# Evolutionary Study of Environmental Culture and Medical Waste Regulation in Healthcare Law

Tareck Alsamara[1], Farouk Ghazi[2]

[1]Prince Sultan University, Saudi Arabia. Email: tareck.samara@gmail.com
[2]Badji Mokhtar Annaba University, Algeria. Email: ghazifarouk1@gmail.com

## Abstract

African countries have shown increasing interest in environmental considerations in medical law. The article examines issues of Evolutionary Study of Environmental Culture and Medical Waste Regulation in Healthcare Law. The study shows how healthcare institutions and society have developed a sense of responsibility towards the environment, particularly in managing healthcare waste, and the cultural shifts towards sustainable practices. The article uses the analytical approach to analyze legal texts in international law and national laws. The article also relies on the comparative approach in comparing the national laws of countries. The article focuses more specifically on approaches to the management of medical waste in National laws, and identifies the three categories defined by legislations which are: waste consisting of human organs, infectious waste, and toxic waste. The article includes a comparison of the approach taken by national laws, since it was decided in countries to have provisions relating to technical requirements for each special category of waste (human, infectious, and toxic). In general, there are technical conditions, including the color of the bag and container that is used to collect it, where it was decided to use the color of green for waste consisting of bodily organs, the color of yellow for the collection of infectious waste and the color red for toxic waste. After examining and comparing the laws, the study shows the following results: national laws realize the importance of the legal definition and regulation of various kinds of medical waste. All legal systems place the responsibility for the removal of medical waste on its producer, and the producer bears the financial cost of disposal.

**Keywords:** Public health, Healthcare law, Medical Waste Regulation, Environmental Law.

International law is concerned with waste, as evidenced by the 1989 Basel Convention on the Control of Transboundary Movement of Hazardous Waste and its Disposal, and a 1999 Protocol supported by the Convention on Liability and Compensation for Damage Resulting from Transboundary Movement of Hazardous Waste and Disposal (Alter, 1997). The Convention is the first international agreement concerned with the issue of hazardous waste. The main objective of the Convention is to protect human health and the environment from the harmful effects of hazardous waste (Korcheva, 2021, Albakjaji, 2022, Mahmood et al , 2022). All States have joined the Basel Convention on the Control of Trans- boundary Movements of Hazardous Wastes and their Disposal. As the agreement expressly declared,

the state's party to it are resolved to protect human health and the environment, through strict control, from the adverse effects that may result from the generation and management of hazardous waste. The philosophy of waste management appears in Algeria law under the provisions of Law No. 01-19 of December 12, 2001, relating to waste management, control, and removal. These provisions are based on specific principles. These principles relate to reducing waste production at its source, as well as organizing waste sorting, collection, transportation, and treatment; the need to value waste by reuse; rational environmental treatment of waste; and the need to inform and sensitize citizens to the dangers arising from waste and its effects on public health. The similar Tunisian approach to waste management appears in Decree No. 1985-56 dated January 2, 1985, relating to the regulation of waste disposal into the ocean.

Medical waste is the waste generated by healthcare institutions such as hospitals and medical laboratories (Lee and Huffman, 1996). The article deals with the management of medical waste under Algerian and Tunisian legislation, focusing on the way both countries have taken public health care into consideration when it comes to medical waste. Interest in the issue of the legal framework for medical waste is increasing, because it has an impact on the efficacy of its management system. Also, the Covid-19 pandemic has demonstrated the importance of the medical waste management system and its role in limiting the spread of the pandemic (Farouk and Alsamara, 2023). The pandemic has also affected medical waste management systems, as pressure has increased on workers in the field of medical waste treatment (Garlasco et al, 2022). It is important to note that medical waste requires vigilance within health institutions, as legislation plays a key role in raising awareness of the importance of zero tolerance when dealing with medical waste (Alsamara et al, 2022, Dhali, 2022).

Literature review:

At the level of previous studies, mention should be made of the study (Manyele and Anicetus), which was entitled: "Management of medical waste in Tanzania hospitals", where the authors successfully tested the health waste management system, but their study concerned only Tanzania. Ökten and others also put forward some bright ideas in their article: "A comparative economic analysis for medical waste treatment options", where they put forward the economic dimensions of managing medical waste, but their article focused only on the economic rather than the legal aspects. In addition, Singh and others succeeded in accurately pointing out the challenges facing countries concerning medical waste, according to their article entitled: "Medical waste, current challenges and future opportunities for sustainable management." This study focused on countries with economies in transition. We can add a study written by (Alzghoul et al) entitled: "Solid medical waste management stations practices and awareness in COVID-19 screening," an article that focused on the period of the Covid-19 pandemic. Liap and others addressed the same topic in their article: "Medical Waste Management during the COVID-19 Pandemic". Some studies dealt with the issue of waste management in Algeria. Among them our study mentions an article published by (Bendjoudi et al) entitled: "Healthcare waste management in Algeria and Mostaganem department", but this study focused on one Algerian city and was not a general evaluation of the Algerian approach to the management of medical waste. It is necessary to refer to the AISSAOUI study entitled: "The management of hospital waste in Algeria", which is a comprehensive study of the Algerian approach to the field of medical waste, but it focused on the economic dimensions of the subject. It is also necessary to refer to the study of Sefouhi and others entitled: "The risk assessment for the healthcare waste in the hospital of Batna city." This study dealt with the

issue of medical waste in the Algerian city of Batna and was not a broad national study.

Our current study focuses on Legal frameworks that govern the disposal and management of medical waste, highlighting how regulations have adapted to emerging environmental challenges and technological advancements.

## Method

This article employs an inductive approach to identify the key elements of the topic within the context of relevant international agreements and laws in the countries under study. Additionally, it adopts an analytical approach to examine the legal provisions in this field, alongside a comparative approach by juxtaposing the legal texts governing medical waste management across the selected nations.

## Results and discussion

3.1 The dual nature of medical waste


Figure 1: Special waste

Special waste is defined as all waste resulting from industrial, agricultural, medical, and service activities and all other activities that by their nature and the components of the materials they contain cannot be collected and transported under the same conditions with household waste. As for special hazardous wastes, they are all special wastes that, due to their components and the toxic properties they contain, can harm public health and the environment. We must point out that waste from therapeutic activities is defined as: all waste resulting from examination, follow-up, and preventive or curative treatment in the field of human and veterinary medicine (Article 3 of Law 19-01). It appears from the above that the Algerian law gives medical waste two characteristics at the same time. It considers it special waste as well as special hazardous waste. Thus, the Algerian legislation is following the provisions of the Basel Convention, which considered medical waste as hazardous waste. Whereas, Annex I of the Basel Convention considered medical waste as a waste that must be controlled (Choksi, 2001).

Waste from therapeutic activities is issued by all therapeutic bodies, regardless of the legal systems that are applied to them, which include specialized hospital institutions, university hospital centers, multi-service clinics, clinics, basic treatment units, medical clinics and dental surgery clinics, as well as analytical laboratories. (Article 2 of Executive Decree No. 03-478). Contrary to Tunisian legislation, which does not consider all medical waste to be hazardous waste, it is noted that Article 3 of Ordinance No. 2745 distinguished between hazardous medical waste and non-hazardous medical waste. It is important to note that medical waste in Algerian law is divided into three categories, namely, waste consisting of bodily organs, infectious waste, and toxic waste. Tunisian legislation defines waste resulting from health activities, all waste of production, transformation or use of materials or products in health institutions, and in general everything that is disposed of or intended to be disposed of. Waste resulting from diagnostic, follow-up, preventive, curative or palliative activities in the field of human medicine. (Ordinance No. 2745 of 2008 dated July 28, 2008, relating to fixing the conditions and methods of disposal of waste from health activities). The Tunisian legislator adds that the wastes of hazardous health activities are biological, chemical, inflammable and explosive

waste, putrefactive, and cutting and puncture waste.

3.2 Obligations of health institutions towards medical waste

The first obligation of health institutions under Algerian law is not to mix medical waste with other waste (Article 17 of Law 01-19). The same approach was taken by the Tunisian legislation through Article 4 of Ordinance No. 2745. In addition, medical waste is not subject to appraisal and reuse, which is evident in Article 11 of the Waste Law, which stipulates that the valuation process does not endanger human and animal health. With this ban, the Algerian legislator aims to avoid the illegal practices that have emerged in some countries. As the recycling of medical waste is not acceptable due to the risks to public health, however, some countries are witnessing disturbing and illegal practices (Patwary et al, 2011). It is important to note that the prescribed penalties give force to the provisions of Algerian law in the field of medical waste management. As the combination of medical waste with household waste constitutes a crime under Algerian legislation, whoever does not respect the principle of separation between medical waste and household waste is punishable by two years' imprisonment.

3.3 Obligations for medical waste consisting of Human organs

Algerian law paid special attention to medical waste consisting of human organs. This is described as waste consisting of human organs, all waste consisting of bodily organs, and waste resulting from human abduction operations resulting from surgical operating rooms and birth rooms. Waste consisting of organs must be collected in green plastic bags and the bags may be used only once. (Articles 5 and 6 of Executive Decree No. 03-478). Waste consisting of bodily organs means members and limbs or parts of organs or limbs, as well as every organ cut from the general every tissue from a human source obtained during treatment activities. (Article 3 of a joint ministerial decision between the Minister of Urban Development and the Environment, the Minister of Health, Population and Hospital Reform, and the Minister of Religious Affairs dated April 4, 2011, specifies the methods of treating waste consisting of bodily organs).

It is noted that Tunisian legislation does not include a legal text on waste consisting of human organs. Referring to the Official Journal of the Republic of Tunisia, we do not find a legal text relating to the management of waste consisting of human organs. This does not mean that it is not subject to the law, but rather general provisions relating to the management of medical waste apply to it.

Furthermore, producers of waste composed of human organs who are unable to treat the waste composed of bodily organs that they produce must conclude an agreement with a health institution that possesses the required facilities and facilities for the treatment of waste composed of bodily organs. (Article 4 of the common decision of April 4, 2011). Thus, the responsibility for removing medical waste that consists of human organs rests with the producers or possessors of bodily waste, every hospital body, and every education or research center that uses tissues composed of human organs. This is the same approach taken by the Tunisian legislators under Article 7 of Ordinance 2745. Legislation in the two countries is affected by “the polluter pays” principle, which states that the one who produces the waste bears the financial cost of removing it, and this shows the impact of environmental laws on the rest of the laws (Schmidtchen et al, 2021, Alsamara et al, 2022).

3.4 Managing the process of removing waste formed from human organs:

The process of disposal of waste formed from human organs passes through several stages that require technical precautions to maintain public health. The disposal process begins with the collection stage, where the green color is used in plastic bags designated for pre-collection of waste consisting of bodily organs, and they must be thick. The waste of pre-collection is

collected in a solid packaging that is closed in a tight manner and bearing the full phrase "waste consisting of bodily organs" (Articles 5 and 6 of the common decision of April 4, 2011). Then comes the stage of sterilization and disinfection, where the waste formed from the bodily organs is treated through the process of removing the infection by adding chemicals aimed at ensuring that the waste formed from the bodily organs is not harmed (Article 8 of the common decision of April 4, 2011). Then the waste moves to the storage stage, where the waste consisting of the bodily organs can be stored by freezing for a maximum period of four weeks. The place of freezing used to store waste consisting of bodily organs shall be specially designed and specified for this purpose. Freezing places must be equipped with ventilation and lighting, isolated from weather and heat fluctuations, and provided with water and sewage channels, and they must be organized and disinfected after each removal (Articles 10 and 11 of the common decision dated April 4, 2011). These are the same arrangements that the Tunisian legislators decided on the necessity of Articles 9-18 of Ordinance 2745. In the end, waste is buried in both legal systems.

3.5 Obligations related to infectious and toxic medical waste:

The Algerian law recognizes infectious waste and toxic waste, and decided on a different path than that required for the disposing of waste consisting of human organs. Infectious waste is defined as: Waste that contains fine particles or their toxicity that may harm human health" (Article 7 of Executive Decree No. 03-478). Toxic waste is defined as: "wastes, residues and expired materials of pharmaceutical, chemical, laboratory, and waste containing high concentrations of heavy metals, acids, used oils and solvents" (Article 10 of Executive Decree No. 03-478). ). Infectious wastes, whether cutting, prickly or abrasive, shall be placed before their prior collection in the bags prepared for this purpose in solid containers, resistant to penetration, or equipped with a sealing system that does not leak chlorine when incinerated, and contains an appropriate disinfectant. Infectious waste should be pre-collected in yellow plastic bags of at least 1.0 mm thickness that may be used only once, resistant, and free of chlorine when incinerated. (Articles 8 and 9 of Executive Decree No. 03-478). As for toxic waste, it must be collected in advance in red, single-use bags that are resistant and solid and do not leak chlorine gas when incinerated. Toxic waste must be sorted, packaged, and labeled under the same conditions applicable to special waste of the same nature, in accordance with the applicable regulation (Articles 11 and 12 of Executive Decree No. 03-478).

The Algerian law adds that the containers must be the same color as the bags in the pre-collection stage, and bear a badge indicating the nature of the waste in a way that is easy to read. After it is filled, it must be transferred to the place of collection to raise it for treatment. It is mandatory that containers used in the collection and transportation of wastes from therapeutic activities must be cleaned and disinfected after each use (Articles 16 and 17 of Executive Decree No. 03-478). Collection places shall be designated only for the deposit of waste from therapeutic activities. The places must have ventilation and lighting, be safe from weather and heat fluctuations, and be provided with water and an outlet for dirty water, and they should be cleaned after each waste removal process and purified periodically. The gathering places must be closed and guarded to prevent the entry of any unauthorized person, and a clear sign should be placed on the door indicating the use of the place. The period of storage of wastes from therapeutic activities in collection places, before being lifted for treatment, should not exceed 24 hours for health institutions that own an incinerator, and forty-eight hours for health institutions that do not have an incinerator (Articles 18-21 of Executive Decree No. 03-478).

Users assigned to pre-collect, transport, and treat wastes from therapeutic activities when handling such wastes shall be provided with

individual protective equipment that is resistant to punctures and wounds. They should be informed of the risks arising from waste handling and training in appropriate methods for handling this waste (Article 29 of Executive Decree No. 03-478). Incineration is a preferred method of destroying biomedical waste, and incineration consists of ashing by combustion at more than 800°C, eliminating microorganisms, and eliminating the risk of infection (Guévart et al, 2002, Alsamara et al, 2022 ).

It is important to note that dealing with waste formed from animal organs resulting from veterinary activities is the same as treating infectious waste. In Tunisia, there are not many details about how to dispose of hazardous health waste, because Article 15 of Ordinance 2745 decided that the removal of such waste should be in accordance with internationally recognized arrangements and methods, without giving more details on the subject.

Penalties for mismanagement of medical waste

The Algerian and Tunisian legislations detailed the penalties for mismanagement of medical waste. Table No. (1) Shows the penalties in the Algerian and Tunisian legislations. The penalties in the two legislations appear to be similar. Minor differences are noted. Moreover, criminal lawsuit related to these violations is practiced before the criminal judiciary, as the police have the right to prosecute the accused and transfer them to the criminal courts, the police work under the control of the public prosecutor. In Algerian legislation, only individuals are punished, while fines can be imposed on legal persons in Tunisian legislation.

Table N 01 Prepared by the authors, based on Algerian legislation (Law No. 01-19), and Tunisian legislation (Law No. 41 of 1996).

| Countries | Algerian law | Tunisian law |
|---|---|---|
| Mismanagement of special hazardous waste | Imprisonment : 1 to 3 years<br>Fine : 600,000 to 900,000 (DZD) | Imprisonment : 2 months to 2 years<br>Fine: 100 (TND) to 50000 (TND) |
| Import of special hazardous waste | Imprisonment : 5 to 8 years<br>Fine : 1000000 (DZD) to 5000000 (DZD) | Imprisonment : 1 month to 5 years<br>Fine : 10000 (TND) to 500000 (TND) |
| Failure to provide information about special hazardous waste | Fine : 50,000 (DZD) to 100,000 (DZD) | Imprisonment : 2 months to 2 years<br>Fine : 100 (TND) to 50000 (TND) |
| The use of chemical packaging materials in the food industry | Imprisonment : 2 months to 1 year<br>Fine : 10,000 (DZD) to 50,000 (DZD) | Imprisonment : 2 months to 2 years<br>Fine : 100 (TND) to 50000 (TND) |
| Mixing special hazardous waste with other waste | Imprisonment: 3 months to 2 years<br>Fine: 300,000 (DZD) to 500,000 (DZD) | Imprisonment : 2 months to 2 years<br>Fine : 100 (TND) to 50000 (TND) |

## Conclusions:

Environmental considerations represent one apparent area of acculturation between branches of law, as represented by the influence of environmental law on health law. Furthermore, the study shows the acculturation between environmental law and medical law, as the legal measures included in international law and national laws originate from environmental law. The role of legislation in balancing public health priorities with environmental protection, ensuring that medical waste disposal does not harm ecosystems or public health. Finally This acculturation points to a growing recognition that health and environmental well-being are deeply interconnected, and thus, both areas of law must collaborate to achieve holistic regulatory frameworks.

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