The Environmental Impact and Potential Human Health Effects of Cremation

Definitions

Cremation is the process whereby human remains are reduced through mechanical, thermal, or other means of dissolution.[1] The literal translation of the Latin root *cremare* is "to burn by fire."[2] Cremation uses flame and heat to reduce remains to bone fragments which are then pulverized in a cremator to the consistency of ashes.

This definition is often stretched to include alkaline hydrolysis, often called hydro, water, flameless, or bio cremation, a newer and more limitedly available process that reduces human remains through a water-based dissolution process that uses alkaline chemicals, heat, agitation, and pressure.

Cremation

Cremation results in toxic emissions including persistent pollutants such as volatile organic compounds (VOCs), particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NOx), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/DFs), co-planar polychlorinated biphenyls (co-PCBs), and heavy metals.[3,4,5]

Many of these toxins can bioaccumulate in humans, including mercury.[3,6] Cremation causes release of mercury (often from dental amalgams, but also from general bioaccumulation in the body) into the environment both in areas close to the source and into the atmosphere.[3,5,7] Cremation also requires a significant amount of fuel, and results in millions of tons of carbon dioxide (CO_2) emissions each year.[8]

There are concerns for crematory workers as well, who may be exposed to nuclear medicine treatments (chemotherapeutics/radiation), orthopedic (implants) and pacemaker explosions, and nanoparticles.[9,10,11]

Pulverized remains, often referred to as ashes, from alkaline hydrolysis (l) and flame cremation (r) Photo courtesy of Melissa Unfred, The Modern Mortician

Emission concentrations of harmful air pollutants from cremators can be affected by several factors, including fuel type, cremator type, flue gas post-treatment system, filters, dust collectors, and operational maintenance.[4,12]

Environmental regulations requiring scrubbing and filtering systems help to burn and neutralize pollutants like the mercury emissions, particulate matter, and nitrous oxide, however, these filters fail to

neutralize the carbon dioxide generated during cremation.[8]

Other ways to reduce cremation-related emissions include clean energy conversion of fuel types, control over content of hazardous components in burial objects, and combustion optimization.[4]

Alkaline Hydrolysis

Alkaline hydrolysis may be a slightly less environmentally impactful method of cremation compared to traditional, flame-based cremation. Alkaline hydrolysis requires water use, but has a smaller carbon footprint, using less fuel for heat, and releasing no emissions from the body itself. Additionally, the organic liquid produced during this type of cremation can be used for fertilizer.[8]

What eco-friendly options do I have if I already have cremated remains?

If you already have cremated remains and would like to honor your loved one and utilize those remains in a way that positively impacts the environment, the following are some available options.

Scattering Grounds

Some cemeteries, natural burial grounds, and conservation areas allow burying or scattering of cremation ashes. Burial in a cemetery protects the land from being re-used for other purposes in perpetuity and funds raised support organizations working to restore and protect natural habitats. Scattering remains in a location meaningful to the deceased is also an option, though discretion and sensitivity to landowners is recommended. There are numerous biodegradable urns made of sustainable materials available that will help to reduce the carbon footprint.

Coral Reef Development

Some companies provide families with a legacy opportunity to honor their loved ones by contributing to the artificial development and restoration of coral reefs in oceans worldwide. Cremated remains are added to specially formulated concrete which is cast into reef bases. Families can take part in the release of reefs into the sea, where the reefs help to establish new habitats for fish and other sea life. This approach is similar to a carbon offset.

Tree Planting

Urns are available that allow cremated remains to be mixed with an organic medium that purports to support plant growth. Some urn companies provide parks and green spaces for planting the trees that result. Note that cremated remains on their own are not capable of further decomposing without enzyme reduction, and cannot support plant life on their own, as calcium phosphate and sodium, the final elements that make up cremated bone, in concentration, are not conducive to healthy plant life. It is also important to be aware that burial on lands that are not designated as cemeteries or protected with conservation easements cannot promise repose in perpetuity.

Ramsey Creek Conservation Preserve and many other natural burial cemeteries assist families with cremated remains

Sources

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