greenhouse gas emissions.

2. Stop Plastic Waste

It would be incorrect to characterize the clinical lab as eco-friendly. The sheer volume of unnecessary plastic waste is easy to notice while walking around, as demonstrated by the non-recyclable bottles, the enormous Styrofoam delivery boxes, and the abandoned pipette tips and racks. An estimated 5.5 million tons of plastic garbage are produced annually by labs, this debris is rejected by recycling facilities because it is contaminated.

A challenging aspect of becoming more eco-friendly is dealing with the amount of single-use plastic waste, but applying the classic 'Reduce, Re-use, recycle' principle can be helpful.

2.1. Reduce with glassware

Single-use plastics are a much-needed requirement for quality and safe practice but are also major contributors to waste generation. Wherever possible, we should try to switch to autoclavable glassware in order to lower the overall amount of plastic that is consumed. It's also helpful to plan experiments with consumable waste in mind, taking the time to think through whether you could multiplex or miniaturise without compromising your results.

2.2. Re-use boxes and tip boxes

Instead of throwing plastic away, think about ways to re-use. Styrofoam boxes from deliveries can be saved for use at your bench or for sending of your own packages or can even be used as ice boxes! Pipette tip waste is often unavoidable but buying refill racks and autoclaving pipette tip boxes helps, utilizing the tower rack systems from Gilson, Rainin or Starlab, which also offers special collection bins for the empty plastic racks. You could also wash and dry reagent reservoirs and cell scrapers if they are for techniques that don't require as much sterility, such as Western Blots.

3. Water Usage

A tap leaking 60 drips per minute wastes about 21

litres of water a day. Our water consumption can easily be reduced with a few simple changes and should therefore always properly switch off the faucets.

3.1. Switch from water baths to bead bath

We can make a big impact by replacing these, especially if you change your water baths as regularly as we all should. If you are unable to make the change, try keeping your water bath covered at all times to help maintain the desired temperature with less energy and requiring less frequent water changes.

3.2. Responsibly dispose of chemicals

Beyond waste, we can also reduce our environmental impact on water by always disposing of chemicals appropriately and never flushing them down the drain, which risks contaminating drinking water.

Although there is limited available data on the actual contribution of clinical laboratories to this environmental impact. Laboratory buildings, processes and equipment are resource intensive. The transportation and storage of samples is an unavoidable necessity, all adding to the environmental burden. It is, therefore, imperative that healthcare professionals should take into consideration their policy development, training strategies and quality improvement programs.

As scientists, we must recognize the impact that our research has on the environment but also see that making small changes can minimize the effects while still enabling us to pursue our work. So, stop feeling blue about your carbon footprint and go green instead!

Future Perspective

Although there are many strengths and many opportunities, there are significant weaknesses and threats in all disciplines within laboratory medicine. I believe that pathology needs to redefine itself as a unitary discipline and redefine its position within modern medicine, within society and within the world. We need to develop greater advocacy skills for our disciplines and establish a Pathology Forum to formulate strategies for education, research, service development and staff recruitment.

- We need to establish academic career advancement programmes, including tenure-track programmes for medical staff, medical trainees, medical laboratory scientists and biochemists.
- We need to encourage the formation of centres of research excellence in laboratory medicine based on the hub and spoke motif as outlined above.
- We need to establish pathology fellowship training programmes for medical and science trainees within laboratory medicine disciplines.
- In addition, we need to establish industrially supported MD, PhD and DSc studentships for medical and scientifically qualified graduates within laboratory medicine. This I believe is key in terms of achieving growth going forward for all laboratory disciplines in the greater family of laboratory medicine.

Laboratory medicine scientists and physicians need to be more proactive in spearheading service developments in pathology arising from the translational research they carry out and we need to properly address intellectual property rights and exploitation issues in relation to the fundamental basic science research that is currently being performed in laboratory medicine academic departments so that this is translated to the laboratory bench and exploited by the laboratories.

Laboratories need to take a lead role in the biobanking, genome resource banking and national cancer genome survey initiatives that have recently been launched.

Most importantly, laboratory medicine needs to think like a business! We need to develop a pathology corporate strategy in our medical schools and hospitals to:

1. Attract external funding from the biotechnology sector (national and international agencies).
2. Establish international research and education networks.
3. Establish endowed studentships for MD, PhD, MSc and DSc students.
4. Establish endowed lectureships and professorships in laboratory medicine with significant support from biotechnology and industry partners.

Furthermore, we need to examine critically the role of private income generation and its potential, use as seed capital funding for strategic academic, technological and scientific development, within our laboratories. Pathology departments should now be establishing business translation, incubator units (BTIUs), in collaboration with hospital institutions, universities and industrial/biotechnology partners. This is fundamental in relation to achieving growth within laboratory 36 medicine. It allows significant

technology transfer, access to 'blue sky' technology, access to innovative thought processing in relation to new chemistries and technology platforms that are currently being developed by the biotechnology sector. We need urgently to develop significant expertise in IPR in order to cope with the exploitation of discovery. Pathology disciplines should now start to provide essential core facilities for medical schools in order to regain the initiative and re-establish laboratory medicine/pathology as a fundamental discipline within medical schools. Such core facilities could include cDNA, CGH array facilities, tissue biobanks and laser capture microdissection, to mention just a few.

Conclusion

Laboratory medicine will only succeed based on its people resource We need to create the pyramid effect in attracting and maintaining people of excellence in service and academic pathology. Mentoring programmes for medical and science graduates within laboratory medicine are extremely important in order to encourage the best, to retain the best and to ensure that the best seek academic advancement for themselves and their discipline. Only by employing this pyramid effect will we see strategic growth within laboratory medicine and protect a rich heritage that has been passed on to all of us.

The Role of Microbiology Laboratories in Seaweed Reduction and Sustainable Agar Production

Dr Mohammad Zeeshan
Microbiology

Introduction

Seaweed, particularly red algae, is a primary source of agar, a gelatinous substance extensively used in microbiology laboratories as a culture medium. The increasing demand for agar, driven by its critical role in scientific research, has led to significant harvesting of seaweed, raising concerns about sustainability and environmental impact. This article explores the challenges associated with seaweed reduction for agar production and how microbiology laboratories can contribute to sustainable practices.

Importance of Agar in Microbiology:

Agar is a polysaccharide derived from the cell walls of red algae, primarily species such as Gelidium and Gracilaria. It is indispensable in microbiology for culturing bacteria, fungi, and other microorganisms due to its ability to form a solid medium at relatively low concentrations and its resistance to degradation by most microbes.

Key roles of agar in microbiology include:

Culture Medium: Agar provides a stable and nutrient-rich environment for growing microorganisms, essential for research and diagnostic purposes.

Gel Electrophoresis: Agarose, a purified form of agar, is used in gel electrophoresis for DNA and protein analysis.

Environmental Impact of Seaweed Harvesting:

The surge in agar demand has led to intensified seaweed harvesting, posing several environmental challenges:

1. Overharvesting: Excessive collection of wild seaweed can disrupt marine ecosystems, affect biodiversity, and lead to the depletion of natural seaweed beds.
2. Habitat Destruction: Harvesting methods, especially those involving dredging, can damage the seabed and habitats of marine organisms.
3. Climate Impact: Seaweeds play a significant role in carbon sequestration. Their reduction could impact the ocean's ability to absorb CO2, exacerbating climate change.

Sustainable Agar Production:

To address these environmental concerns, microbiology laboratories and the broader scientific community are exploring sustainable alternatives and practices:

1. **Cultivation of Seaweed:** Instead of harvesting

wild populations, cultivating seaweed in controlled environments can reduce the ecological impact. Aquaculture practices can ensure a steady supply of raw materials without depleting natural resources.

2. **Alternative Sources of Agar:** Research into alternative agar sources, such as different species of algae or even non-algal polysaccharides, is ongoing. Innovations in biotechnology could lead to the development of synthetic or semi-synthetic agar substitutes.
3. **Efficient Use of Agar:** Laboratories can adopt practices to use agar more efficiently, such as optimizing the concentration needed for culturing and recycling agar when possible.
4. **Sustainable Harvesting Practices:** Implementing and promoting sustainable harvesting practices, such as selective harvesting and rotating collection areas, can help mitigate the environmental impact.

Role of Microbiology Laboratories in Promoting Sustainability:

Microbiology laboratories can play a crucial role in promoting sustainable agar production through several initiatives:

1. **Research and Development**: Conducting research to identify and develop alternative gelling agents that can replace or supplement agar. Exploring genetically modified algae that yield higher agar content with less environmental impact.
2. **Awareness and Education:** Educating researchers and students about the environmental impact of agar production and encouraging sustainable laboratory practices.
3. **Collaboration with Industry:** Partnering with seaweed farmers, suppliers, and industry stakeholders to promote sustainable cultivation and harvesting methods.
4. **Non-culture based diagnostic method:** there should be efforts for reliable non-culture based diagnostic solutions e.g., serological, and molecular method. This not only reduces the seaweeds usage but also reduces the turnaround time.
5. **Policy Advocacy:** Supporting and advocating for policies that protect marine ecosystems and promote sustainable resource use in the production of laboratory materials.

Conclusion

The use of agar in microbiology laboratories is vital for scientific research, but it is equally important to address the environmental implications of its production. By adopting sustainable practices, investing in research for alternatives, and promoting awareness, the scientific community can help ensure that the demand for agar does not compromise the health of marine ecosystems. Balancing the needs of research with environmental stewardship will pave the way for a more sustainable future in microbiological sciences.

Figure 1: Harvesting seaweed in Indonesia

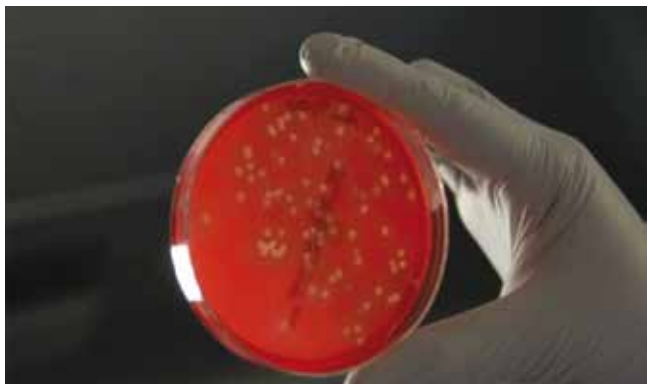


Figure 2: Agar in microbiology laboratory

The Role of Behavioral Change in Reducing Energy Use in Microbiology Laboratories

Dr Mohammad Zeeshan
Microbiology

Introduction

Microbiology laboratories are essential hubs of scientific research but are also among the most energy-intensive spaces in academic and research institutions. While technological advancements and energy-efficient equipment play significant roles in reducing energy consumption, the behavior of laboratory personnel is equally crucial. This article explores the impact of behavioral change on energy use in microbiology laboratories and outlines strategies to promote energy-efficient practices among lab users.

Understanding Energy Use in Microbiology Laboratories

Microbiology laboratories consume large amounts of energy due to the need for precise environmental controls, specialized equipment, and continuous operation of certain devices. Key energy-consuming elements include:

a. **Incubators and Autoclaves**: These devices are essential for culturing microorganisms and sterilizing equipment, operating at high temperatures for extended periods.
b. **Freezers and Refrigerators**: Ultra-low temperature freezers are critical for storing biological samples, but they consume significant energy.
c. **Ventilation and HVAC Systems**: Maintaining clean air and controlled temperatures is crucial, but these systems are major energy users.
d. **Lighting and Electronic Devices**: Continuous lighting and the use of computers, microscopes, and other electronic devices add to the energy load.

The Impact of Behavioral Change

While upgrading energy-efficient equipment is important, changing the daily habits and behaviors of lab personnel can lead to substantial energy savings with minimal financial investment. Behavioral changes can reduce energy consumption through:

i. **Efficient Use of Equipment**: Proper scheduling and operation of equipment, such as turning off devices when not in use, can significantly cut energy use.
ii. **Maintenance and Calibration**: Regular maintenance and calibration ensure that equipment runs efficiently, preventing unnecessary energy waste.
iii. **Optimized Laboratory Practices**: Simple adjustments in how experiments are conducted and how equipment is shared can lead to more efficient energy use.

Strategies for Promoting Behavioral Change

1. Education and Training:
a. Awareness Campaign: Implementing awareness campaigns to educate lab personnel about the energy consumption of different devices and the importance of energy-saving practices.
b. Training Programs: Conducting training sessions to teach efficient laboratory practices, proper equipment usage, and maintenance routines.

2. Energy Monitoring and Feedback:
a. Real-Time Monitoring: Installing energy monitoring systems to track the energy use of individual devices and the lab as a whole.
b. Feedback Mechanisms: Providing regular feedback to lab users about their energy consumption and the impact of their behaviors, reinforcing positive changes.

3. Incentive Programs:
a. Recognition and Rewards: Establishing recognition programs that reward labs or individuals who demonstrate significant energy savings through behavior changes.
b. Competitions: Organizing friendly competitions between labs or departments to see who can reduce their energy use the most.

4. Leadership and Culture:

a. Role of Lab Managers: Lab managers and principal investigators can lead by example, demonstrating and enforcing energy-efficient practices.
b. Cultivating a Culture of Sustainability: Fostering a culture where sustainability and energy efficiency are integral to the lab's identity and daily operations.

5. Policy and Procedure:

a. Energy-Efficient Protocols: Developing and implementing standard operating procedures (SOPs) that incorporate energy-efficient practices.
b. Regular Audits: Conducting regular energy audits to identify areas for improvement and ensure compliance with energy-saving policies.

Examples of Behavioral Changes

1. **Turning Off Equipment**: Ensuring that all non-essential equipment is turned off after use or during extended periods of inactivity.
2. **Optimizing Freezer Use**: Consolidating samples and using freezer maps to reduce the frequency of door openings.
3. **Efficient Autoclaving**: Running autoclaves only with full loads and at off-peak times to reduce energy demand.
4. **Lighting**: Using task lighting instead of overhead lights when possible and turning off lights in unoccupied areas.

Conclusion

Behavioral change is a powerful tool in reducing energy use in microbiology laboratories. By educating and engaging lab personnel, implementing monitoring and feedback systems, incentivizing energy-efficient behaviors, and fostering a culture of sustainability, significant energy savings can be achieved. These changes not only reduce operational costs but also contribute to broader environmental goals, demonstrating the crucial role that individual and collective actions play in creating more sustainable laboratory environments.

Reducing Pathology's Environmental Impact – What can we do?

Dr Fatima Khan and Dr Tamana Asghari
Histopathology

The healthcare industry has a detrimental impact on the environment. It leads to the pollution and contamination of water, air and soil. It is responsible for 5-8% of greenhouse emissions and uses up precious natural resources such as fresh water. Ultimately, these changes result in damage to the earth's ecosystem, contributing to global warming. Although climate change has harmful consequences worldwide, it is the developing nations that are particularly at risk. This is because they lack the resources and funding to prevent and deal with the aftermath of extreme weather and rising temperatures. One recent example is the 2022 flooding in Pakistan that caused the deaths of over 1500 people and an economic loss of USD $10 billion. Hence, it is the responsibility of all medical workers, including laboratory professionals, to be heedful of the impact their activities have on the environment.
Some key areas eco-friendly practices may be applied in include waste management, energy conservation and water conservation. Pathology laboratories routinely utilize toxic chemicals to report the best and most accurate results for their patients. However, it is important to adopt optimal recycling and disposal strategies for these harmful chemicals. Aside from basic waste disposal strategies, newer techniques should be adopted. For example, xylene can be recycled by distillation, which also reduces purchasing costs. Formalin can be treated by flocculation before disposal. A recycling program should be established for materials such as paper and cardboard not contaminated with hazardous substances. Furthermore, reusable containers and glassware should be used whenever possible and biodegradable alternatives to plastic products should be used instead.

Energy conservation can be achieved by using motion-activated, low-energy LED lighting and instruments that switch to standby mode when not in

use. Regularly checking and maintaining instruments optimizes energy use, and well-maintained air-conditioning minimizes energy wastage. Water usage is reduced by utilizing low-flow faucets and water-saving devices, as well as promptly fixing leaks. Providing training to staff on the importance of and best practices for resource conservation, waste reduction, and disposal is crucial. Staff should be encouraged to develop and implement improved environmental policies and guidelines for the lab. Workshops can improve awareness, and sharing research on successful sustainability techniques in other labs can inspire new initiatives. Regular audits ensure the adequate execution of established policies and identify areas for improvement. A key area where pathology is advancing is digital pathology, which uses computer technology to analyze digital images of tissue samples. This approach reduces the need for multiple traditional slides, thereby decreasing the usage of harmful staining chemicals and generating less physical waste. Additionally, digital pathology offers superior electronic record-keeping, eliminating the need for paper-based documentation and its associated environmental impact.

Although most environmental preservation strategies are system-based, the impact an individual can make should not be underestimated. Simple choices, such as opting for digital publications over paper copies, turning off computers at the end of the workday, and being mindful of daily plastic glove and paper towel usage in the gross room, can make a significant difference. These choices may also inspire colleagues to adopt similar sustainability measures. Patients deserve the best possible healthcare, but it is imperative that in the quest to provide it, we do not forget the need for concurrent environmental sustainability.

Water Usage and Conservation in Clinical Labs

Saba Siddiqui
Clinical Chemistry

Clinical laboratories are crucial to healthcare, delivering vital diagnostic services, but their significant water usage raises environmental and resource depletion concerns. In clinical chemistry, water is heavily used for equipment cleaning, reagent preparation, dilution, and sample analysis. To mitigate this, labs are implementing innovative water-saving techniques such as closed-loop water systems that recycle water, advanced automation to reduce cleaning frequency, and water-efficient equipment. These strategies not only conserve water but also lower operational costs and enhance environmental sustainability. This article examines these cutting-edge approaches to promoting water conservation in clinical chemistry.

Strategies for Reducing Water Usage in Clinical Chemistry Procedures.
Reducing water usage in clinical chemistry procedures is essential for sustainable laboratory practices. Key strategies include recycling and reusing water through treatment systems and closed-loop circulation, minimizing freshwater input. Investing in water-efficient equipment with features like low-flow systems and automated shut-off valves aids in reducing consumption. Optimizing procedures by adjusting rinse cycles, sample and reagent volumes, and implementing water-saving protocols is crucial. Automation optimizes water usage by dispensing precise volumes, while alternatives to water-based cooling and point-of-use filtration systems enhance efficiency and purity. Batch processing and regular monitoring identify conservation opportunities, while advanced purification technologies ensure high-quality water with minimal waste. Pursuing green lab certification provides guidelines for reducing environmental impact, including water usage in clinical chemistry procedures.

Water Conservation Practices Chemical Pathology Section.
In Aga Khan University Hospital's chemical pathology section, water conservation and usage adhere to stringent standards to ensure consistent assay performance and instrument reliability. Within the Total Laboratory Automation (TLA), three water plants serve as backups for each other, guaranteeing an uninterrupted supply

for testing. The Gebrauchsanweisung WSU2, located in the automation hall, produces ultra-pure water through ion exchange and reverse osmosis modules, ensuring constant high-quality water with dynamic maintenance intervals. It can supply up to 10 liters of ultra-pure water in case of emergency. Additionally, the Protegra CS RO 130 AFU, with its El-Ion electro-deionization module, provides continuous operation with low energy consumption, producing flow rates of 120 - 170 liters per hour. Water is utilized as a calibration standard and for instrument cleaning, reagent preparation, and specimen processing, ensuring accurate results in manual toxicology and special testing procedures.

Role of Water Plants in Green Lab Practices at Aga Khan Hospital's Chemical Pathology

In our chemical pathology practices at Aga Khan Hospital, our water plants play a pivotal role in promoting environmentally friendly laboratory practices. They are instrumental in the resource-efficient production of ultrapure water essential for laboratory diagnostics, ensuring that the quality standards required for various assays and equipment operations are consistently met. Through the careful selection of low-consumption equipment and the implementation of regular maintenance protocols, we strive to minimize water waste and energy consumption in our laboratory operations.

Moreover, our commitment to sustainability extends to evaluating laboratory processes to identify and eliminate unnecessary water usage. By implementing closed-loop systems, we are able to recirculate water within equipment, thereby reducing wastage during sample analysis and preparation. Additionally, our backup water units ensure that high-quality water is readily available whenever needed, guaranteeing uninterrupted laboratory operations.

Furthermore, we are mindful of optimizing water filtration methods to conserve energy and reduce our environmental impact. By carefully selecting the appropriate grade of water purity required for our daily laboratory practices, such as utilizing reverse osmosis or ion exchange methods, we aim to minimize energy consumption and wastewater production associated with water purification processes.

These concerted efforts towards water conservation and efficiency contribute to our overarching goal of promoting sustainability in our chemical pathology laboratory. By adopting green lab practices and reducing our environmental footprint, we align with our commitment to responsible stewardship of environmental resources while maintaining the high standards of quality and efficiency expected in healthcare settings.

Enhancing Radiation Safety and Protection in Medical Practice - Go Green

Dr Shayan Anwar
Department of Radiology

Radiation safety is a paramount concern across various medical departments, encompassing radiology, interventional cardiology, and surgery. The utilization of fluoroscopic procedures contributes significantly to radiation exposure for both patients and medical personnel. While diagnostic imaging modalities like computed tomography, mammography, and nuclear imaging contribute minimally to cumulative dose exposures, any level of radiation exposure poses potential risks. Therefore, implementing effective radiation protection strategies becomes imperative to mitigate these risks and safeguard the well-being of both patients and healthcare workers.

Radiation Protection Principles:
Radiation protection primarily revolves around three fundamental principles: justification, optimization, and dose limitation. Justification entails a thorough evaluation of the benefits versus risks associated with utilizing radiation for medical procedures or treatments. It is essential for physicians and radiologic personnel to educate patients about the potential adverse effects of radiation exposure, ensuring informed decision-making. Adherence to the "As Low as Reasonably Achievable" (ALARA) principle is crucial, emphasizing the minimization of radiation exposure while acknowledging its indispensable role in medical diagnostics and therapy. The ALARA principle underscores the continuous endeavor to reduce radiation exposure to levels that are reasonably achievable without compromising clinical efficacy.

Understanding Radiation Science:
A comprehensive understanding of the scientific underpinnings of radiation's detrimental effects is essential in devising effective protection strategies. X-rays, composed of high-energy photons within the electromagnetic spectrum, possess the capability to ionize atoms and induce molecular damage, including DNA alterations. Radiation doses are quantified through parameters such as absorbed dose, equivalent dose, and effective dose, each crucial for interpreting dose recommendations and assessing potential health risks. Notably, exceeding recommended exposure thresholds can lead to deterministic effects, while stochastic effects, such as cancer development, manifest with a probability proportional to radiation exposure.

Addressing Concerns and Clinical Significance:
Biological effects of radiation exposure encompass both deterministic and stochastic effects, ranging from immediate tissue damage to long-term carcinogenesis. Minimizing exposure duration, optimizing distance from radiation sources, and employing physical shielding are pivotal in reducing radiation exposure. Innovative approaches include the judicious use of pulsed fluoroscopy, optimization of imaging techniques, and the implementation of lead shielding devices. Furthermore, dosimeters play a crucial role in monitoring cumulative radiation exposure among healthcare personnel, facilitating informed decision-making and promoting a culture of safety awareness.

Nuclear Medicine and Waste Management:
The advent of nuclear medicine has revolutionized diagnostic and therapeutic modalities, necessitating stringent protocols for radiation safety and waste management. From diagnostic PET scans to therapeutic brachytherapy, the medical application of radioactive materials requires meticulous oversight and adherence to regulatory guidelines. Proper disposal of radioactive waste, adherence to handling protocols, and ensuring secure storage are imperative to mitigate environmental and health risks associated with unplanned exposures.

Enhancing Healthcare Outcomes:
Education and protocol development are central to enhancing radiation safety practices across healthcare settings. Institutional radiation safety departments play a pivotal role in educating and enforcing protective measures, thereby fostering a culture of safety consciousness among healthcare professionals. Simple interventions, such as educational videos and protocol standardization, have demonstrated efficacy in optimizing radiation practices and reducing unnecessary exposure. By adhering to principles of justification, optimization, and dose limitation, healthcare providers can effectively mitigate radiation risks and optimize patient care outcomes.
Effective radiation safety and protection strategies are indispensable in modern medical practice, where ionizing radiation plays a pivotal role in diagnosis and therapy. By adhering to established principles, implementing innovative techniques, and fostering a culture of safety awareness, healthcare providers can minimize radiation risks and ensure optimal patient outcomes. Continued research, education, and protocol development are paramount to advancing radiation safety practices and mitigating potential health hazards associated with medical radiation exposure.

THE BEST OF THE PAST

#Pathologists #Followtheirlead #changeagents #greenlab

Interviewee: Dr. Lena Jafri
Interview Recorded by Dr Hafsa Majid

Dr. Lena Jafri is a faculty member in the Section of Chemical Pathology, a visionary leader and is renowned for her commitment to sustainable practices and innovation. Dr. Jafri has spearheaded numerous initiatives to transform traditional lab operations into eco-friendly, energy-efficient models. Her dedication to green lab practices has not only elevated the standards of environmental responsibility but also inspired positive change within the Dept. of Pathology and Lab Med. We asked her about her Green Lab Initiative and below are her responses.

What was your vision and goals for the green lab initiatives, and how do they align with our organization's overall mission?

Our vision for the Green Lab initiatives was to create a more sustainable and environmentally friendly environment within our Section of Chemical Pathology in the Department of Pathology and Lab Medicine. The goals included decluttering laboratory spaces, implementing practices for reusing materials, establishing recycling systems, and optimizing energy usage to reduce our carbon footprint. These initiatives align perfectly with our organization's overall mission of promoting responsible and ethical practices in healthcare. By adopting green lab practices, we not only contribute to environmental conservation but also demonstrate our commitment to delivering healthcare in a manner that prioritizes sustainability. Me and my Assistant Manager Ms. Rizwana Kausar attended the 2022 IFCC Conference in South Korea, representing Pakistan and learned about the Green Lab concept. This initiative, emphasizing decluttering, reusing, recycling, and energy saving, promoting sustainability in clinical labs. Inspired by AKU's successful green initiatives, we aimed to implement similar practices in our Chemical Pathology Section. Rizwana proposed a Green Lab project upon her return, which I eagerly embraced and spearheaded.

How did you motivate and engaged the team to embrace and sustain green practices in their daily activities?

We motivated and engaged the team by highlighting the benefits of green practices, such as cost savings and environmental impact reduction. Through regular communication, training sessions, and recognition of achievements, we instilled a sense of ownership and responsibility, fostering a culture of sustainability in their daily activities.

What have been the most significant challenges in implementation phase, how have you successfully addressed them, and how will you ensure their long-term sustainability and impact?

One of the most significant challenges during the implementation phase has been ensuring that our green lab practices align with existing regulatory requirements like CAP standards. This required careful adjustments and additional time and effort to ensure compliance while maintaining our sustainability goals. We are addressing this challenge by gradually investing in infrastructure upgrades and energy-efficient equipment, supported by collaboration among stakeholders and institutional backing. Another challenge has been the establishment of a Green procurement Policy, which is crucial for acquiring eco-friendly instruments and infrastructure for our lab setup. To overcome this, we have advocated for the development and implementation of such a policy within our institute. In terms of ensuring long-term sustainability and impact, ongoing efforts will focus on regular

monitoring and evaluation of our green lab initiatives. We will continue to education our technologists and faculty in the clinical lab about best green lab practices and seek institutional support to maintain momentum and drive further progress. Additionally, incorporating green practices into our standard operating procedures and training programs will help embed sustainability into our lab culture for the future.

What are your plans for the future of the green lab?

For future, incorporating sustainable eco-friendly lab practices into our long-term lab planning is imperative. The urgency of addressing sustainability goals stems from the recognition that our current lab practices, if left unchecked, can have detrimental consequences. Climate change, resource depletion, and pollution are among the pressing challenges Pakistan is facing. By adopting sustainable practices, we not only mitigate these challenges but also set an example for our peers and future generations. In response to the challenges faced during the implementation phase of our Green Lab initiatives, we have developed a comprehensive Green Lab checklist that can be effectively implemented. This checklist can serve as a practical guide to ensure that our lab practices align with sustainability goals while meeting regulatory requirements like CAP standards. The growing emphasis on sustainability in global healthcare, along with AKU's support for sustainable initiatives, signals a promising shift towards environmentally conscious decision-making and investment in sustainable solutions. Starting with a Green Team at the Section level, we are expanding efforts to the departmental level with support from our Chair. Establishing a Green Taskforce may represent the future direction for our department.

THE BEST OF THE PAST

#greenlab

Interviewee: Ms Rizwana Kausar
Interview Recorded by Dr Hafsa Majid

Ms. Rizwana Kausar, Assistant Manager, Clinical Chemistry, is a dynamic advocate for sustainability within laboratory settings, recognized for her exceptional contributions to promoting green initiatives. As a seasoned professional with expertise in lab management and operations, Ms. Kausar has played a pivotal role in implementing innovative strategies to minimize waste, conserve resources, and reduce the environmental footprint of laboratory facilities. We asked her about the Green Lab Initiative and below are her responses.

Can you describe your specific role in the green lab initiatives and highlight any particular pro jects you have led or contributed to significantly?

I co-lead the Green Lab project with Dr. Lena Jafri, the Section Head, aiming to reduce our carbon footprint by lowering energy usage, cutting waste generation, and conserving resources. Our initial focus was on fostering a culture of environmental awareness within the clinical chemistry section. Through small group discussions, laboratory professionals were educated on the environmental impact of their work and the importance of sustainable practices. This led to a shared understanding and commitment to environmental responsibility. Employees now actively promote green lab practices, demonstrating personal accountability and fostering a supportive environment for the project's success and continuity. A notable initiative of this project is

the reduction of paper usage. This effort began with identifying areas for improvement and implementing targeted solutions, such as transitioning to electronic reporting and conducting electronic reviews of Levey-Jennings charts of routine chemistry and immunoassay tests . By moving away from traditional paper-based methods, the project aimed to streamline processes, reduce waste, and lower our environmental impact. This transition not only improved efficiency but also demonstrated our commitment to sustainable practices in the clinical chemistry section.

How do you incorporate green practices into daily work routines, and can you provide an example of a successful green project you've implemented?

Incorporating green practices into daily work routines is crucial for sustainability. For example, we have implemented several initiatives to reduce our environmental impact in our daily operations including. Ensuring lights and instruments are switched off when not in use, wherever possible. Turning off fume hoods and closing sashes when not in use. Regularly organizing and defrosting freezers to improve energy efficiency. Promoting double-sided printing to minimize paper consumption. These efforts are not only aimed at reducing our carbon footprint but also at fostering a more sustainable work environment.

What are the challenges in adopting green practices, and how can overcome them to ensure the initiatives' success?

Adopting green practices often comes with challenges, but overcoming these obstacles is crucial for the success of sustainability initiatives. In Pakistan, there are no existing examples of Green Labs, so we have been actively researching and implementing various best practices ourselves. Since Green Labs is a voluntary initiative, finding the extra time and resources to educate ourselves on different green practices can be challenging. Ensuring that green practices comply with regulatory standards is also challenging. Some green technologies or practices may involve higher upfront costs, which can be a barrier, especially if there is limited budget allocation. Implementing new technologies or systems, such as energy-efficient equipment, may require technical expertise that is not readily available.

To overcome these challenges and ensure the success of green initiatives, several strategies can be employed: Having strong support from leadership and management is essential. Working with suppliers, stakeholders, and industry partners can provide access to expertise, resources, and support in adopting green practices. Regularly evaluating and adjusting green practices based on feedback and results ensures that initiatives remain effective and relevant.

How have the green lab initiatives impacted your professional development, and what valuable lessons have you learned from being involved in these projects?

Participating in green lab initiatives has significantly impacted my professional development. These initiatives have provided invaluable lessons in sustainability practices and highlighted their critical importance in daily operations. I've developed a deeper sense of environmental responsibility, understanding the significant impact our lab activities can have on the planet. This awareness has driven me to seek innovative solutions and adopt best practices to reduce our environmental footprint while maintaining operational efficiency.
A key lesson I've learned is the value of continuous improvement and process optimization. These initiatives have shown me how small changes in our laboratory procedures and equipment usage can lead to significant reductions in waste and energy consumption. This focus on improvement has not only enhanced the sustainability of our lab operations but has also sharpened my problem-solving skills and ability to innovate. Green lab initiatives has not only contributed to my professional growth but has also aligned my career with a greater purpose: promoting environmental sustainability. I now feel a strong sense of responsibility to advocate for sustainable practices

within the laboratory and educate my colleagues on the benefits of these practices. This experience has enriched my professional life and empowered me to make a meaningful impact in my field while contributing to a more sustainable future.

HAPPENINGS IN PATHOLOGY

Artificial Intelligence: A Canvas for Healthcare Transformation

Drs. Lena Jafri and Shanzay Rehman
Clinical Chemistry

The healthcare landscape is continuously disrupted by innovations targeting medical technology, delivery models, and pharmaceutical breakthroughs, aimed at enhancing patient care, improving clinical outcomes, and embracing technological advancements. Examples include robotic-assisted surgery, personalized medicine, telemedicine, and the integration of Artificial Intelligence (AI).

AI is revolutionizing medical education, necessitating the development of new skills among healthcare professionals. Effective change management is essential for hospitals to navigate these shifts and integrate advancements into clinical service and research. Establishing a structured action plan enables smooth transitions, ultimately enhancing healthcare delivery and patient outcomes. Our main objective was to develop a framework for integrating Artificial intelligence (AI) into medical education, research, and in-service practices. Our plan was formulated in three phases. For phase 1 and 2 we conducted need assessment interviews and hosted a workshop based on the SWITCH: Elephant, Rider, and Path model.
For phase 3 of our study we hosted a workshop on 26th April 2024. The primary aim of our workshop was to finalize and review an action plan for integrating AI into health care practice using the data from phases 1 and 2. However we approached this workshop with a unique perspective. Instead of using traditional methods, we provided the participants with canvases and paints and asked them to paint their views on AI into health care. This activity not only fostered a creative environment, by allowing participants to openly share their ideas but also underscored a profound perspective that

Picture 1: Small Group Discussions while reviewing the action plan

no matter how advanced technology may be it cannot replace the power of the human mind and human imagination. Participants provided a diverse range of interpretations ranging from vibrant and optimistic ones, depicting the positives of AI to more ominous ones reflecting their fears and uncertainties about this emerging technology. Additionally the participants also expressed the multilayered relationship between lab data and AI adding further depth to the discussions.

Our second activity consisted of the gallery walk aimed at explaining the concept of the SWITCH frame work more thoroughly. Three boards were set up representing the rider (analytical aspect), the elephant (emotional aspect) and the path (the external aspect). Each board contained a list of challenges, experiences and future insights on how AI can be incorporated into health care by focusing on the analytical, emotional and external changes. The participants were tasked with walking around each group and deciding if each element belonged to its respective group. This activity helped the participants in grasping the SWITCH model and also facilitated the sharing of ideas.

For our last activity the participants were then divided into three groups each group representing the rider, the elephant and path. The document was

divided into three sections and all groups were assigned a separate section to review. This activity allowed groups to closely work on each section of the document. Once completed, the finalized document was then shared with the participants and further changes were incorporated. Overall, our workshop provided a platform for insightful discussions and artistic expressions, offering valuable perspectives on the complex relationship between AI and healthcare. It also brought together professionals from different fields of health care fostering interdisciplinary collaborations and unique sharing of ideas. By the end of the workshop successfully achieved our goal on reviewing and finalizing the action plan, ending the workshop on a positive note.

Picture 2: Participants of the workshop holding their completed paintings

Empowering Sustainability: The Green Assembly

Farhat Jahan
Clinical Chemistry

We held a Green Assembly at the section of Chemical Pathology on June 5, 2024, in line with the World Environment Day to promote sustainability and environmental stewardship. The assembly's mission was to involve all staff in activities emphasizing the crucial role of a Green Lab, fostering a strong sense of unity and recognize our Green Guardians.
Dr. Erum Khan, Chairperson of Pathology and Laboratory Medicine, emphasized the urgent need for adopting greener practices, both on an individual level and collectively as a department, to ensure a sustainable future. The Green Lab team members shared their experiences of Green initiatives taken to reduce the carbon footprint of the lab, including moving towards e-reporting, energy saving through optimizing energy consumption by instruments, and waste segregation to improve waste disposal. Each member spoke for one minute, highlighting the importance and environmental impact of these Green Lab initiatives, such as online reporting, double-sided printing, online quality control review process, online assessments, segregation of hazardous and non-hazardous waste, safe chemical disposal, and energy-saving measures of shutting down small equipment during off-hours, properly closing fume hoods, and regularly cleaning and defrosting freezers/ refrigerators and use of energy-efficient lights.

Picture 1: Ms Rizwana sharing the Green Laboratory Initiatives taken by Clinical Chemistry.

Following this, Ms Rizwana shared the areas where green Lab initiative have been taken, such as water management, energy management, waste management, and chemical management (Picture 1). To make the event more engaging, a quiz on the Green Lab and environmental issues was held. Staff who answered correctly received beautiful table plants. Additionally, small plants were awarded to staff members who chose stairs over the lift and to active participants in the Green Lab initiatives. The assembly concluded with the national anthem and a group photo (Picture 2), marking the end of this wonderful and inspiring event (Picture 3).

Picture 2: Group Picture of the Green Assembly Participants.

Picture 3: The Green Assembly at Clinical Chemistry

Polaroid

Chemical Pathology

To promote sustainability and reduce environmental impact, the chemistry department has undertaken several initiatives within its laboratory operations. By digitizing Levey Jennings graph reviews, they've eliminated paper usage, aligning with broader goals of resource conservation. Moreover, the implementation of energy-saving measures like closing fume hood sashes and switching off equipment when idle has led to significant reductions in energy consumption, thereby curbing carbon emissions. Encouraging the use of stairs over elevators not only saves energy but also fosters physical activity, promoting both individual well-being and environmental responsibility.

Hematology

Picture 1: A Hematology technologist is performing manual staining of slides which involves a washing step, requiring excessive usage of water. This excessive usage of water has reduced in our lab, by switching to automated staining.

Picture 2: A donor attendant is giving hard copy of screening report to a Blood Donor. By giving negative screening report in soft copy format will reduce the paper usage.

Histopathology

Picture 1: The current method of grossing on Dragon software with speech recognition technology

Picture 2: The previous method of grossing on recorders.

Microbiology

Picture 1 : Segregation of waste material in microbiology labpratory: paper waste and Laboratorey waste.

Picture 2: Digitalization of data entry of specimens

Molecular Pathology

Picture 1: Shows the entire team of molecular biologists who are participants in the GreenLab laboratory.

Radiology

Aga Khan University Hospital representation in 8th Annual body imaging Radiological Society of Pakistan conference, held at Allied Hospital Faisalabad, on April 20th and 21st , 2024

Certificate course in breast imaging for radiologist across Pakistan Pictures from hands on sessions conducted in Peshawar and Lahore

TEST IN FOCUS

Heat Stroke Health Screening Panel

hospitals.aku.edu/Karachi/clinical-laboratories