Opinion Paper

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Imperative: reducing the environmental impact of clinical laboratories

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Abstract: Clinical laboratories are significant contributors to the environmental burden of the planet. They have been slow to address the issues with a few exceptions, but it is highly encouraging to see the current impetus and ambition in this direction. This paper describes some of these initiatives and provides the rationale as to why clinical laboratories should become sustainable. It also describes the economic and intangible benefits that labs will accrue in achieving sustainability.

Keywords: action taken; benefits; environmental management systems (EMS); green labs; ISO14001; laboratory sustainability; need.

Background

All human activity impacts the environment. Environmental factors contribute to climate change and consequently are the root cause of a significant burden of morbidity and mortality, particularly in developing countries. The resulting impact is estimated to cause about 25% of death and disease globally, reaching nearly 35% in regions such as sub-Saharan Africa. Children under five years of age seem to bear the largest environmental burden [1]. All individuals and organizations, including laboratories, have a societal obligation to do their part to alleviate the harm they do to the environment.

The key environmental consequence of human activity and especially energy usage is global warming, for which the scientific evidence is overwhelming. It results in the rise of sea levels, and changes in the ecology and disease patterns. They also involve, *inter alia*, the loss of irreplaceable resources, a reduction of biodiversity with species extinction, atmospheric pollution, the increased consumption of energy and water, and production of heat, the ever-increasing production of waste and resultant contamination of sites by runoff or landfill and the sea [2].

Laboratories contribute to these problems and, in addition, are also significant users of chemicals and single-use plastics. Yet, few clinical laboratories are aware of this or have plans in place to address this situation and become sustainable. Though some guidance was provided some 10 years ago [3] we believe it was barely noticed and mostly unused [4]. This is despite the fact that if unconscious consumption and waste production can be significantly reduced, it can lead to actual cost savings as well as an improved environmental footprint.

Organisational action taken thus far

Sustainability in the clinical laboratory is becoming a main-stream topic in the United Kingdom (UK). The UK health service procurement agency asks for net zero suppliers and the UK Sustainable Healthcare Coalition (https://sustainablehealthcare.org.uk/) verifies targets for net zero. In addition to the European Green Deal, the new Health and Care Act 2022 came into effect in England from 1 July 2022. This requires the National Health Service (NHS) to consider climate change when making decisions. The legislation states that NHS organisations will have to consider and comply with the UK's Climate Change Act 2008, should aim to meet greenhouse gas emission targets, and comply with the Environment Act 2021, which includes targets for improving the natural environment, including air quality. The NHS must also "adapt to any current or predicted impacts of climate change" [5].

In Europe, the EU (European Union) Eco-Management and Audit Scheme (EMAS) [6] helps organizations including laboratories to evaluate, report, and improve

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continuously their environmental performance, and the non-governmental organisation, Healthcare without Harm (https://noharm.org/) is producing a sustainable product index.

In the United States, several major health systems are moving in the right direction with setting decarbonisation goals; examples include Kaiser Permanente, a major U.S. non-profit health system who is aiming to become carbon net positive and the University of California Health System and Cleveland Clinic who aim to become carbon neutral by 2025, and 2027 respectively.

Other examples from around the globe include several Canadian health systems which are committed to carbon neutrality; more than 175 hospitals in Argentina, Brazil, Chile, Colombia, and Costa Rica, working towards carbon reduction, 100% renewable electricity targets in Africa including the UNDP's Solar for Health Program in Zimbabwe and in South Africa, Netcare, which has ambitions to reduce carbon emissions by over 35% by the year 2023 [7].

In addition, the larger healthcare based green organisations like Global Green and Healthy Hospitals have been steadily increasing their memberships from 55 to 72 countries in the last four years (https://greenhospitals.org/gghh-connect). My Green Lab has been (https://www.mygreenlab.org/) dedicated to laboratories and laboratory suppliers; they are unique in their ACT (for accountability, consistency, and transparency) labelling for manufacturers. ACT reflects green practice in manufacturing, energy and water use, packaging, and end-of-life aspects of their products. Politically they have raised the profile of laboratory science by being involved as a panellist at COP26 in Glasgow, UK. While they do lean more towards the pharmaceutical industry and university laboratories than the clinical sector, many of their recommendations hold true for the clinical laboratory [8].

The Centres for Sustainable Healthcare has a network specific for the laboratory "Clinical Labs Susnet." This is an online sustainability networking space for clinical laboratory professionals, the *in vitro* diagnostics industry, educators, and students across biomedical and healthcare science disciplines. It is a space for like-minded individuals with a passion for sustainability to collaborate, share ideas, resources and to embed sustainable practice into pathology and associated healthcare laboratories [9].

Many hospitals have developed their sustainability policies, and these have been refined over time. In one previous version of an Environmental Management System (EMS) document of the Nottinghamshire Healthcare NHS Foundation Trust (UK), it was stated that, "All Department Managers have responsibility to: Ensure all the staff in the area are aware of and follow the guidance and procedures related to energy conservation, waste segregation, and any other environment-related activity." The latest policy states that, "All staff have a responsibility to consider environmental, social and economic issues when making both short and long-term decisions." This is a noticeably clear but subtle change in accountability, which makes the plan more personal and more likely to succeed [10].

Despite these efforts and though laboratories are resource intensive, it is our view that there has not been a concerted approach towards sustainability. The only way to gain real traction on sustainability is to campaign for change and to educate laboratories about the environmental benefits and its cost-effectiveness to effect a change in mind-set. For example, it may not always be easy to convince those requesting tests that some of their requests are unnecessary. Communications are a hurdle to overcome too, as many parties are involved in the endeavour. Persistence is the key. Once a system for sustainability is in place, people tend to follow and implement it. An article by Seifert [11], lists seven main reasons why EMAS schemes fail but these are applicable to any change management strategy around sustainability. The top three reasons were lack of knowledge of environmental audit, cost of time and the ability to motivate staff and keeping them motivated.

Environmental standards

The ISO 14000 family of standards seeks to promote effective environmental management systems in organizations. There have been early adopters of ISO14001. One of them was the Institute Pasteur, which achieved ISO status in 2011 and became EMAS accredited in 2013 [12]. However, these have been exceptions rather than the rule. The ISO 14000 family includes most notably the ISO 14001 voluntary standard, which represents the core set of standards used by organizations for designing and implementing an effective environmental management system (EMS). The current version is ISO 14001:2015. The new version of ISO 14001 focuses on the improvement of environmental performance rather than the improvement of the management system itself. One of the main updates asks organizations to consider environmental impact during the entire life cycle [13].

What is important is to understand is that ISO14001 is the guiding principle of the EMAS system with the requirements set out in the EN ISO 14001:2004 Standard constituting the basis of the EMS requirements. Organisations registered in the EMAS are required to address and that have a direct link to a number of elements of the EN ISO 14001:2004 Standard. The ISO has since released a subsequent version of the International Standard ISO 14001. The second edition of the standard

(EN ISO 14001:2004) has been replaced by the third edition (ISO 14001:2015) and EMAS has consequently been updated [14].

Recently, the EFLM launched "EFLM Guidelines for Green and Sustainable Medical Laboratories" in August 2022. This guide and checklist is a manual and is accompanied by a self-assessment checklist for any clinical laboratory to embark on their green journey.

Benefits of going green

Is it possible for a clinical laboratory to be sustainable, implement a green plan and be at a minimum cost neutral? Sustainable laboratories can be economically beneficial. In 2019, Gruson made a statement "I believe we can achieve significant cost savings – as high as 40–70% of waste disposal outlays, representing €3.5–6 billion in savings for the health industry" [15]. It has been estimated that most of the existing laboratories can reduce their energy consumption by 30–50% using existing technology, which is significant given their annual energy costs in the USA alone amounts to one to two billion US dollars [16]. In 2019 Ross et al. [17] published results from an ISO14001 study in an Australian laboratory have described how they were able to generate over AUD800,000 (approximately USD500,000) in savings through their implementation of ISO14001. Notable savings were made by moving to double sided printing, introducing PDF reports, the use of LED and movement-sensors lights, turning off equipment when not in use and air-conditioning switched on during out of hours only for rooms that are in use. This realised paper savings of A$142,401, postage savings of A$715,108 and energy savings of A$73,849. The overall costs of implementation were A$137,604.36 and savings costs of A$939,868.68 leading to an overall savings of A$802,264.22. This study shows that becoming green is not only ethically and socially correct but also has the potential to be self-funding and cost beneficial.

Besides the economic benefits, there are several other intangible benefits which can be identified. Going green enhances a laboratory's brand and image with its customers, suppliers and other stakeholders. It sends out the message that the laboratory takes seriously its responsibilities to the society it serves.

The improvement of our environment has become an issue of increasing political importance. We should anticipate more legislation at local government, national and regional levels and subsequent changes in local policy in response to this legislation. Going green voluntarily, will pre-empt these changes in legislations and prepare the laboratory to be better placed when they are eventually enforced. Future laboratory accreditation is expected to acknowledge an organisation's responsibility to improving environmental practice. The forthcoming changes to the International Standard ISO:15189 are a prime example of this, demonstrating how service improvement will be expected to consider sustainable and climate conscious practices.

Many laboratories are using successful engagement in green activities as a source for commercial marketing. Many see going green as a status symbol. Education for Sustainable Development is becoming a fundamental part of undergraduate education and the workforce of tomorrow will be joining with preconceived expectations of working more sustainably. The current workforce are also now realising a 'sustainable practice' responsibility and the laboratory workplaces need to respond to this. Going green, will not only lift the morale of current staff members, but will make the workplace more attractive to young job applicants who are entering employment, more socially conscious about good environmental practices. Furthermore, the newly implemented sustainability champion roles found within the healthcare setting, offers an opportunity for the laboratory scientist to become more visible within their organisation, offering an opportunity for professional development and raising the profile of the profession.

The implementation of greener practice will not only benefit the environment and the laboratory budget but will subsequently provide opportunities for professional development and help towards minimising the detrimental global health implications which are resulting from the current climate emergency [18].

Conclusions

The last 10 years has seen substantial social awareness of the need for a sustainable future with ever increasing global, regional, country, and local initiatives. The clinical laboratory has been slow to adapt to this change and the impetus for it had not been seen in most laboratories until recently. Now, the proliferation in activity has been commendable across the spectrum from individual laboratories, manufacturers, and professional bodies. There is much to do. The momentum and tools are available, and the vision for a carbon zero future is a common goal.

It will be important that there are forums where best practices can be shared, advice on setting up environmental management systems can be given and, importantly, the methodology and evidence to build a business

case to implement sustainable systems such as ISO14001 is available.

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